

Exploring
PSYCHOLOGY

NINTH EDITION

David G. Myers

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PSYCHOLOGY

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Exploring
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David G. Myers

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For Sara Neevel
with gratitude for your meticulous
support, and for your friendship

ABOUT THE AUTHOR



DAVID MYERS received his psychology Ph.D. from the University of Iowa. He has spent his career at Hope College in Michigan, where he has taught dozens of introductory psychology sections. Hope College students have invited him to be their commencement speaker and voted him “outstanding professor.”

His research and writings have been recognized by the Gordon Allport Intergroup Relations Prize, by a 2010 Honored Scientist award from the Federation of Associations in Behavioral & Brain Sciences, by a 2010 Award for Service on Behalf of Personality and Social Psychology, and by three honorary doctorates.

Myers’ scientific articles have, with support from National Science Foundation grants, appeared in three dozen scientific periodicals, including *Science*, *American Scientist*, *Psychological Science*, and the *American Psychologist*. In addition to his scholarly writing and his textbooks for introductory and social psychology, he also digests psychological science for the general public. His writings have appeared in four dozen magazines, from *Today’s Education* to *Scientific American*. He also has authored five general audience books, including *The Pursuit of Happiness* and *Intuition: Its Powers and Perils*.

David Myers has chaired his city’s Human Relations Commission, helped found a thriving assistance center for families in poverty, and spoken to hundreds of college and community groups. Drawing on his experience, he also has written three dozen articles and a book (*A Quiet World*) about hearing loss, and he is advocating a transformation in American assistive listening technology (see www.hearingloop.org). For his leadership, he received an American Academy of Audiology Presidential Award in 2011, and the Hearing Loss Association of America Walter T. Ridder Award in 2012.

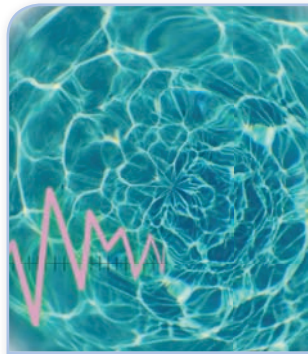
He bikes to work year-round and plays regular pick-up basketball. David and Carol Myers have raised two sons and a daughter, and have one granddaughter.

	Preface . . .	xv
	Time Management: Or, How to Be a Great Student and Still Have a Life . . .	xxxiv
CHAPTER 1	Thinking Critically With Psychological Science . . .	1
CHAPTER 2	The Biology of Behavior . . .	35
CHAPTER 3	Consciousness and the Two-Track Mind . . .	77
CHAPTER 4	Developing Through the Life Span . . .	117
CHAPTER 5	Gender and Sexuality . . .	163
CHAPTER 6	Sensation and Perception . . .	191
CHAPTER 7	Learning . . .	237
CHAPTER 8	Memory . . .	271
CHAPTER 9	Thinking, Language, and Intelligence . . .	305
CHAPTER 10	Motivation and Emotion . . .	351
CHAPTER 11	Stress, Health, and Human Flourishing . . .	389
CHAPTER 12	Personality . . .	423
CHAPTER 13	Social Psychology . . .	457
CHAPTER 14	Psychological Disorders . . .	505
CHAPTER 15	Therapy . . .	545
APPENDIX A	Statistical Reasoning in Everyday Life . . .	A-1
APPENDIX B	Psychology at Work . . .	B-1
APPENDIX C	Subfields of Psychology . . .	C-1
APPENDIX D	Complete Chapter Reviews . . .	D-1
APPENDIX E	Answers to <i>Experience the Testing Effect</i> Questions . . .	E-1
	Glossary . . .	G-1
	References . . .	R-1
	Name Index . . .	NI-1
	Subject Index . . .	SI-1

CONTENTS

Preface . . . xv

Time Management: Or, How to Be
a Great Student and Still Have a Life . . . xxxiv



Thinking Critically With Psychological Science . . . 1

CHAPTER 1

What Is Psychology? . . . 2

Psychology's Roots . . . 2

Contemporary Psychology . . . 5

Psychology's Biggest Question . . . 5

Psychology's Three Main Levels of Analysis . . . 6

Psychology's Subfields . . . 8

The Need for Psychological Science . . . 10

What About Intuition and Common Sense? . . . 10

The Scientific Attitude: Curious, Skeptical, and
Humble . . . 13

Critical Thinking . . . 15

How Do Psychologists Ask and Answer
Questions? . . . 15

The Scientific Method . . . 15

Description . . . 17

Correlation . . . 20

Experimentation . . . 22

Frequently Asked Questions About
Psychology . . . 25

Improve Your Retention—and Your Grades . . . 29



The Biology of Behavior . . . 35

CHAPTER 2

Biology and Behavior . . . 36

Neural Communication . . . 36

Neurons . . . 36

The Neural Impulse . . . 37

How Neurons Communicate . . . 38

How Neurotransmitters Influence Us . . . 40

The Nervous System . . . 41

The Peripheral Nervous System . . . 42

The Central Nervous System . . . 44

The Endocrine System . . . 45

The Brain . . . 46

Older Brain Structures . . . 47

CLOSE UP: The Tools of Discovery—Having Our
Head Examined . . . 48

The Cerebral Cortex . . . 53

Our Divided Brain . . . 59

Right-Left Differences in the Intact Brain . . . 61

Behavior Genetics: Predicting Individual
Differences . . . 62

Genes: Our Codes for Life . . . 62

Twins and Adoption Studies . . . 63

Gene-Environment Interaction . . . 67

Evolutionary Psychology: Understanding Human
Nature . . . 68

Natural Selection and Adaptation . . . 69

Evolutionary Success Helps Explain
Similarities . . . 70



Consciousness and the Two- Track Mind . . . 77

CHAPTER 3

The Brain and Consciousness . . . 78

- Dual Processing: The Two-Track Mind . . . 79
- Selective Attention . . . 80

Sleep and Dreams . . . 83

- Biological Rhythms and Sleep . . . 83
- Sleep Theories . . . 88
- Sleep Deprivation and Sleep Disorders . . . 89
- Dreams . . . 93

Hypnosis . . . 97

- Frequently Asked Questions About Hypnosis . . . 97
- Explaining the Hypnotized State . . . 98

Drugs and Consciousness . . . 100

- Tolerance, Dependence, and Addiction . . . 100
- THINKING CRITICALLY ABOUT:** Addiction . . . 101
- Types of Psychoactive Drugs . . . 102
- Influences on Drug Use . . . 109



Developing Through the Life Span . . . 117

CHAPTER 4

Developmental Psychology's Major Issues . . . 118

Prenatal Development and the Newborn . . . 118

- Conception . . . 118

Prenatal Development . . . 119

The Competent Newborn . . . 120

Infancy and Childhood . . . 121

Physical Development . . . 121

Cognitive Development . . . 124

CLOSE UP: Autism and “Mind-Blindness” . . . 130

Social Development . . . 132

Reflections on Nature and Nurture . . . 139

Adolescence . . . 140

Physical Development . . . 140

Cognitive Development . . . 141

Social Development . . . 143

THINKING CRITICALLY ABOUT: How Much Credit or Blame Do Parents Deserve? . . . 147

Emerging Adulthood . . . 148

Reflections on Continuity and Stages . . . 149

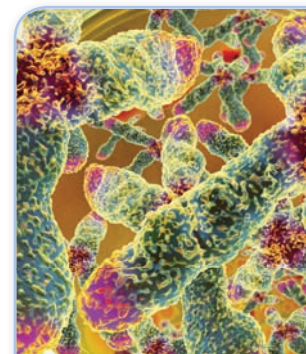
Adulthood . . . 150

Physical Development . . . 150

Cognitive Development . . . 153

Social Development . . . 154

Reflections on Stability and Change . . . 158



Gender and Sexuality . . . 163

CHAPTER 5

Gender Development . . . 164

Genes: How Are We Alike? How Do We Differ? . . . 164

The Nature of Gender: Our Biology . . . 167

The Nurture of Gender: Our Culture . . . 169

Human Sexuality . . . 171

The Physiology of Sex . . . 171

The Psychology of Sex . . . 175

CLOSE UP: The Sexualization of Girls . . . 177

Sexual Orientation . . . 178

Environment and Sexual Orientation . . . 179

Biology and Sexual Orientation . . . 180

An Evolutionary Explanation of Human Sexuality . . . 183

Gender Differences in Sexuality . . . 183

Natural Selection and Mating Preferences . . . 184

Critiquing the Evolutionary Perspective . . . 185

Reflections on Gender, Sexuality, and Nature–Nurture Interaction . . . 185



Sensation and Perception . . . 191

CHAPTER 6

Basic Principles of Sensation and Perception . . . 192

Transduction . . . 192

Thresholds . . . 193

THINKING CRITICALLY ABOUT: Can Subliminal Messages Control Our Behavior? . . . 195

Sensory Adaptation . . . 196

Perceptual Set . . . 197

Context Effects . . . 198

Emotion and Motivation . . . 199

Vision . . . 200

The Stimulus Input: Light Energy . . . 200

The Eye . . . 200

Visual Information Processing . . . 202

Color Vision . . . 206

Visual Organization . . . 208

Visual Interpretation . . . 214

Hearing . . . 216

The Stimulus Input: Sound Waves . . . 216

The Ear . . . 216

The Other Senses . . . 220

Touch . . . 220

Pain . . . 220

Taste . . . 224

Smell . . . 225

Body Position and Movement . . . 227

Sensory Interaction . . . 227

THINKING CRITICALLY ABOUT: ESP—Perception Without Sensation? . . . 230



Learning . . . 237

CHAPTER 7

How Do We Learn? . . . 238

Classical Conditioning . . . 239

Pavlov's Experiments . . . 240

Pavlov's Legacy . . . 244

Operant Conditioning . . . 246

Skinner's Experiments . . . 246

Skinner's Legacy . . . 253

CLOSE UP: Training Our Partners . . . 255

Contrasting Classical and Operant Conditioning . . . 255

Biology, Cognition, and Learning . . . 256

Biological Constraints on Conditioning . . . 256

Cognition's Influence on Conditioning . . . 259

Learning by Observation . . . 261

Mirrors and Imitation in the Brain . . . 262

Applications of Observational Learning . . . 263

THINKING CRITICALLY ABOUT: Does Viewing Media Violence Trigger Violent Behavior? . . . 265



Memory ... 271

CHAPTER 8

Studying Memory ... 272

Memory Models ... 273

Building Memories: Encoding ... 274

Dual-Track Memory: Effortful Versus Automatic Processing ... 274

Automatic Processing and Implicit Memories ... 275

Effortful Processing and Explicit Memories ... 275

Memory Storage ... 280

Retaining Information in the Brain ... 281

Synaptic Changes ... 283

Retrieval: Getting Information Out ... 285

Measuring Retention ... 285

Retrieval Cues ... 286

Forgetting ... 289

Forgetting and the Two-Track Mind ... 290

Encoding Failure ... 291

Storage Decay ... 291

Retrieval Failure ... 292

Memory Construction Errors ... 294

Misinformation and Imagination Effects ... 295

Source Amnesia ... 296

Discerning True and False Memories ... 297

Children's Eyewitness Recall ... 297

Repressed or Constructed Memories of Abuse? ... 298

Improving Memory ... 299



Thinking, Language, and Intelligence ... 305

CHAPTER 9

Thinking ... 306

Concepts ... 306

Problem Solving: Strategies and Obstacles ... 307

Forming Good and Bad Decisions and Judgments ... 308

THINKING CRITICALLY ABOUT: The Fear Factor—Why We Fear the Wrong Things ... 310

Thinking Creatively ... 314

CLOSE UP: Fostering Your Own Creativity ... 315

Do Other Species Share Our Cognitive Skills? ... 316

Language ... 318

Language Structure ... 318

Language Development ... 319

The Brain and Language ... 322

Do Other Species Have Language? ... 323

Thinking and Language ... 326

Language Influences Thinking ... 326

Thinking in Images ... 328

Intelligence ... 329

What Is Intelligence? ... 329

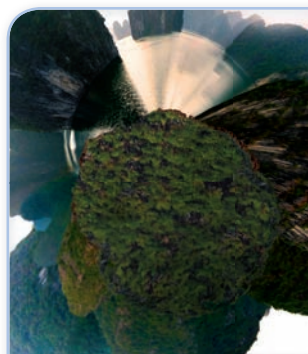
Assessing Intelligence ... 333

Aging and Intelligence ... 337

CLOSE UP: Extremes of Intelligence ... 338

Genetic and Environmental Influences on Intelligence ... 339

Group Differences in Intelligence Test Scores ... 342



Motivation and Emotion . . . 351

CHAPTER 10

Motivational Concepts . . . 352

- Instincts and Evolutionary Psychology . . . 352
- Drives and Incentives . . . 353
- Optimum Arousal . . . 353
- A Hierarchy of Motives . . . 355

Hunger . . . 356

- The Physiology of Hunger . . . 357
- The Psychology of Hunger . . . 359
- Obesity and Weight Control . . . 361
- CLOSE UP:** Waist Management . . . 363

The Need to Belong . . . 364

- The Benefits of Belonging . . . 364
- The Pain of Being Shut Out . . . 365
- Connecting and Social Networking . . . 367
- CLOSE UP:** Managing Your Social Networking . . . 369

Achievement Motivation . . . 370

Emotion: Arousal, Behavior, and Cognition . . . 371

- Historical Emotion Theories . . . 372
- Schachter-Singer Two Factor Theory:
Arousal + Label = Emotion . . . 373
- Zajonc, LeDoux, and Lazarus: Does Cognition
Always Precede Emotion? . . . 374

Embodied Emotion . . . 376

- The Basic Emotions . . . 376
- Emotions and the Autonomic Nervous
System . . . 377

The Physiology of Emotions . . . 377

THINKING CRITICALLY ABOUT: Lie Detection . . . 379

Expressed and Experienced Emotion . . . 378

- Detecting Emotion in Others . . . 379
- Gender and Emotion . . . 381
- Culture and Emotion . . . 382
- The Effects of Facial Expressions . . . 384



Stress, Health, and Human Flourishing . . . 389

CHAPTER 11

Stress and Health . . . 390

- Stress: Some Basic Concepts . . . 390
- Stress and Illness . . . 394
- CLOSE UP:** Tips for Handling Anger . . . 398

Coping With Stress . . . 401

- Personal Control . . . 401
- Optimism Versus Pessimism . . . 404
- Social Support . . . 405
- CLOSE UP:** Pets Are Friends, Too . . . 408

Reducing Stress . . . 407

- Aerobic Exercise . . . 407
- Relaxation and Meditation . . . 409
- Faith Communities and Health . . . 410

Happiness . . . 412

- Positive Psychology . . . 413
- What Affects Our Well-Being? . . . 414
- What Predicts Our Happiness Levels? . . . 417
- CLOSE UP:** Want to Be Happier? . . . 418



Personality ... 423

CHAPTER 12

The Psychodynamic Theories ... 424

Freud's Psychoanalytic Perspective: Exploring the Unconscious ... 424

The Neo-Freudian and Psychodynamic Theorists ... 424

Assessing Unconscious Processes ... 424

Evaluating Freud's Psychoanalytic Perspective and Modern Views of the Unconscious ... 424

Humanistic Theories ... 432

Abraham Maslow's Self-Actualizing Person ... 433

Carl Rogers' Person-Centered Perspective ... 433

Assessing the Self ... 434

Evaluating Humanistic Theories ... 434

Trait Theories ... 435

Exploring Traits ... 436

Assessing Traits ... 437

THINKING CRITICALLY ABOUT: How to Be a "Successful" Astrologer or Palm Reader ... 438

The Big Five Factors ... 439

Evaluating Trait Theories ... 441

Social-Cognitive Theories ... 443

Reciprocal Influences ... 443

Assessing Behavior in Situations ... 445

Evaluating Social-Cognitive Theories ... 445

Exploring the Self ... 446

The Benefits of Self-Esteem ... 447

Self-Serving Bias ... 448

Culture and the Self ... 450



Social Psychology ... 457

CHAPTER 13

Social Thinking ... 458

The Fundamental Attribution Error ... 458

Attitudes and Actions ... 460

Social Influence ... 463

Cultural Influences ... 463

Conformity: Complying With Social Pressures ... 465

Obedience: Following Orders ... 467

Group Behavior ... 471

Social Relations ... 475

Prejudice ... 476

CLOSE UP: Automatic Prejudice ... 477

Aggression ... 481

Attraction ... 487

CLOSE UP: Online Matchmaking and Speed Dating ... 488

Altruism ... 493

Conflict and Peacemaking ... 496



Psychological Disorders ... 505

CHAPTER 14

What Is a Psychological Disorder? ... 506

Understanding Psychological Disorders ... 506

THINKING CRITICALLY ABOUT: ADHD—Normal High Energy or Genuine Disorder? . . . 507

Classifying Disorders—and Labeling People . . . 509

THINKING CRITICALLY ABOUT: Insanity and Responsibility . . . 512

Anxiety Disorders . . . 512

Generalized Anxiety Disorder . . . 513

Panic Disorder . . . 513

Phobias . . . 513

Obsessive-Compulsive Disorder . . . 514

Post-Traumatic Stress Disorder . . . 515

Understanding Anxiety Disorders . . . 516

Mood Disorders . . . 519

Major Depressive Disorder . . . 520

Bipolar Disorder . . . 520

Understanding Mood Disorders . . . 521

CLOSE UP: Suicide and Self-Injury . . . 524

Schizophrenia . . . 528

Symptoms of Schizophrenia . . . 528

Onset and Development of Schizophrenia . . . 529

Understanding Schizophrenia . . . 530

Other Disorders . . . 534

Dissociative Disorders . . . 534

Eating Disorders . . . 536

Personality Disorders . . . 537

Rates of Psychological Disorders . . . 540



Therapy . . . 545

CHAPTER 15

Treating Psychological Disorders . . . 546

The Psychological Therapies . . . 546

Psychoanalysis and Psychodynamic Therapy . . . 547

Humanistic Therapies . . . 548

Behavior Therapies . . . 550

Cognitive Therapies . . . 554

Group and Family Therapies . . . 557

Evaluating Psychotherapies . . . 559

Is Psychotherapy Effective? . . . 560

Which Psychotherapies Work Best? . . . 562

Evaluating Alternative Therapies . . . 563

How Do Psychotherapies Help People? . . . 565

Culture and Values in Psychotherapy . . . 566

CLOSE UP: A Consumer's Guide to Mental Health Professionals . . . 567

The Biomedical Therapies . . . 568

Drug Therapies . . . 568

Brain Stimulation . . . 571

Psychosurgery . . . 574

Therapeutic Lifestyle Change . . . 574

Preventing Psychological Disorders . . . 576

Resilience . . . 576

Creating Healthy Environments . . . 577

APPENDIX A: Statistical Reasoning in Everyday Life . . . A-1

APPENDIX B: Psychology at Work . . . B-1

APPENDIX C: Subfields of Psychology . . . C-1

APPENDIX D: Complete Chapter Reviews . . . D-1

APPENDIX E: Answers to Experience the Testing Effect Questions . . . E-1

Glossary . . . G-1

References . . . R-1

Name Index . . . NI-1

Subject Index . . . SI-1

Throughout its nine editions, my unwavering vision for *Exploring Psychology* has been to merge rigorous science with a broad human perspective that engages both mind and heart. I aim to offer a state-of-the-art introduction to psychological science that speaks to students' needs and interests. I aspire to help students understand and appreciate the wonders of their everyday lives. And I seek to convey the inquisitive spirit with which psychologists *do* psychology.

I am genuinely enthusiastic about psychology and its applicability to our lives. Psychological science has the potential to expand our minds and enlarge our hearts. By studying and applying its tools, ideas, and insights, we can supplement our intuition with critical thinking, restrain our judgmentalism with compassion, and replace our illusions with understanding. By the time students complete this guided tour of psychology, they will also, I hope, have a deeper understanding of our moods and memories, about the reach of our unconscious, about how we flourish and struggle, about how we perceive our physical and social worlds, and about how our biology and culture in turn shape us. (See **TABLES 1** and **2**, next page.)


Believing with Thoreau that “anything living is easily and naturally expressed in popular language,” I seek to communicate psychology’s scholarship with crisp narrative and vivid storytelling. “A writer’s job,” says my friend Mary Pipher, “is to tell stories that connect readers to all the people on Earth, to show these people as the complicated human beings they really are, with histories, families, emotions, and legitimate needs.” Writing as a solo author, I hope to tell psychology’s story in a way that is warmly personal as well as rigorously scientific. I love to reflect on connections between psychology and other realms, such as literature, philosophy, history, sports, religion, politics, and popular culture. And I love to provoke thought, to play with words, and to laugh. For his pioneering 1891 *Principles of Psychology*, William James sought “humor and pathos.” And so do I.

I am grateful for the privilege of assisting with the teaching of this mind-expanding discipline to so many students, in so many countries, through so many different languages. To be entrusted with discerning and communicating psychology’s insights is both an exciting honor and a great responsibility.

Creating this book is a team sport. Like so many human achievements, it is the product of a collective intelligence. Woodrow Wilson spoke for me: “I not only use all the brains I have, but all I can borrow.” The thousands of instructors and millions of students across the globe who have taught or studied (or both!) with this book have contributed immensely to its development. Much of this contribution has occurred spontaneously, through correspondence and conversations. For this edition, we also formally involved 1061 researchers and teaching psychologists, and 251 students, in our efforts to gather accurate and up-to-date information about the field of psychology and the content, study aids, and supplements needs of instructors and students in the introductory course. We look forward to continuing feedback as we strive, over future editions, to create an ever better book and teaching package.

What’s NEW?

This ninth edition is the most carefully reworked and extensively updated of all the revisions to date. This new edition features improvements to the organization and presentation, especially to our system of supporting student learning and remembering.



TABLE 1 Evolutionary Psychology and Behavior Genetics

The **evolutionary perspective** is covered on the following pages:

Aging, pp. 151–152
 Anxiety disorders, p. 518
 Biological predispositions:
 in learning, pp. 256–260
 in operant conditioning, pp. 258–260
 Brainstem, p. 47
 Consciousness, p. 78
 Darwin, Charles, p. 6
 Depression and light exposure therapy, p. 564
 Emotion, effects of facial expressions and,
 pp. 384–385
 Emotional expression, pp. 382–383
 Evolutionary perspective, defined, p. 7
 Exercise, pp. 407–408
 Fear, p. 310
 Feature detection, p. 204
 Hearing, p. 216
 Hunger and taste preference, p. 359
 Instincts, p. 352
 Intelligence, pp. 329–331, 333–334,
 343–346
 Language, pp. 318–319, 320–322
 Love, pp. 154–156
 Math and spatial ability, pp. 342–343
 Mating preferences, pp. 184–185
 Menopause, pp. 150–151
 Need to belong, p. 364
 Obesity, p. 461
 Overconfidence, pp. 311–312
 Perceptual adaptation, p. 215
 Puberty, onset of, pp. 148–149
 Sensation, p. 192
 Sensory adaptation, p. 196
 Sexual orientation, p. 181
 Sexuality, pp. 173, 183–184
 Sleep, pp. 84, 88
 Smell, pp. 225–226
 Taste, pp. 224–225
 See also Chapter 2, The Biology of Behavior.

Behavior genetics is covered on the following pages:

Abuse, intergenerational transmission of,
 p. 264
 Adaptability, p. 53
 Aggression, pp. 579–580
 intergenerational transmission of, p. 264
 Autism, pp. 130–131
 Behavior genetics perspective, p. 7
 Biological perspective, p. 36
 Brain plasticity, p. 58
 Continuity and stages, p. 149
 Deprivation of attachment, p. 136
 Depth perception, p. 210
 Development, p. 119
 Drives and incentives, p. 353
 Drug dependence, p. 110
 Drug use, pp. 109–112
 Eating disorders, p. 536
 Epigenetics, p. 120
 Happiness, pp. 412–413
 Hunger and taste preference, pp. 359–360
 Intelligence:
 Down syndrome, pp. 338–339
 genetic and environmental influences,
 pp. 339–346
 Learning, pp. 256–257, 258–259
 Motor development, p. 123
 Nature–nurture, pp. 5–6
 twins, p. 6
 Obesity and weight control, pp. 361–362
 Parenting styles, p. 138
 Perception, pp. 214–215
 Personality traits, p. 437–440
 Psychological disorders and:
 ADHD, p. 507
 anxiety disorders, p. 517
 biopsychosocial approach, p. 508
 depression, p. 523
 insanity and responsibility, p. 512
 mood disorders, pp. 523–524
 personality disorders, pp. 538–539
 post-traumatic stress syndrome,
 pp. 515–516
 schizophrenia, pp. 531–533
 Reward deficiency syndrome, p. 52
 Romantic love, pp. 154–156
 Sexual disorders, pp. 173–174
 Sexual orientation, p. 180
 Sexuality, p. 173
 Sleep patterns, p. 87
 Smell, pp. 225–226
 Stress, personality, and illness, pp. 397–399
 managing stress with exercise, pp. 407–409
 Traits, pp. 341–342
 See also Chapter 2, The Biology of Behavior.


TABLE 2 Neuroscience

In addition to the coverage found in Chapter 2, **neuroscience** can be found on the following pages:

Aggression, pp. 482–483
 Aging: physical exercise and the brain, p. 152
 Animal language, pp. 316–317
 Antisocial personality disorder, pp. 538–539
 Arousal, pp. 175–176
 Attention-deficit hyperactivity disorder
 (ADHD) and the brain, p. 507
 Autism, pp. 130–131
 Automatic prejudice: amygdala, p. 477
 Biofeedback, p. 409
 Biopsychosocial approach, pp. 6–7
 aggression, p. 487
 aging, pp. 152, 157, 291
 dementia and Alzheimer's, p. 284
 development, pp. 186–187
 dreams, pp. 93–94
 drug use, pp. 109–112
 emotion, pp. 141, 283, 374–375, 378,
 381–382
 hypnosis, pp. 99–100
 learning, pp. 256–260
 pain, pp. 222–223
 personality, p. 444
 psychological disorders, p. 508
 sleep, pp. 83–88
 therapeutic lifestyle change, pp. 574–575
 Brain development:
 adolescence, p. 140
 experience and, pp. 122–123
 infancy and childhood, p. 124
 sexual differentiation in utero, p. 169
 Brain stimulation therapies,
 pp. 572–573
 Cognitive neuroscience, pp. 4, 78
 Drug dependence, pp. 109–111
 Emotion and cognition, pp. 371–372
 Emotional intelligence and brain damage,
 p. 333
 Fear learning, p. 518
 Fetal alcohol syndrome and brain abnor-
 malities, p. 120
 Hallucinations: pp. 107–108
 Hallucinations and:
 near-death experiences, pp. 107–108
 schizophrenia, p. 529
 sleep, p. 95
 Hormones and:
 abuse, pp. 136–137
 appetite, pp. 357–358
 development, p. 167
 in adolescents, pp. 167, 140–141
 of sexual characteristics, pp. 167–168
 emotion, pp. 378–379
 gender, p. 167
 sex, pp. 150–151
 sexual behavior, pp. 171–173
 stress, pp. 377, 391–393, 394–396, 405
 weight control, p. 359
 Hunger, p. 357
 Insight, pp. 307–308
 Intelligence, p. 334
 creativity, pp. 314–315
 twins, pp. 339–340
 Language, pp. 318, 322–323
 and deafness, p. 322
 and thinking in images, p. 328
 Light-exposure therapy: brain scans, p. 564
 Meditation, pp. 409–410
 Memory:
 emotional memories, p. 283
 explicit memories, pp. 281–282
 implicit memories, pp. 282–283
 physical storage of, pp. 280–282
 and sleep, pp. 88, 95
 and synaptic changes, pp. 283–285
 Mirror neurons, pp. 262–263
 Neuroscience perspective, defined, p. 7
 Neurotransmitters and:
 anxiety disorders, pp. 518, 569
 biomedical therapy:
 depression, pp. 523–525, 569–570
 ECT, pp. 571–572
 schizophrenia, pp. 530, 568–569
 child abuse, p. 137
 cognitive-behavioral therapy: obsessive-
 compulsive disorder, p. 557
 depression, pp. 523–525
 drugs, pp. 100, 102
 exercise, p. 407
 narcolepsy, pp. 92–93
 schizophrenia, pp. 530, 532
 Observational learning and brain imaging,
 p. 261
 Optimum arousal: brain mechanisms for
 rewards, pp. 353–355
 Orgasm, p. 173
 Pain, p. 220
 phantom limb pain, p. 222
 virtual reality, pp. 223–224
 Parallel vs. serial processing, p. 205
 Perception:
 brain damage and, p. 205
 color vision, pp. 206–208
 feature detection, p. 204
 transduction, p. 192
 visual information processing,
 pp. 200–202
 Perceptual organization, pp. 208–211
 Personality and brain-imaging, p. 437
 Post-traumatic stress disorder
 (PTSD) and the limbic system,
 pp. 515–516
 Psychosurgery: lobotomy, p. 574
 Schizophrenia and brain abnormalities,
 pp. 530–531, 532
 Sensation:
 body position and movement, p. 227
 deafness, pp. 217–218
 hearing, pp. 216–217
 sensory adaptation, p. 196
 smell, pp. 225–226
 taste, pp. 224–225
 touch, p. 220
 vision, p. 200
 Sexual orientation, pp. 180, 182
 Sleep:
 cognitive development and, p. 96
 memory and, p. 88
 recuperation during, p. 88
 Smell and emotion, p. 226
 Unconscious mind, pp. 431–432

NEW Study System Follows Best Practices From Learning and Memory Research

The new learning system harnesses the *testing effect*, which documents the benefits of actively retrieving information through self-testing (**FIGURE 1**). Thus, each chapter now offers 15 to 20 new *Retrieve It* questions interspersed throughout. Creating these *desirable difficulties* for students along the way optimizes the testing effect, as does *immediate feedback* (via inverted answers beneath each question).

In addition, each main section of text begins with numbered questions that establish *learning objectives* and direct student reading. The Chapter Review section repeats these questions as a further self-testing opportunity (with answers in the Complete Chapter Reviews appendix). The Chapter Review section also offers a page-referenced list of key terms and concepts, and new *Experience the Testing Effect* questions in multiple formats to promote optimal retention.



FIGURE 1

Testing effect For suggestions of how students may apply the testing effect to their own learning, watch this 5-minute YouTube animation: www.tinyurl.com/HowToRemember



Nearly 1000 New Research Citations

My ongoing scrutiny of dozens of scientific periodicals and science news sources, enhanced by commissioned reviews and countless e-mails from instructors and students, enables my integrating our field's most important, thought-provoking, and student-relevant new discoveries. Part of the pleasure that sustains this work is learning something new every day! (For a complete list of significant changes to the content, see www.worthpub.com/myers.)

Reorganized Chapters

In addition to the new study aids and updated coverage, I've introduced the following organizational changes:

- Chapter 1 concludes with a new section, "Improve Your Retention—And Your Grades." This guide will help students replace ineffective and inefficient old habits with new habits that increase retention and success.
- The contents of the previous edition's Nature, Nurture, and Human Diversity chapter are now integrated throughout the text, including in Chapters 2, 4, 5, 12, and 13. (See Table 4 on page xxi.)
- Chapter 4, Developing Through the Life Span, has been shortened by moving the Aging and Intelligence coverage to Chapter 9, Thinking, Language, and Intelligence.
- NEW Chapter 5, Gender and Sexuality, includes new and significantly reorganized discussions.

- Chapter 6, Sensation and Perception, now covers both topics in a more efficient and integrated fashion (rather than covering sensation first, then perception). Coverage of the deaf experience is now in Chapter 9, Thinking, Language, and Intelligence.
- Chapter 7, Learning, now has a separate Biology, Cognition, and Learning section that more fully explores the biological and cognitive constraints on learning.
- Chapter 8, Memory, follows a new format, and more clearly explains how different brain networks process and retain memories. I worked closely with Janie Wilson (Professor of Psychology at Georgia Southern University and Vice President for Programming of the Society for the Teaching of Psychology) in this chapter's revision.
- Chapter 10 now combines Motivation with Emotion.
- Chapter 11, Stress, Health, and Human Flourishing, now includes discussion of positive psychology, well-being, and personal control.
- Chapter 12, Personality, offers improved coverage of modern-day psychodynamic approaches, which are now more clearly distinguished from their historical Freudian roots.
- The Social Psychology chapter now follows the Personality chapter.
- Chapter 14, Psychological Disorders, now includes coverage of eating disorders, previously in the Motivation chapter.

Clinical Chapters Were Carefully Reviewed and Significantly Improved

With helpful guidance from clinical psychologist colleagues, I have strengthened the clinical perspective, which has improved the Personality, Psychological Disorders, and Therapy chapters, among others. For example, I cover problem-focused and emotion-focused coping strategies and the relationship of psychotherapy to cancer survival in the Stress, Health, and Human Flourishing chapter, and the Intelligence chapter describes how psychologists use intelligence tests in clinical settings. Material from today's positive psychology is also woven throughout (see **TABLE 3**).

In addition, the Personality and Therapy chapters now more clearly distinguish between historical psychoanalysis and modern-day psychodynamic theories.

New Time Management Section for Students

To help students maximize their reading, studying, and exam preparation efforts, a new student preface offers time management guidance.

Beautiful New Design and Contemporary New Photo Program

This new, more open and colorful design, chock full of new photos and illustrations, provides a modern visual context for the book's up-to-date coverage.

Dedicated Versions of Next-Generation Media

This ninth edition is accompanied by the dramatically enhanced **Psych-Portal**, which adds new features (**LearningCurve** formative assessment activities and **Launch Pad** carefully crafted prebuilt assignments) while incorporating the full range of Worth's psychology media products (Video Tool Kit, PsychInvestigator, PsychSim). (For details, see p. xxv.)

 **TABLE 3** Examples of Positive Psychology

Coverage of **positive psychology** topics can be found in the following chapters:

Topic	Chapter
Altruism/Compassion	4, 9, 12, 13, 15
Coping	11
Courage	13
Creativity	8, 12, 13
Emotional intelligence	9, 13
Empathy	4, 7, 11, 13, 15
Flow	10
Gratitude	10, 11, 13
Happiness/Life Satisfaction	4, 10, 11
Humility	13
Humor	11, 13
Justice	13
Leadership	10, 12, 13, App B
Love	4, 5, 10, 11, 12, 13, 14, 15
Morality	4
Optimism	11, 12
Personal control	11
Resilience	4, 11, 13, 15
Self-discipline	4, 10, 12
Self-efficacy	11, 12
Self-esteem	10, 12
Spirituality	11, 13
Toughness (grit)	9, 10
Wisdom	3, 4, 9, 12, 13

What Continues?

Eight Guiding Principles

Despite all the exciting changes, this new edition retains its predecessors' voice, as well as much of the content and organization. It also retains the goals—the guiding principles—that have animated the previous eight editions:

Facilitating the Learning Experience

- 1. To teach critical thinking** By presenting research as intellectual detective work, I illustrate an inquiring, analytical mindset. Whether students are studying development, cognition, or social behavior, they will become involved in, and see the rewards of, critical reasoning. Moreover, they will discover how an empirical approach can help them evaluate competing ideas and claims for highly publicized phenomena—ranging from ESP and alternative therapies, to astrology and repressed and recovered memories.
- 2. To integrate principles and applications** Throughout—by means of anecdotes, case histories, and the posing of hypothetical situations—I relate the findings of basic research to their applications and implications. Where psychology can illuminate pressing human issues—be they racism and sexism, health and happiness, or violence and war—I have not hesitated to shine its light.
- 3. To reinforce learning at every step** Everyday examples and rhetorical questions encourage students to process the material actively. Concepts presented earlier are frequently applied, and reinforced, in later chapters. For instance, in Chapter 3, students learn that much of our information processing occurs *outside* of our conscious awareness. Ensuing chapters drive home this concept. Numbered Learning Objective Questions at the beginning of each main section, Retrieve It self-tests throughout each chapter, a marginal glossary, and Chapter Review key terms lists and self-tests help students learn and *retain* important concepts and terminology.

Demonstrating the Science of Psychology

- 4. To exemplify the process of inquiry** I strive to show students not just the outcome of research, but how the research process works. Throughout, the book tries to excite the reader's curiosity. It invites readers to imagine themselves as participants in classic experiments. Several chapters introduce research stories as mysteries that progressively unravel as one clue after another falls into place.
- 5. To be as up-to-date as possible** Few things dampen students' interest as quickly as the sense that they are reading stale news. While retaining psychology's classic studies and concepts, I also present the discipline's most important recent developments. More than 900 references in this edition are dated 2009–2012. Likewise, the new photos and everyday examples are drawn from today's world.
- 6. To put facts in the service of concepts** My intention is not to fill students' intellectual file drawers with facts, but to reveal psychology's major concepts—to teach students how to think, and to offer psychological ideas worth thinking about. In each chapter, I place emphasis on those concepts I hope students will carry with them long after they complete the course. Always, I try to follow Albert Einstein's purported dictum that “everything should be made as simple as possible, but not simpler.” Learning Objective Questions and Retrieve It questions throughout each chapter help students focus on the most important concepts.

Promoting Big Ideas and Broadened Horizons

- 7. To enhance comprehension by providing continuity** Many chapters have a significant issue or theme that links subtopics, forming a thread that ties the chapter together. The Learning chapter conveys the idea that bold

thinkers can serve as intellectual pioneers. The Thinking, Language, and Intelligence chapter raises the issue of human rationality and irrationality. The Psychological Disorders chapter conveys empathy for, and understanding of, troubled lives. Other threads, such as cognitive neuroscience, dual processing, and cultural and gender diversity, weave throughout the whole book, and students hear a consistent voice.

- 8. To convey respect for human unity and diversity** Throughout the book, readers will see evidence of our human kinship—our shared biological heritage, our common mechanisms of seeing and learning, hungering and feeling, loving and hating. They will also better understand the dimensions of our diversity—our *individual* diversity in development and aptitudes, temperament and personality, and disorder and health; and our *cultural* diversity in attitudes and expressive styles, child-rearing and care for the elderly, and life priorities.

Continually Improving Cultural and Gender Diversity Coverage

This edition presents an even more thoroughly cross-cultural perspective on psychology (TABLE 4)—reflected in research findings and text and photo examples. New Chapter 5, Gender and Sexuality, allows a separate-chapter focus on the psychology of women and men, though these topics are also thoroughly integrated throughout the text (see TABLE 5). In addition, I am working to offer a world-based psychology for our worldwide student readership. Thus, I continually search the world for research findings and text and photo examples, conscious that readers may be in Melbourne, Sheffield, Vancouver, or Nairobi. North American and European examples come easily, given that I reside in the United States, maintain contact with friends and colleagues in Canada, subscribe to several European periodicals, and live periodically in the U.K. This edition, for example, offers many dozens of Canadian, British, and Australian and New Zealand examples. We are all citizens of a shrinking world, thanks to increased migration and the growing global economy. Thus, American students, too, benefit from information and examples that internationalize their world-consciousness. And if psychology seeks to explain *human* behavior (not just American or Canadian or Australian behavior), the broader the scope of studies presented, the more accurate is our picture of this world's people. My aim is to expose all students to the world beyond their own culture, and I continue to welcome input and suggestions from all readers. Discussion of the relevance of cultural and gender diversity begins on the first page of the first chapter and continues throughout the text.

Strong Critical Thinking Coverage

I aim to introduce students to critical thinking throughout the book. Revised Learning Objective Questions at the beginning of each main section, and Retrieve It questions throughout each chapter, encourage critical reading to glean an understanding of important concepts. This ninth edition also includes the following opportunities for students to learn or practice their critical thinking skills.

- **Chapter 1, *Thinking Critically With Psychological Science***, introduces students to psychology's research methods, emphasizing the fallacies of our everyday intuition and common sense and, thus, the need for psychological science. *Critical thinking* is introduced as a key term in this chapter (p. 15). Appendix A, Statistical Reasoning in Everyday Life, encourages students to “focus on thinking smarter by applying simple statistical principles to everyday reasoning.”


TABLE 4 Culture and Multicultural Experience

Culture and multicultural experience is covered on the following pages:

- Aggression, p. 484
and video games, pp. 265, 485–486
- Aging population, pp. 151–152
- AIDS, p. 396
- Anger, pp. 398–399
- Animal research ethics, pp. 27–28
- Attraction: love and marriage, pp. 492–493
- Attractiveness, pp. 184–185, 490
- Attribution: political effects of, p. 459
- Behavioral effects of culture, pp. 26–27, 67–68
- Body ideal, pp. 536–537
- Body image, pp. 536–537
- Categorization, p. 306
- Conformity, pp. 465, 467
- Corporal punishment practices, pp. 251–252
- Cultural norms, pp. 164, 464
- Culture:
context effects, pp. 198–199
definition, p. 463
variation over time, p. 464
- Culture and the self, pp. 450–451
- Culture shock, p. 391
- Deaf culture, pp. 58, 61, 320, 321–322
- Development:
adolescence, p. 140
attachment, p. 137
child-rearing, pp. 138–139
cognitive development, p. 129
moral development, pp. 142–143
parenting styles, pp. 138–139
social development, pp. 132–133
- Drug use, p. 112
- Emotion:
emotion-detecting ability, pp. 379–381
- Emotion: expressing, pp. 381–382, 383–385
- Enemy perceptions, p. 498
- Fear, p. 310–311
- Flow, p. 81
- Fundamental attribution error, p. 458
- Gender:
cultural norms, pp. 164, 169
roles, p. 169–170
social power, p. 165
- Grief, expressing, pp. 157–158
- Happiness, pp. 416–418
- Hindsight bias, pp. 11–12
- History of psychology, pp. 2–5
- Homosexuality, views on, p. 178
- Human diversity/kinship, pp. 26–27, 463–464
- Identity: forming social, pp. 144–145
- Individualism/collectivism, p. 451
- Intelligence, pp. 329–330, 343, 344
bias, p. 345
Down syndrome, p. 338
nutrition and, p. 344
- Language, pp. 319–321, 326–327, 464
critical periods, pp. 321–322
monolingual/bilingual, p. 327
universal grammar, p. 321
- Leaving the nest, pp. 148–149
- Life satisfaction, p. 415
- Life span and well-being, pp. 156–157
- Loop systems for hearing assistance, p. B14
- Management styles, pp. B11–B13
- Marriage, p. 155
- Meditation, pp. 409–410
- Memory, encoding, pp. 276–277
- Menopause, p. 151
- Mental illness rate, pp. 540–541
- Motivating achievement, pp. B7–B8
- Motivation: hierarchy of needs, p. 355
- Need to belong, pp. 364–365
- Neurotransmitters: curare, pp. 39–41
- Obesity, pp. 361–362, 362–363
- Observational learning: television and aggression, p. 264
- Organ donation, pp. 312–313
- Pace of life, pp. 19, 464
- Pain: perception of, pp. 220–225
- Parent and peer relationships, pp. 145–146
- Participative management, pp. B11–B12
- Peacemaking:
conciliation, p. 500
contact, p. 499
cooperation, pp. 499–500
- Peer influence, pp. 145–147
- Power of individuals, pp. 474–475
- Prejudice, pp. 24, 29, 476–481
“missing women,” p. 477
- Prejudice prototypes, p. 306
- Psychological disorders:
cultural norms, p. 506
dissociative personality disorder, p. 534
- eating disorders, pp. 508, 536–537
- schizophrenia, pp. 508, 531–532
- suicide, pp. 524–525
- susto*, p. 508
- taijin-kyofusho*, p. 508
- Psychotherapy:
culture and values in, pp. 566–567
- EMDR training, p. 563
- Puberty and adult independence, pp. 148–149
- Self-esteem, p. 417
- Self-serving bias, pp. 448–449
- Sex drive, p. 184
- Sexual orientation, pp. 178–183
- Similarities, pp. 70–72
- Sleep patterns, pp. 87–88
- Social clock, p. 154
- Social loafing, pp. 471–472
- Social networking, pp. 367–368
- Social-cultural perspective, pp. 7–11
- Spirituality: Israeli kibbutz communities, pp. 410–411
- Stress:
adjusting to a new culture, p. 391
health consequences, p. 401
racism and, p. 392
- Taste preferences, pp. 359–360
- Teen sexuality, pp. 176–178
- Testing bias, p. 345
- Weight control, p. 360
- See also Chapter 13, Social Psychology.


TABLE 5 The Psychology of Men and Women

The psychology of men and women is covered on the following pages:

- Absolute thresholds, pp. 193–194
- ADHD, p. 607
- Adulthood: physical changes, pp. 150–151
- Aggression, pp. 481–483
father absence, p. 484
pornography, pp. 484–485
rape, pp. 484, 485
- Alcohol:
and addiction, p. 103
and sexual aggression, pp. 102–103
use, pp. 102–103
- Altruism, pp. 493–494
- Antisocial personality disorder, pp. 538–539
- Attraction, pp. 487–491
- Autism, p. 140
- Behavioral effects of gender, pp. 26–27
- Biological predispositions in color perceptions, p. 257
- Biological sex/gender, pp. 167–168
- Bipolar disorder, pp. 520–521
- Body image, pp. 536–537
- Color vision, pp. 206–208
- Conformity/obedience, p. 467–470
- Dating, p. 488
- Depression, pp. 520, 521–522
learned helplessness, p. 526
- Dream content, pp. 93–94
- Drug use:
biological influences, p. 110
psychological/social-cultural influences, pp. 110–112
- Eating disorders, pp. 536–537
- Emotion-detecting ability, pp. 379–381, 381–382
- Empty nest, p. 156
- Father care, p. 135
- Father presence, p. 177
- Freud's views:
evaluating, pp. 430–432
identification/gender identity, pp. 426–427
Oedipus/Electra complexes, p. 426
penis envy, p. 428
- Fundamental attribution error, pp. 458–459
- Gender:
and anxiety, p. 513
and child-rearing, pp. 170–171
development, p. 164
“missing women,” p. 477
prejudice, pp. 476–478
roles, pp. 169–170
similarities/differences, pp. 164–166
- Gendered brain, pp. 167, 175, 182–183
- Generic pronoun “he,” p. 327
- Grief, pp. 157–158
- Group polarization, p. 473
- Happiness, pp. 417–418
- Hearing loss, pp. 217–218, 322
- Hormones and:
aggression, p. 482
sexual behavior, pp. 171–172
sexual development, pp. 140–141, 167
testosterone-replacement therapy, p. 172
- Intelligence:
bias, p. 345
stereotype threat, pp. 345–346
- Leadership: transformational, p. B12
- Losing weight, p. 363
- Love, pp. 154–156, 491–493
- Marriage, p. 155, 405
- Maturation, pp. 140–141
- Menarche, p. 140
- Menopause, p. 151
- Midlife crisis, p. 154
- Obesity:
genetic factors, pp. 361–362
health risks, p. 361
- Observational learning:
sexually violent media, p. 265
TV's influence, pp. 263–264
- Pain sensitivity, p. 221
- Pornography, pp. 175–176
- Prejudice, p. 306
- Psychological disorders, rates of, p. 540
- PTSD: development of, pp. 515–516
- Rape, p. 481
- Religiosity and life expectancy, pp. 410, 412
- REM sleep, arousal in, p. 86
- Romantic love, pp. 491–493
- Savant syndrome, p. 331
- Schizophrenia, p. 528
- Self-injury, p. 525
- Sense of smell, pp. 225–226
- Sexual attraction, pp. 184–185
- Sexual dysfunctions, pp. 173–174
- Sexual fantasies, p. 176
- Sexual orientation, pp. 178–173
- Sexuality, pp. 175–176
- Sexuality:
adolescent, pp. 176–178
evolutionary explanation, pp. 183–184
external stimuli, pp. 175–176
imagined stimuli, p. 176
- Sexualization of girls, p. 177
- Stereotyping, p. 198
- Stress and:
AIDS, p. 396
depression, pp. 399–400
health, and sexual abuse, p. 407
heart disease, pp. 397–398
immune system, pp. 394–396
response to, pp. 392–394
- Suicide, pp. 524–525
- Teratogens: alcohol consumption, p. 120
- Women in psychology's history, p. 3
- See also Chapter 5, Gender and Sexuality, and Chapter 13, Social Psychology.

- “*Thinking Critically About . . .*” boxes are found throughout the book, modeling for students a critical approach to some key issues in psychology. For example, see the updated box “Thinking Critically About: The Fear Factor—Why We Fear the Wrong Things” (pages 310–311).
- *Detective-style stories* throughout the narrative get students thinking critically about psychology’s key research questions. For example, in Chapter 14, I present the causes of schizophrenia piece by piece, showing students how researchers put the puzzle together.
- “*Apply this*” and “*Think about it*” style discussions keep students active in their study of each chapter. In Chapter 13, for example, students take the perspective of participants in a Solomon Asch conformity experiment, and later in one of Stanley Milgram’s obedience experiments. I’ve also asked students to join the fun by taking part in activities they can try along the way. For example, in Chapter 6, they try out a quick sensory adaptation activity. In Chapter 10, they try matching expressions to faces and test the effects of different facial expressions on themselves.
- *Critical examinations of pop psychology* spark interest and provide important lessons in thinking critically about everyday topics. For example, Chapter 6 includes a close examination of ESP, and Chapter 8 addresses the controversial topic of repression of painful memories.

See TABLE 6 for a complete list of this text’s coverage of critical thinking topics and Thinking Critically About boxes.



TABLE 6 Critical Thinking and Research Emphasis

Critical thinking coverage, and in-depth stories of psychology’s scientific research process, can be found on the following pages:

<p>Thinking Critically About . . . boxes: Addiction, p. 101 The Evolutionary Perspective on Human Sexuality, pp. 183–186 Can Subliminal Messages Control Our Behavior?, p. 195 ESP—Perception Without Sensation?, pp. 230–232 Does Viewing Media Violence Trigger Violent Behavior?, p. 265 The Fear Factor—Why We Fear the Wrong Things, pp. 310–311 Lie Detection, p. 379 How to Be a “Successful” Astrologer or Palm Reader, pp. 438–439 ADHD—Normal High Energy or Genuine Disorder?, p. 507 Insanity and Responsibility, p. 512</p> <p>Critical Examinations of Pop Psychology: The need for psychological science, p. 10 Perceiving order in random events, pp. 12–13 Do we use only 10 percent of our brains?, p. 56 Can hypnosis enhance recall? Coercion? Be therapeutic? Alleviate pain?, pp. 97–98</p>	<p>Has the concept of “addiction” been stretched too far?, p. 101 Near-death experiences, p. 107 Critiquing the evolutionary perspective, pp. 185–186 How much credit or blame do parents deserve?, p. 147 Sensory restriction, pp. 97–100 Is there extrasensory perception?, pp. 230–232 Do other species exhibit language?, pp. 323–325 How valid is the Rorschach test?, pp. 429–430 Is repression a myth?, p. 431 Is Freud credible?, pp. 430–432 Is psychotherapy effective?, pp. 560–563 Evaluating alternative therapies, pp. 563–565 Do video games teach or release violence?, pp. 485–486</p> <p>Thinking Critically With Psychological Science: The limits of intuition and common sense, pp. 10–13 The scientific attitude, pp. 13–14</p>	<p><i>Critical thinking</i> introduced as a key term, p. 15 The scientific method, pp. 15–17 Correlation and causation, pp. 21–22 Exploring cause and effect, pp. 22–23 Random assignment, pp. 22–23 Independent and dependent variables, pp. 23–24 Statistical reasoning, pp. A1–A4 Describing data, pp. A1–A4 Making inferences, pp. A7–A8</p> <p>Scientific Detective Stories: Is breast milk better than formula?, pp. 22–23 Our divided brains, pp. 59–61 Twin and adoption studies, pp. 63–66 Why do we sleep?, pp. 88–89 Why do we dream?, pp. 94–96 Is hypnosis an extension of normal consciousness or an altered state?, pp. 98–100 How a child’s mind develops, pp. 124–129 What determines sexual orientation?, pp. 178–183</p>	<p>Parallel processing, pp. 205–206 How do we see in color?, pp. 206–208 How are memories constructed?, pp. 274–280 How do we store memories in our brains?, pp. 280–282 Do other species exhibit language?, pp. 323–325 Aging and intelligence, pp. 337–338 Why do we feel hunger?, pp. 357–359 Why—and in whom—does stress contribute to heart disease?, pp. 397–399 How and why is social support linked with health?, pp. 405–407 The pursuit of happiness: Who is happy, and why?, pp. 412–419 Self-esteem versus self-serving bias, pp. 448–450 Why do people fail to help in emergencies?, pp. 494–495 What causes mood disorders?, pp. 521–527 Do prenatal viral infections increase risk of schizophrenia?, pp. 531–532 Is psychotherapy effective?, pp. 560–561</p>
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APA Principles and New MCAT 2015 Guidelines

APA Principles for Quality Undergraduate Education and APA Learning Goals and Outcomes

In February 2011, the American Psychological Association (APA) approved the new *Principles for Quality Undergraduate Education in Psychology*. These broad-based principles and their associated recommendations were designed to “produce psychologically literate citizens who apply the principles of psychological science at work and at home.” (See www.apa.org/education/undergrad/principles.aspx.)

APA’s more specific 2002 Learning Goals and Outcomes (from their *Guidelines for the Undergraduate Psychology Major*, updated in 2006) were designed to gauge progress in students graduating with psychology majors. (See www.apa.org/ed/precollege/about/psymajor-guidelines.pdf) Many psychology departments have since used these goals and outcomes to help establish their own benchmarks for departmental assessment purposes. APA’s 2009 Assessment CyberGuide for Learning Goals and Outcomes (www.apa.org/ed/governance/bea/assess.aspx) may assist your efforts.

Some instructors are eager to know whether a given text for the introductory course helps students get a good start at achieving these APA benchmarks. See www.worthpublishers.com/myers for detailed guides to how well *Exploring Psychology*, ninth edition, corresponds to both the 2011 APA Principles and the 2006 APA Learning Goals and Outcomes.

MCAT Will Include Psychology Starting in 2015

Beginning in 2015, the Medical College Admission Test (MCAT) is devoting 25 percent of its questions to the “Psychological, Social, and Biological Foundations of Behavior,” with most of those questions coming from the psychological science taught in introductory psychology courses. From 1977 to 2014, the MCAT focused on biology, chemistry, and physics. Hereafter, reports the new *Preview Guide for MCAT 2015*, the exam will also recognize “the importance of socio-cultural and behavioral determinants of health and health outcomes.” The exam’s new psychology section covers the breadth of topics in this text. See, for example, **TABLE 7**, which outlines the precise correlation between the topics in this text’s Sensation and Perception chapter and the corresponding portion of the MCAT exam. For a complete pairing of the new MCAT psychology topics with this book’s contents, see www.worthpublishers.com/myers.



TABLE 7 Sample MCAT Correlation With *Exploring Psychology*, Ninth Edition

MCAT 2015: Categories in Sensation and Perception	Myers, <i>Exploring Psychology</i> , Ninth Edition, Correlations	
Content Category 6e: <i>Sensing the environment</i>	Section Title or Topic	Page Number
Sensory Processing	Sensation and Perception	191–235
Sensation	Sensation and Perception	193–195
<i>Thresholds</i>	Thresholds	193–195
<i>Signal detection theory</i>	<i>Signal detection theory</i>	193
<i>Sensory adaptation</i>	Sensory adaptation	196–197


 Sample MCAT Correlation With *Exploring Psychology*, Ninth Edition, continued

MCAT 2015: Categories in Sensation and Perception	Myers, <i>Exploring Psychology</i> , Ninth Edition, Correlations	
	Section Title or Topic	Page Number
Content Category 6e: <i>Sensing the environment</i>		
Sensory receptors transduce stimulus energy and transmit signals to the central nervous system.	Transduction	192
<i>Sensory pathways</i>	Visual Information Processing	202–206
	The Ear	216–217
	Understanding Pain	221
	Taste	224–225
	Smell	225–226
	Body Position and Movement	227
<i>Types of sensory receptors</i>	The Eye	201–204
	The Ear	216–219
	Understanding Pain	221–222
	Taste	224–225
	Smell	225–226
	Body Position and Movement	227
The cerebral cortex controls voluntary movement and cognitive functions.	Functions of the Cortex	54–57
<i>Information processing in the cerebral cortex</i>	The Cerebral Cortex	53–57
<i>Lateralization of cortical functions</i>	The Cerebral Cortex	53–56
	Our Divided Brain	59–61
	Right-Left Differences in the Intact Brain	61–62
Vision	Vision	200–215
Structure and function of the eye	The Eye	200–202
Visual processing	Visual Information Processing	202–206
<i>Visual pathways in the brain</i>	<i>Figure 6.16 Pathway from the eyes to the visual cortex</i>	203
<i>Parallel processing</i>	<i>Parallel processing</i>	205–206
<i>Feature detection</i>	<i>Feature detection</i>	204–205
Hearing	Hearing	216–219
Auditory processing	Transduction of sound	216–217
<i>Auditory pathways in the brain</i>	Transduction of sound	216–217
<i>Perceiving loudness and pitch</i>	<i>Perceiving Loudness</i>	218
	<i>Perceiving Pitch</i>	219
<i>Locating sounds</i>	<i>Locating Sounds</i>	219
Sensory reception by hair cells	<i>Photo of hair cells; detailed drawing of inner ear, including hair cells</i>	216, 217
	The Ear	216
Other Senses	The Other Senses	220–227
Somatosensation		
<i>Sensory systems in the skin</i>	Sensory cortex	54–55
	Touch	220


 Sample MCAT Correlation With *Exploring Psychology*, Ninth Edition, continued

MCAT 2015: Categories in Sensation and Perception	Myers, <i>Exploring Psychology</i> , Ninth Edition, Correlations	
Content Category 6e: <i>Sensing the environment</i>	Section Title or Topic	Page Number
<i>Tactile pathways in the brain</i>	Sensory cortex	54–55
	<i>Figure 6.38 The pain circuit</i>	221
<i>Types of pain</i>	Pain	221–222
<i>Factors that influence pain</i>	<i>Biological Influences</i>	221–222
	<i>Psychological Influences</i>	222
	<i>Social-Cultural Influences</i>	222–223
Taste	Taste	224–225
<i>Taste buds/chemoreceptors that detect specific chemicals in the environment</i>	Taste receptors and their functions	224–225
<i>Gustatory pathways in the brain</i>	Processing taste in the brain	226
Smell	Smell	225–227
<i>Olfactory cells/chemoreceptors that detect specific chemicals in the environment</i>	Olfactory receptor cells, and processing olfaction in the brain	225–226
<i>Pheromones</i>	Smell of sex-related hormones	181, 182
<i>Olfactory pathways in the brain</i>	Processing olfaction in the brain	225–226
<i>Role of smell in perception of taste</i>	Sensory Interaction	227–229
Perception	Sensation and Perception	191–235
Bottom-up/Top-down processing	Bottom-up and top-down processing	192, 221
Perceptual organization (i.e., depth, form, motion, constancy)	Visual Organization: Form Perception, Depth Perception (including Relative Motion), Perceptual Constancy	208–214
	Processing motion	205
Gestalt principles	Gestalt principles	208–209

Next-Generation Multimedia

Exploring Psychology, ninth edition, boasts impressive multimedia options. For more information about any of these choices, visit Worth Publishers' online catalog at www.worthpublishers.com.

PsychPortal With LearningCurve Quizzing

The ninth edition's dramatically enhanced **PsychPortal** adds new features (**LearningCurve** formative assessment activities and **Launch Pad** carefully crafted prebuilt assignments) while incorporating the full range of Worth's psychology media options (Video Tool Kit, PsychInvestigator, PsychSim).

Based on the latest findings from learning and memory research, LearningCurve combines adaptive question selection, personalized study plans, immediate and valuable feedback, and state-of-the-art question analysis reports. LearningCurve's game-like nature keeps students engaged while helping them learn and *remember* key concepts.

Launch Pad offers a set of prebuilt assignments, carefully crafted by a group of instructional designers and instructors with an abundance of teaching experience as well as deep familiarity with Worth content. Each Launch Pad unit contains videos, activities, and formative assessment pieces to build student understanding for each topic, culminating with a randomized summative quiz to hold students accountable for the unit. Assign units in just a few clicks, and find scores in your gradebook upon submission. Launch Pad appeals not only to instructors who have been interested in adding an online component to their course but haven't been able to invest the time, but also to experienced online instructors curious to see how other colleagues might scaffold a series of online activities. Customize units as you wish, adding and dropping content to fit your course. (See **FIGURE 2**.)

Faculty Support and Student Resources

- **New! Faculty Lounge**—<http://psych.facultylounge.worthpublishers.com>—(see **FIGURE 3**) is an online place to find and share favorite teaching ideas and materials, including videos, animations, images, PowerPoint® slides and lectures, news stories, articles, web links, and lecture activities. Includes publisher- as well as peer-provided resources—all faculty-reviewed for accuracy and quality.
- Instructor's Media Guide for Introductory Psychology
- Enhanced Course Management Solutions (including course cartridges)
- eBook in various available formats, with embedded Concepts in Action
- Book Companion Site

FIGURE 2
Launch Pad in PsychPortal

The screenshot displays the PsychPortal interface for the course "Myers Exploring Psychology 9e". At the top, the user is logged in as "Kevin Feyen - DEMO-9" with options to "Sign Out" and "Student View". A search bar is available. Below the header, a message prompts the user to "Make this course available to my students" and "Activate once you're ready to distribute the course URL to your class".

The main content area features a "Launch Pad" tab (selected) and an "eBook Only" tab. A notification states "No assignments are currently due." with a link to "Show upcoming assignments tracker". Below this is a list of chapters and appendices:

- Chapter 1. Thinking Critically With Psychological Science
- Chapter 2. The Biology of Behavior
- Chapter 3. Consciousness and the Two-Track Mind
- Chapter 4. Developing Through the Life Span
- Chapter 5. Gender and Sexuality
- Chapter 6. Sensation and Perception
- Chapter 7. Learning
- Chapter 8. Memory
- Chapter 9. Thinking, Language, and Intelligence
- Chapter 10. Motivation and Emotion
- Chapter 11. Stress, Health, and Human Flourishing
- Chapter 12. Personality
- Chapter 13. Social Psychology
- Chapter 14. Psychological Disorders
- Chapter 15. Therapy
- Appendix A: Statistical Reasoning in Everyday Life
- Appendix B: Psychology at Work

The right-hand sidebar contains a "Gradebook" section for "DEMO-9/11/2012" with the user name "Kevin Feyen". It includes options to "View all resources by type", "Create and manage announcements", and "View class roster & groups", along with an "Open Instructor Console" button. Below the gradebook is a "Scientific American" news feed with articles such as "Was This Summer A Climate Change Event?", "Romney Says No to 'Net Neutrality'", and "Readers Respond to 'Cyborg Humanity'".

FIGURE 3
Sample from our Faculty Lounge site
(psych.facultylounge.worthpublishers.com)



Video and Presentation

- **New! Worth Introductory Psychology Videos**, produced in conjunction with *Scientific American* and *Nature*, is a breakthrough collection of NEW modular, tutorial videos on core psychology topics. This set includes animations, interviews with top scientists, and carefully selected archival footage and is available on flash drive, or as part of the new Worth Video Anthology for Introductory Psychology.
- **New! The Worth Video Anthology for Introductory Psychology** is a complete collection, all in one place, of our video clips from the **Video Tool Kit**, the **Digital Media Archive**, and the third edition of the *Scientific American Frontiers Teaching Modules*, as well as from the new *Worth Introductory Psychology Videos* co-produced with *Scientific American* and *Nature*. Available on DVD or flash drive, the set is accompanied by its own Faculty Guide.
- **New! Interactive Presentation Slides for Introductory Psychology** is an extraordinary series of PowerPoint® lectures. This is a dynamic, yet easy-to-use new way to engage students during classroom presentations of core psychology topics. This collection provides opportunities for discussion and interaction, and includes an unprecedented number of embedded video clips and animations (including activities from our **ActivePsych** series).

Assessment

- **New! LearningCurve**
- Printed Test Banks
- Diploma Computerized Test Banks
- Online Quizzing
- iClicker Radio Frequency Classroom Response System

Print

- Instructor's Resources
- Lecture Guides
- Study Guide
- *Pursuing Human Strengths: A Positive Psychology Guide*
- *Critical Thinking Companion*, Second Edition
- *Psychology and the Real World: Essays Illustrating Fundamental Contributions to Society*. This ©2011 project of the FABBS Foundation brought together a virtual “Who’s Who” of contemporary psychological scientists to describe—in clear, captivating ways—the research they have passionately pursued and what it means to the “real world.” Each contribution is an original essay written for this project.

From Scientific American

- Improving the Mind & Brain: A *Scientific American* Special Issue
- *Scientific American* Reader to Accompany Myers

In Appreciation

If it is true that “whoever walks with the wise becomes wise” then I am wiser for all the wisdom and advice received from my colleagues. Aided by thousands of consultants and reviewers over the last two decades, this has become a better, more accurate book than one author alone (this author, at least) could write. As my editors and I keep reminding ourselves, all of us together are smarter than any one of us.

My indebtedness continues to each of the teacher-scholars whose influence I acknowledged in the eight previous editions, to the innumerable researchers who have been so willing to share their time and talent to help me accurately report their research, and to the 1155 instructors and students who took the time to offer feedback over the phone, in a survey, or at one of our face-to-face focus groups. I also appreciated having detailed consultation on the Memory chapter from Janie Wilson (Georgia Southern University, and Vice President for Programming of the Society of the Teaching of Psychology).

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At Worth Publishers a host of people played key roles in creating this ninth edition.

Although the information gathering is never ending, the formal planning began as the author-publisher team gathered for a two-day retreat in June 2010. This happy and creative gathering included John Brink, Thomas Ludwig, Richard Straub, and me from the author team, along with my assistants Kathryn Brownson and Sara Neevel. We were joined by Worth Publishers executives Tom Scotty, Elizabeth Widdicombe, Catherine Woods, Craig Bleyer, and Mark Resmer; editors Christine Brune, Kevin Feyen, Nancy Fleming, Tracey Kuehn, Betty Probert, and Trish Morgan; artistic director Babs Reingold; sales and marketing colleagues Tom Kling, Carlise Stembridge, John Britch, Lindsay Johnson, Cindi Weiss, Kari Ewalt, Mike Howard, and Matt Ours; and special guests Amy Himsel (El Camino Community College), Jennifer Peluso (Florida Atlantic University), Charlotte vanOyen Witvliet (Hope College), and Jennifer Zwolinski (University of San Diego). The input and brainstorming during this meeting of minds gave birth, among other things, to the study aids in this edition, the carefully revised clinical coverage, the separate gender and sexuality chapter, and the refreshing new design.

Christine Brune, chief editor for the last eight editions, is a wonder worker. She offers just the right mix of encouragement, gentle admonition, attention to detail, and passion for excellence. An author could not ask for more.

Development editor Nancy Fleming is one of those rare editors who is gifted both at “thinking big” about a chapter—and with a kindred spirit to my own—while also applying her sensitive, graceful, line-by-line touches.

Publisher Kevin Feyen is a valued team leader, thanks to his dedication, creativity, and sensitivity. Catherine Woods (Senior Vice President, Editorial and Production) helped construct and execute the plan for this text and its supplements. Catherine was also a trusted sounding board as we faced a seemingly unending series of discrete decisions along the way. Elizabeth Block and Nadina Persaud coordinated production of the huge media and print supplements package for this edition. Betty Probert efficiently edited and produced the print supplements and, in the process, also helped fine-tune the whole book. Nadina also provided invaluable support in commissioning and organizing the multitude of reviews, mailing information to professors, and handling numerous other daily tasks related to the book’s development and production. Lee Ann McKevitt did a splendid job of laying out each page. Bianca Moscatelli and Donna Ranieri worked together to locate the myriad photos.

Tracey Kuehn, Director of Print and Digital Development, displayed tireless tenacity, commitment, and impressive organization in leading Worth’s gifted artistic production team and coordinating editorial input throughout the production process. Production Manager Sarah Segal masterfully kept the book to its tight schedule, and Art Director Babs Reingold skillfully directed creation of the beautiful new design and art program. Production Manager Stacey Alexander, along with Supplements Production Editor Edgar Bonilla, did their usual excellent work of producing the many supplements.

To achieve our goal of supporting the teaching of psychology, this teaching package not only must be authored, reviewed, edited, and produced, but also made available to teachers of psychology. For their exceptional success in doing that, our author team is grateful to Worth Publishers’ professional sales and marketing team. We are especially grateful to Executive Marketing Manager Kate Nurre, Marketing Manager Lindsay Johnson, and National Psychology and Economics Consultant Tom Kling both for their tireless efforts to inform our teaching colleagues of our efforts to assist their teaching, and for the joy of working with them.

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The day this book went to press was the day I started gathering information and ideas for the tenth edition. Your input will again influence how this book continues to evolve. So, please, do share your thoughts.



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Are You Trying to Study Regularly for the First Time and Feeling Overwhelmed?



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Motivated students: This course at Bunker Hill Community College meets at the increasingly popular time of midnight to 2:00 A.M., allowing shift workers, busy parents, and others to make it to class.

We all face challenges in our schedules. Some of you may be taking midnight courses, others squeezing in an online course in between jobs or after putting children to bed at night. Some of you may be veterans using military benefits to jump-start a new life.

How can you balance all of your life's demands and be successful? Time management. Manage the time you have so that you can find the time you need.

In this section, I will outline a simple, four-step process for improving the way you make use of your time.

1. Keep a time-use diary to understand how you are using your time. You may be surprised at how much time you're wasting.
2. Design a new schedule for using your time more effectively.
3. Make the most of your study time so that your new schedule will work for you.
4. If necessary, refine your new schedule, based on what you've learned.

How Are You Using Your Time Now?

Although everyone gets 24 hours in the day and seven days in the week, we fill those hours and days with different obligations and interests. If you are like most people, you probably use your time wisely in some ways, and not so wisely in others. Answering the questions in **TABLE 1** can help you find trouble spots—and hopefully more time for the things that matter most to you.

The next thing you need to know is how you *actually* spend your time. To find out, record your activities in a *time-use diary* for one week. Be realistic. Take notes on

how much time you spend attending class, studying, working, commuting, meeting personal and family needs, fixing and eating meals, socializing (don't forget texting, Facebooking, and gaming), exercising, and anything else that occupies your time, including life's small practical tasks, which can take up plenty of your 24/7. As you record your activities, take notes on how you are feeling at various times of the day. When does your energy slump, and when do you feel most energetic?

Design a Better Schedule

Take a good look at your time-use diary. Where do you think you may be wasting time? Do you spend a lot of time commuting, for example? If so, could you use that time more productively? If you take public transportation, commuting is a great time to read and test yourself for review.

Did you remember to include time for meals, personal care, work schedules, family commitments, and other fixed activities?

How much time do you sleep? In the battle to meet all of life's daily commitments and interests, we tend to treat sleep as optional. Do your best to manage your life so that you can get enough sleep to feel rested. You will feel better and be healthier, and you will also do better academically and in relationships with your family and friends. (You will read more about this in Chapter 3.)

Are you dedicating enough time for focused study? Take a last look at your notes to see if any other patterns pop out. Now it's time to create a new and more efficient schedule.

Plan the Term

Before you draw up your new schedule, think ahead. Buy a portable calendar that covers the entire school term, with a writing space for each day. Using the course outlines provided by your instructors, enter the dates of all exams, term-paper deadlines, and other important assignments. Also be sure to enter your own long-range personal plans (work and family commitments, etc.). Carry this calendar with you each day. Keep it up-to-date, refer to it often, and change it as needed. Through this process, you will develop a regular schedule that will help you achieve success.

Plan Your Week

To pass those exams, meet those deadlines, and keep up with your life outside of class, you will need to convert your long-term goals into a daily schedule. Be realistic—you will be living with this routine for the entire school term. Here are some more things to add to that portable calendar.

1. Enter your class times, work hours, and any other fixed obligations. Be thorough. Allow plenty of time for such things as commuting, meals, and laundry.
2. Set up a study schedule for each course. Remember what you learned about yourself in the study habits survey (Table 1) and your time-use diary. Close-Up: More Tips for Effective Scheduling (next page) offers some detailed guidance drawn from psychology's research.
3. After you have budgeted time for studying, fill in slots for other obligations, exercise, fun, and relaxation.



Table 1
Study Habits Survey

Answer the following questions, writing *Yes* or *No* for each line.

1. Do you usually set up a schedule to budget your time for studying, work, recreation, and other activities? _____
2. Do you often put off studying until time pressures force you to cram? _____
3. Do other students seem to study less than you do, but get better grades? _____
4. Do you usually spend hours at a time studying one subject, rather than dividing that time among several subjects? _____
5. Do you often have trouble remembering what you have just read in a textbook? _____
6. Before reading a chapter in a textbook, do you skim through it and read the section headings? _____
7. Do you try to predict test questions from your class notes and reading? _____
8. Do you usually try to summarize in your own words what you have just finished reading? _____
9. Do you find it difficult to concentrate for very long when you study? _____
10. Do you often feel that you studied the wrong material for a test? _____

Thousands of students have participated in similar surveys. Students who are fully realizing their academic potential usually respond as follows: (1) yes, (2) no, (3) no, (4) no, (5) no, (6) yes, (7) yes, (8) yes, (9) no, (10) no.

Do your responses fit that pattern? If not, you could benefit from improving your time management and study habits.

CLOSE UP

More Tips for Effective Scheduling

There are a few other things you will want to keep in mind when you set up your schedule.

Spaced study is more effective than massed study. If you need 3 hours to study one subject, for example, it's best to divide that into shorter periods spaced over several days.

Alternate subjects, but avoid interference. Alternating the subjects you study in any given session will keep you fresh and will, surprisingly, increase your ability to remember what you're learning in each different area. Studying similar topics back-to-back, however, such as two different foreign languages, could lead to interference in your learning. (You will hear more about this in Chapter 8.)

Determine the amount of study time you need to do well in each course. The time you need depends upon the difficulty of your courses and the effectiveness of your study methods. Ideally, you would spend at least 1 to 2 hours studying for each hour spent in

class. Increase your study time slowly by setting weekly goals that will gradually bring you up to the desired level.

Create a schedule that makes sense. Tailor your schedule to meet the demands of each course. For the course that emphasizes lecture notes, plan a daily review of your notes soon after each class. If you are evaluated for class participation (for example, in a language course), allow time for a review just before the class meets. Schedule study time for your most difficult (or least motivating) courses during hours when you are the most alert and distractions are fewest.

Schedule open study time. Life can be unpredictable. Emergencies and new obligations can throw off your schedule. Or you may simply need some extra time for a project or for review in one of your courses. Try to allow for some flexibility in your schedule each week.

Following these guidelines will help you find a schedule that works for you!

Make Every Minute of Your Study Time Count

How do you study from a textbook? Many students simply read and reread in a passive manner. As a result, they remember the wrong things—the catchy stories but not the main points that show up later in test questions. To make things worse, many students take poor notes during class. Here are some tips that will help you get the most from your class and your text.

Take Useful Class Notes

Good notes will boost your understanding and retention. Are yours thorough? Do they form a sensible outline of each lecture? If not, you may need to make some changes.

Keep Each Course's Notes Separate and Organized

Keeping all your notes for a course in one location will allow you to flip back and forth easily to find answers to questions. Three options are (1) separate notebooks for each course, (2) clearly marked sections in a shared ring binder, or (3) carefully organized folders if you opt to take notes electronically. For the print options, removable pages will allow you to add new information and weed out past mistakes. Choosing notebook pages with lots of space, or using mark-up options in electronic files, will allow you to add comments when you review and revise your notes after class.

Use an Outline Format

Use roman numerals for major points, letters for supporting arguments, and so on. (See **FIGURE 1** for a sample.) In some courses, taking notes will be easy, but some instructors may be less organized, and you will have to work harder to form your outline.

Clean Up Your Notes After Class

Try to reorganize your notes soon after class. Expand or clarify your comments and clean up any hard-to-read scribbles while the material is fresh in your mind. Write important questions in the margin, or by using an electronic markup feature, next to notes that answer them. (For example: “What are the sleep stages?”) This will help you when you review your notes before a test.

Create a Study Space That Helps You Learn

It’s easier to study effectively if your work area is well designed.

Organize Your Space

Work at a desk or table, not in your bed or a comfy chair that will tempt you to nap.

Minimize Distractions

Turn the TV off, turn off your phone, and close Facebook and other distracting windows on your computer. If you must listen to music to mask outside noise, play soft instrumentals, not vocal selections that will draw your mind to the lyrics.

Ask Others to Honor Your Quiet Time

Tell roommates, family, and friends about your new schedule. Try to find a study place where you are least likely to be disturbed.

Set Specific, Realistic Daily Goals

The simple note “7–8 P.M.: Study Psychology” is too broad to be useful. Instead, break your studying into manageable tasks. For example, you will want to subdivide large reading assignments. If you aren’t used to studying for long periods, start with relatively short periods of concentrated study, with breaks in between. In this text, for example, you might decide to read one major section before each break. Limit your breaks to 5 or 10 minutes to stretch or move around a bit.

Your attention span is a good indicator of whether you are pacing yourself successfully. At this early stage, it’s important to remember that you’re in training. If your attention begins to wander, get up immediately and take a short break. It is better to study effectively for 15 minutes and then take a break than to fritter away 45 minutes out of your study hour. As your endurance develops, you can increase the length of study periods.

Use SQ3R to Help You Master This Text

David Myers organized this text by using a system called SQ3R (Survey, Question, Read, Retrieve, Review). Using SQ3R can help you to understand what you read, and to retain that information longer.

		<i>When is my daily peak in circadian arousal? Study hardest subject then!</i>
○	Sleep (Chapter 3)	
	I. Biological Rhythms	
	A. Circadian Rhythm (circa-about; diem-day)—24-hour cycle.	
	1. Ups and downs throughout day/night.	
	Dip in afternoon (siesta time).	
	2. Melatonin—hormone that makes us sleepy. Produced by pineal gland in brain. Bright light shuts down production of melatonin.	
	(Dim the lights at night to get sleepy.)	
	B. FOUR Sleep Stages, cycle through every 90 minutes all night! Aserinsky discovered—his son—REM sleep (dreams, rapid eye movement, muscles paralyzed but brain super active). EEG measurements showed sleep stages.	
○	1. NREM-1 (non-Rapid Eye Movement sleep; brief, images like hallucinations; hypnagogic jerks)	
	2. NREM-2 (harder to waken, sleep spindles)	
	3. NREM-3 (DEEP sleep—hard to wake up! Long slow waves on EEG; bedwetting, night terrors, sleepwalking occurs here; asleep but not dead—can still hear, smell, etc. Will wake up for baby.)	
	4. REM Sleep (Dreams...)	

FIGURE 1

Sample class notes in outline form

Here is a sample from a student’s notes taken in outline form from a lecture on sleep.

Applying SQ3R may feel at first as though it's taking more time and effort to “read” a chapter, but with practice, these steps will become automatic.

Survey

Before you read a chapter, survey its key parts. Scan the chapter outline. Note that main sections have numbered Learning Objective Questions to help you focus. Pay attention to headings, which indicate important subtopics, and to words set in bold type.

Surveying gives you the big picture of a chapter's content and organization. Understanding the chapter's logical sections will help you break your work into manageable pieces in your study sessions.

Question

As you survey, don't limit yourself to the numbered Learning Objective Questions that appear throughout the chapter. Jotting down additional questions of your own will cause you to look at the material in a new way. (You might, for example, scan this section's headings and ask “What does ‘SQ3R’ mean?”) Information becomes easier to remember when you make it personally meaningful. Trying to answer your questions while reading will keep you in an active learning mode.

You will hear more about SQ3R in Chapter 1.

Read

As you read, keep your questions in mind and actively search for the answers. If you come to material that seems to answer an important question that you haven't jotted down, stop and write down that new question.

Be sure to read everything. Don't skip photo or art captions, graphs, boxes, tables, or quotes. An idea that seems vague when you read about it may become clear when you see it in a graph or table. Keep in mind that instructors sometimes base their test questions on figures and tables.

Retrieve

When you have found the answer to one of your questions, close your eyes and mentally recite the question and its answer. Then write the answer next to the question in your own words. Trying to explain something in your own words will help you figure out where there are gaps in your understanding. These kinds of opportunities to practice *retrieving* develop the skills you will need when you are taking exams. If you study without ever putting your book and notes aside, you may develop false confidence about what you know. With the material available, you may be able to recognize the correct answer to your questions. But will you be able to recall it later, when you take an exam without having your mental props in sight?

Test your understanding as often as you can. Testing yourself is part of successful learning, because the act of testing forces your brain to work at remembering, thus establishing the memory more permanently (so you can find it later for the exam!). Use the self-testing opportunities throughout each chapter, including the periodic Retrieve It items. Also take advantage of the self-testing that is available on the free book companion website (www.worthpublishers.com/myers).

Review

After working your way through the chapter, read over your questions and your written answers. Take an extra few minutes to create a brief written summary covering all of your questions and answers. At the end of the chapter, you should take advantage of three important opportunities for self-testing and review—a list of the chapter's Learning Objective Questions for you to try answering before checking

Appendix D (Complete Chapter Reviews), a list of the chapter's key terms for you to try to define before checking the referenced page, and a final self-test that covers all of the key chapter concepts (with answers in Appendix E).

Don't Forget About Rewards!

If you have trouble studying regularly, giving yourself a reward may help. What kind of reward works best? That depends on what you enjoy. You might start by making a list of 5 or 10 things that put a smile on your face. Spending time with a loved one, taking a walk or going for a bike ride, relaxing with a magazine or novel, or watching a favorite show can provide immediate rewards for achieving short-term study goals.

To motivate yourself when you're having trouble sticking to your schedule, allow yourself an immediate reward for completing a specific task. If running makes you smile, change your shoes, grab a friend, and head out the door! You deserve a reward for a job well done.

Do You Need to Revise Your New Schedule?

What if you've lived with your schedule for a few weeks, but you aren't making progress toward your academic and personal goals? What if your studying hasn't paid off in better grades? Don't despair and abandon your program, but do take a little time to figure out what's gone wrong.

Are You Doing Well in Some Courses But Not in Others?

Perhaps you need to shift your priorities a bit. You may need to allow more study time for Chemistry, for example, and less time for some other course.

Have You Received a Poor Grade on a Test?

Did your grade fail to reflect the effort you spent preparing for the test? This can happen to even the hardest-working student, often on a first test with a new instructor. This common experience can be upsetting. "What do I have to do to get an A?" "The test was unfair!" "I studied the wrong material!"

Try to figure out what went wrong. Analyze the questions you missed, dividing them into two categories: class-based questions and text-based questions. How many questions did you miss in each category? If you find far more errors in one category than in the other, you'll have some clues to help you revise your schedule. Depending on the pattern you've found, you can add extra study time to review of class notes, or to studying the text.

Are You Trying to Study Regularly for the First Time and Feeling Overwhelmed?

Perhaps you've set your initial goals too high. Remember, the point of time management is to identify a regular schedule that will help you achieve success. Like any skill, time management takes practice. Accept your limitations and revise your schedule to work slowly up to where you know you need to be—perhaps adding 15 minutes of study time per day.

I hope that these suggestions help make you more successful academically, and that they enhance the quality of your life in general. Having the necessary skills makes any job a lot easier and more pleasant. Let me repeat my warning not to attempt to make too drastic a change in your lifestyle immediately. Good habits require time and self-discipline to develop. Once established, they can last a lifetime.

REVIEW

Time Management: Or, How to Be a Great Student and Still Have a Life

1. How Are You Using Your Time Now?

- Identify your areas of weakness.
- Keep a time-use diary.
- Record the time you actually spend on activities.
- Record your energy levels to find your most productive times.

2. Design a Better Schedule

- Decide on your goals for the term and for each week.
- Enter class times, work times, social times (for family and friends), and time needed for other obligations and for practical activities.
- Tailor study times to avoid interference and to meet each course's needs.

3. Make Every Minute of Your Study Time Count

- Take careful class notes (in outline form) that will help you recall and rehearse material covered in lectures.
- Try to eliminate distractions to your study time, and ask friends and family to help you focus on your work.
- Set specific, realistic daily goals to help you focus on each day's tasks.
- Use the SQ3R system (survey, question, read, retrieve, review) to master material covered in your text.
- When you achieve your daily goals, reward yourself with something that you value.

4. Do You Need to Revise Your New Schedule?

- Allocate extra study time for courses that are more difficult, and a little less time for courses that are easy for you.
- Study your test results to help determine a more effective balance in your schedule.
- Make sure your schedule is not too ambitious. Gradually establish a schedule that will be effective for the long term.

Exploring
PSYCHOLOGY

WHAT IS PSYCHOLOGY?

Psychology's Roots

CONTEMPORARY PSYCHOLOGY

Psychology's Biggest Question

Psychology's Three Main Levels of Analysis

Psychology's Subfields

THE NEED FOR PSYCHOLOGICAL SCIENCE

What About Intuition and Common Sense?

The Scientific Attitude: Curious, Skeptical,
and Humble

Critical Thinking

HOW DO PSYCHOLOGISTS ASK AND ANSWER QUESTIONS?

The Scientific Method

Description

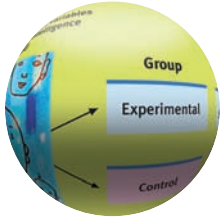
Correlation

Experimentation

FREQUENTLY ASKED QUESTIONS ABOUT PSYCHOLOGY

IMPROVE YOUR RETENTION—AND YOUR GRADES





Thinking Critically With Psychological Science

Hoping to satisfy their curiosity about people and to remedy their own woes, millions turn to “psychology.” They listen to talk-radio counseling. They read articles on psychic powers. They attend stop-smoking hypnosis seminars. They immerse themselves in self-help websites and books on the meaning of dreams, the path to ecstatic love, and the roots of personal happiness.

Others, intrigued by claims of psychological truth, wonder: Do mothers and infants bond in the first hours after birth? How—and how much—does parenting shape children’s personalities and abilities? What factors affect our drive to achieve? Does psychotherapy heal?

In working with such questions, how can we separate uninformed opinions from examined conclusions? *How can we best use psychology to understand why people think, feel, and act as they do?*





Tim Gaiety/Alamy

A smile is a smile the world around Throughout this book, you will see examples not only of our cultural and gender diversity but also of the similarities that define our shared human nature. People in different cultures vary in when and how often they smile, but a naturally happy smile *means* the same thing anywhere in the world.

To assist your active learning of psychology, Learning Objectives, framed as questions, appear at the beginning of major sections. You can test your understanding by trying to answer the question before, and then again after, you read the section.

Information sources are cited in parentheses, with name and date. Every citation can be found in the end-of-book References, with complete documentation that follows American Psychological Association style.

What Is Psychology?

For people whose exposure to psychology comes from popular books, magazines, TV, and the Internet, psychologists seem to analyze personality, offer counseling, and dispense child-rearing advice. Do they? *Yes*, and much more. Consider some of psychology's questions, which perhaps have also been yours:

- Have you ever found yourself reacting to something as one of your biological parents would—perhaps in a way you vowed you never would—and then wondered how much of your personality you inherited? *To what extent do genes predispose our person-to-person personality differences? To what extent do home and community environments shape us?*
- Have you ever worried about how to act among people of a different culture, race, gender, or sexual orientation? *In what ways are we alike as members of the human family? How do we differ?*
- Have you ever awakened from a nightmare and, with a wave of relief, wondered why you had such a crazy dream? *How often, and why, do we dream?*
- Have you ever played peekaboo with a 6-month-old and wondered why the baby finds the game so delightful? The infant reacts as though, when you momentarily move behind a door, you actually disappear—only to reappear out of thin air. *What do babies actually perceive and think?*
- Have you ever wondered what fosters school and work success? *Are some people just born smarter? And does sheer intelligence explain why some people get richer, think more creatively, or relate more sensitively?*
- Have you ever wondered how the Internet, video games, and electronic social networks affect people? *How do today's electronic media influence how we think and how we relate?*
- Have you ever become depressed or anxious and wondered whether you'll ever feel “normal”? *What triggers our bad moods—and our good ones? What's the line between a normal mood swing and a psychological disorder for which someone should seek help?*

Psychology is a science that seeks to answer such questions.

Psychology's Roots



1-1: What are some important milestones in psychology's development?

To be human is to be curious about ourselves and the world around us. Before 300 B.C.E., the Greek naturalist and philosopher Aristotle theorized about learning and memory, motivation and emotion, perception and personality. Today we chuckle at some of his guesses, like his suggestion that the source of our personality is the heart. But credit Aristotle with asking the right questions.

Psychological Science Is Born

Philosophers' thinking about thinking continued until the birth of psychology on a December day in 1879, in a small, third-floor room at Germany's University of Leipzig. There, two young men were helping an austere, middle-aged professor, Wilhelm Wundt, create an experimental apparatus. Their machine measured the time lag between people's hearing a ball hit a platform and their pressing a telegraph key (Hunt, 1993). Curiously, people responded in about one-tenth of a second when asked to press the key as soon as the sound occurred—and in about two-tenths of a second when asked to press the key as soon as they were consciously aware of perceiving the sound. (To be aware of one's awareness takes a little longer.) Wundt was seeking to measure “atoms of

the mind”—the fastest and simplest mental processes. So began the first psychological laboratory, staffed by Wundt and by psychology’s first graduate students.

Before long, this new science of psychology became organized into different branches, or schools of thought, each promoted by pioneering thinkers. Two early schools were **structuralism** and **functionalism**. As physicists and chemists discerned the structure of matter, so Wundt’s student Edward Bradford Titchener aimed to discover the mind’s structure. He engaged people in self-reflective *introspection* (looking inward), training them to report elements of their experience as they looked at a rose, listened to a metronome, smelled a scent, or tasted a substance. What were their immediate sensations, their images, their feelings? And how did these relate to one another? Alas, introspection proved somewhat unreliable. It required smart, verbal people, and its results varied from person to person and experience to experience. As introspection waned, so did structuralism.

Hoping to assemble the mind’s structure from simple elements was rather like trying to understand a car by examining its disconnected parts. Philosopher-psychologist William James thought it would be more fruitful to consider the evolved *functions* of our thoughts and feelings. Smelling is what the nose does; thinking is what the brain does. But *why* do the nose and brain do these things? Under the influence of evolutionary theorist Charles Darwin, James assumed that thinking, like smelling, developed because it was *adaptive*—it contributed to our ancestors’ survival. Consciousness serves a function. It enables us to consider our past, adjust to our present, and plan our future. As a *functionalist*, James encouraged explorations of down-to-earth emotions, memories, willpower, habits, and moment-to-moment streams of consciousness.

As these names illustrate, the early pioneers of most fields, including psychology, were predominantly men. In 1890, over the objections of Harvard’s president, James admitted Mary Whiton Calkins into his graduate seminar (Scarborough & Furumoto, 1987). (In those years women lacked even the right to vote.) When Calkins joined, the other students (all men) dropped out. So James tutored her alone. Later, she finished all of Harvard’s Ph.D. requirements, outscoring all the male students on the qualifying exams. Alas, Harvard denied her the degree she had earned, offering her instead a degree from Radcliffe College, its undergraduate “sister” school for women. Calkins resisted the unequal treatment and refused the degree. She nevertheless went on to become a distinguished memory researcher and the American Psychological Association’s (APA’s) first female president in 1905.

The honor of being the first female psychology Ph.D. later fell to Margaret Floy Washburn, who also wrote an influential book, *The Animal Mind*, and became the APA’s second female president in 1921.

structuralism early school of thought promoted by Wundt and Titchener; used introspection to reveal the structure of the human mind.

functionalism early school of thought promoted by James and influenced by Darwin; explored how mental and behavioral processes function—how they enable the organism to adapt, survive, and flourish.

Throughout the text, important concepts are **boldfaced**. As you study, you can find these terms with their definitions in a nearby margin and in the Glossary at the end of the book.



Wilhelm Wundt Wundt established the first psychology laboratory at the University of Leipzig, Germany.

© Bettmann/Corbis



William James and Mary Whiton Calkins James was a legendary teacher-writer who authored an important 1890 psychology text. He mentored Calkins, who became a pioneering memory researcher and the first woman to be president of the American Psychological Association.

(left) Mary Evans Picture Library/Alamy; (right) Wellesley College Archives

Margaret Floy Washburn The first woman to receive a psychology Ph.D., Washburn synthesized animal behavior research in *The Animal Mind*.

Center for the History of Psychology Archives of the History of American Psychology, The University of Akron

Study Tip: Memory research reveals a *testing effect*: We retain information much better if we actively retrieve it by self-testing and rehearsing. To bolster your learning and memory, take advantage of the Retrieve It opportunities you'll find throughout this text.

RETRIEVE IT

- What event defined the start of scientific psychology?

ANSWER: Scientific psychology began in Germany in 1879 when Wilhelm Wundt opened the first psychology laboratory.

- Why did introspection fail as a method for understanding how the mind works?

ANSWER: People's self-reports varied, depending on the experience and the person's intelligence and verbal ability.

- _____ used introspection to define the mind's makeup; _____ focused on how mental processes enable us to adapt, survive, and flourish.

ANSWER: Structuralism; functionalism

Psychological Science Develops

In the field's early days, many psychologists shared with the English essayist C. S. Lewis the view that “there is one thing, and only one in the whole universe which we know more about than we could learn from external observation.” That one thing, Lewis said, is ourselves: “We have, so to speak, inside information” (1960, pp. 18–19). Wundt and Titchener focused on inner sensations, images, and feelings. James engaged in introspective examination of the stream of consciousness and emotion. For these and other early pioneers, *psychology* was defined as “the science of mental life.”

And so it continued until the 1920s, when the first of two provocative American psychologists appeared on the scene. John B. Watson, and later B. F. Skinner, dismissed introspection and redefined *psychology* as “the scientific study of observable *behavior*.” You cannot observe a sensation, a feeling, or a thought, they said, but you *can* observe and record people's behavior as they respond to different situations. Many agreed, and the **behaviorists** became one of psychology's two major forces well into the 1960s.

The other major force was *Freudian psychology*, which emphasized the ways our unconscious thought processes and our emotional responses to childhood experiences affect our behavior. (In chapters to come, we'll look more closely at Sigmund Freud's ideas.)

As the behaviorists had rejected the early 1900s definition of psychology, two other groups rejected the behaviorist definition in the 1960s. The first, the **humanistic psychologists**, led by Carl Rogers and Abraham Maslow, found both Freudian psychology and behaviorism too limiting. Rather than focusing on the meaning of early childhood memories or on the learning of conditioned responses, the humanistic psychologists drew attention to ways that current environmental influences can nurture or limit our growth potential, and the importance of having our needs for love and acceptance satisfied. (More on this in Chapter 12.)



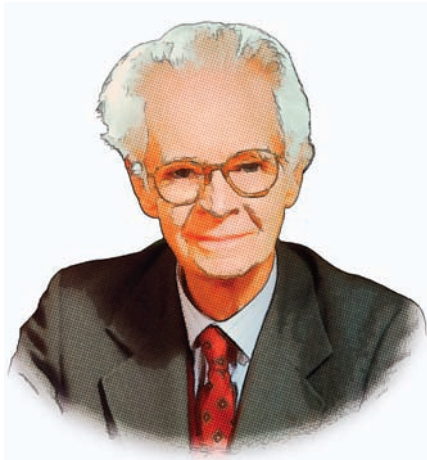
John B. Watson and Rosalie Rayner Working with Rayner, Watson championed psychology as the science of behavior and demonstrated conditioned responses on a baby who became famous as “Little Albert.” (More about Watson's controversial study in Chapter 7.)

(Left) ©Underwood & Underwood/Corbis
(Right) Center for the History of Psychology Archives of the History of American Psychology, The University of Akron



The second group of psychologists pioneered the 1960s *cognitive revolution*, leading the field back to its early interest in mental processes. *Cognitive psychology* scientifically explores how we perceive, process, and remember information, and even why we can get anxious or depressed. **Cognitive neuroscience**, an interdisciplinary study, has enriched our understanding of the brain activity underlying mental activity.

To encompass psychology's concern with observable behavior *and* with inner thoughts and feelings, today we define **psychology** as the *science of behavior and mental processes*. Let's unpack this definition. *Behavior* is anything an organism *does*—any action we can observe and record. Yelling, smiling, blinking, sweating, talking, and questionnaire marking are all observable behaviors. *Mental processes* are the internal, subjective experiences we infer from behavior—sensations, perceptions, dreams, thoughts, beliefs, and feelings.



B. F. Skinner A leading behaviorist, Skinner rejected introspection and studied how consequences shape behavior.

Bachrach/Getty Images



Sigmund Freud The controversial ideas of this famed personality theorist and therapist have influenced humanity's self-understanding.

© Bettmann/Corbis

The key word in psychology's definition is *science*. Psychology is less a set of findings than a way of asking and answering questions. My aim, then, is not merely to report results but also to show you how psychologists play their game. You will see how researchers evaluate conflicting opinions and ideas. And you will learn how all of us, whether scientists or simply curious people, can think smarter when describing and explaining the events of our lives.

RETRIEVE IT

- How did the cognitive revolution affect the field of psychology?

ANSWER: It recaptured the field's early interest in mental processes and made them legitimate topics for scientific study.

Contemporary Psychology

This young science of psychology developed from the more established fields of philosophy and biology. Wundt was both a philosopher and a physiologist. Ivan Pavlov, who pioneered the study of learning (Chapter 7), was a Russian physiologist. Freud was an Austrian physician. Jean Piaget, the last century's most influential observer of children, (Chapter 4), was a Swiss biologist. James was an American philosopher. This list of pioneering psychologists—"Magellans of the mind," as Morton Hunt (1993) has called them—illustrates psychology's origins in many disciplines and countries.

Like the pioneers, today's psychologists are citizens of many lands. The International Union of Psychological Science has 71 member nations, from Albania to Zimbabwe. Psychology is *growing* and it is *globalizing*. The story of psychology is being written in many places, with interests ranging from nerve cell activity to international conflicts.

Psychology's Biggest Question



1-2: What is psychology's historic big issue?

Are our human traits present at birth, or do they develop through experience? The debate over this huge **nature–nurture issue** is ancient. The Greek philosopher Plato (428–348 B.C.E.) assumed that we inherit character and intelligence and that certain ideas are inborn. Aristotle (384–322 B.C.E.) countered that there is nothing in the mind that does not first come in from the external world through the senses.

behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2).

humanistic psychology historically significant perspective that emphasized the growth potential of healthy people.

cognitive neuroscience the interdisciplinary study of the brain activity linked with cognition (including perception, thinking, memory, and language).

psychology the science of behavior and mental processes.

nature–nurture issue the longstanding controversy over the relative contributions that genes and experience make to the development of psychological traits and behaviors. Today's psychological science sees traits and behaviors arising from the interaction of nature and nurture.



A nature-made nature-nurture experiment

Because identical twins have the same genes, they are ideal participants in studies designed to shed light on hereditary and environmental influences on intelligence, personality, and other traits. Studies of identical and fraternal twins provide a rich array of findings—described in later chapters—that underscore the importance of both nature and nurture.

(left) © Hola Images/agefotostock; (right) WoodyStock /Alamy

More insight into nature's influence on behavior arose after a 22-year-old seafaring voyager, Charles Darwin, pondered the incredible species variation he encountered, including tortoises on one island that differed from those on nearby islands. His 1859 *On the Origin of Species* explained this diversity by proposing the evolutionary process of **natural selection**: From among chance variations, nature selects traits that best enable an

organism to survive and reproduce in a particular environment. Darwin's principle of natural selection is still with us 150+ years later as biology's organizing principle, and now an important principle for twenty-first-century psychology. This would surely have pleased Darwin, for he believed his theory explained not only animal structures (such as a polar bear's white coat) but also animal behaviors (such as the emotional expressions associated with human lust and rage).

The nature–nurture issue recurs throughout this text as today's psychologists explore the relative contributions of biology and experience, asking, for example, how we humans are alike (because of our common biology and evolutionary history) and diverse (because of our differing environments). Are gender differences biologically predisposed or socially constructed? Is children's grammar mostly innate or formed by experience? How are intelligence and personality differences influenced by heredity, and by environment? Are sexual behaviors more “pushed” by inner biology or “pulled” by external incentives? Should we treat psychological disorders—depression, for example—as disorders of the brain, disorders of thought, or both?

Over and over again we will see that in contemporary science the nature–nurture tension dissolves: *Nurture works on what nature endows*. Our species is biologically endowed with an enormous capacity to learn and adapt. Moreover, every psychological event (every thought, every emotion) is simultaneously a biological event. Thus, depression can be both a brain disorder and a thought disorder.

RETRIEVE IT

- What is contemporary psychology's position on the nature–nurture debate?

ANSWER: Psychological events often stem from the interaction of nature and nurture, rather than from either of them acting alone.

natural selection the principle that, among the range of inherited trait variations, those contributing to reproduction and survival will most likely be passed on to succeeding generations.

levels of analysis the differing complementary views, from biological to psychological to social-cultural, for analyzing any given phenomenon.

biopsychosocial approach an integrated approach that incorporates biological, psychological, and social-cultural levels of analysis.

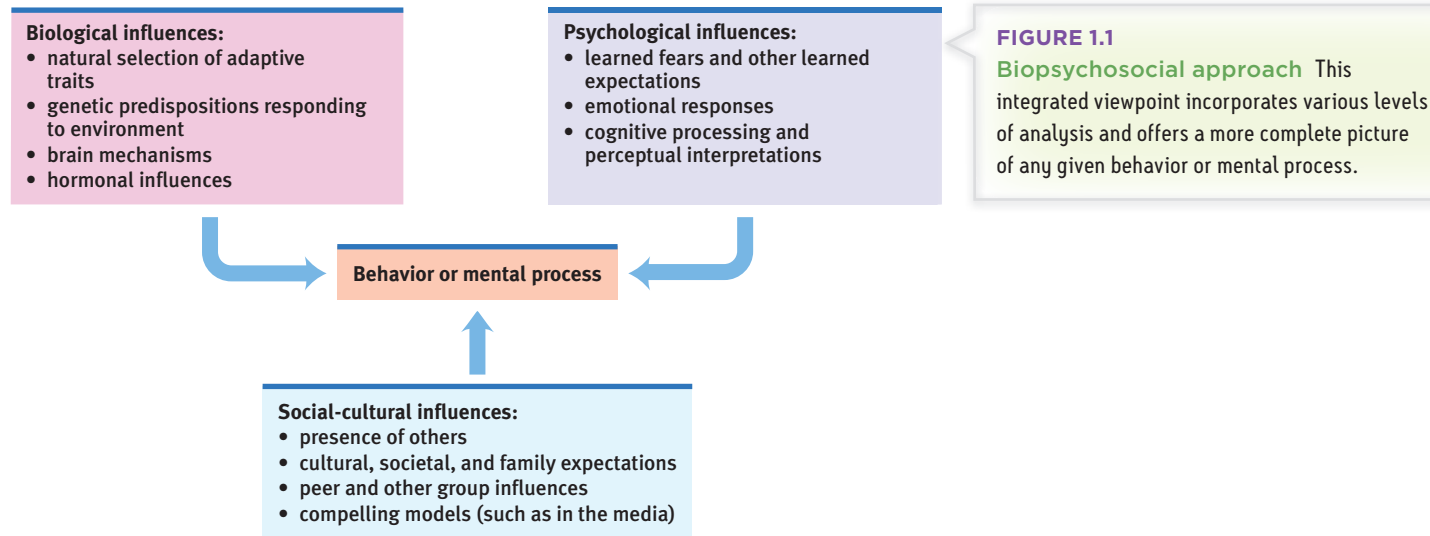
Psychology's Three Main Levels of Analysis



1-3: What are psychology's levels of analysis and related perspectives?

Each of us is a complex system that is part of a larger social system. But each of us is also composed of smaller systems, such as our nervous system and body organs, which are composed of still smaller systems—cells, molecules, and atoms.

These tiered systems suggest different **levels of analysis**, which offer complementary outlooks. It's like explaining why grizzly bears hibernate. Is it because hibernation helped their ancestors to survive and reproduce? Because their inner physiology drives them to do so? Because cold environments hinder food gathering during winter? Such perspectives are complementary because “everything is related to everything else” (Brewer, 1996). Together, different levels of analysis form a **biopsychosocial approach**, which integrates biological, psychological, and social-cultural factors (**FIGURE 1.1**).



Each level provides a vantage point for viewing a behavior or mental process, yet each by itself is incomplete. Like different academic disciplines, psychology's varied perspectives ask different questions and have their own limits. The different perspectives described in **TABLE 1.1** complement one another. Consider, for example, how they shed light on anger:

- Someone working from a *neuroscience perspective* might study brain circuits that cause us to be “red in the face” and “hot under the collar.”
- Someone working from the *evolutionary perspective* might analyze how anger facilitated the survival of our ancestors' genes.
- Someone working from the *behavior genetics perspective* might study how heredity and experience influence our individual differences in temperament.
- Someone working from the *psychodynamic perspective* might view an outburst as an outlet for unconscious hostility.



Table 1.1

Psychology's Current Perspectives

Perspective	Focus	Sample Questions
<i>Neuroscience</i>	How the body and brain enable emotions, memories, and sensory experiences	How do pain messages travel from the hand to the brain? How is blood chemistry linked with moods and motives?
<i>Evolutionary</i>	How the natural selection of traits has promoted the survival of genes	How does evolution influence behavior tendencies?
<i>Behavior genetics</i>	How our genes and our environment influence our individual differences	To what extent are psychological traits such as intelligence, personality, sexual orientation, and vulnerability to depression products of our genes? Of our environment?
<i>Psychodynamic</i>	How behavior springs from unconscious drives and conflicts	How can someone's personality traits and disorders be explained by unfulfilled wishes and childhood traumas?
<i>Behavioral</i>	How we learn observable responses	How do we learn to fear particular objects or situations? What is the most effective way to alter our behavior, say, to lose weight or stop smoking?
<i>Cognitive</i>	How we encode, process, store, and retrieve information	How do we use information in remembering? Reasoning? Solving problems?
<i>Social-cultural</i>	How behavior and thinking vary across situations and cultures	How are we alike as members of one human family? How do we differ as products of our environment?

- Someone working from the *behavioral perspective* might attempt to determine which external stimuli trigger angry responses or aggressive acts.
- Someone working from the *cognitive perspective* might study how our interpretation of a situation affects our anger and how our anger affects our thinking.
- Someone working from the *social-cultural perspective* might explore how expressions of anger vary across cultural contexts.

The point to remember: Like two-dimensional views of a three-dimensional object, each of psychology's perspectives is helpful. But each by itself fails to reveal the whole picture.

RETRIEVE IT

- What advantage do we gain by using the biopsychosocial approach in studying psychological events?

ANSWER: By incorporating different levels of analysis, the biopsychosocial approach can provide a more complete view than any one perspective could offer.

Psychology's Subfields

1-4: What are psychology's main subfields?

Picturing a chemist at work, you probably envision a white-coated scientist surrounded by glassware and high-tech equipment. Picture a psychologist at work and you would be right to envision

- a white-coated scientist probing a rat's brain.
- an intelligence researcher measuring how quickly an infant shows boredom by looking away from a familiar picture.
- an executive evaluating a new "healthy lifestyles" training program for employees.
- someone at a computer analyzing data on whether adopted teens' temperaments more closely resemble those of their adoptive parents or their biological parents.
- a therapist listening carefully to a client's depressed thoughts.
- a traveler visiting another culture and collecting data on variations in human values and behaviors.
- a teacher or writer sharing the joy of psychology with others.



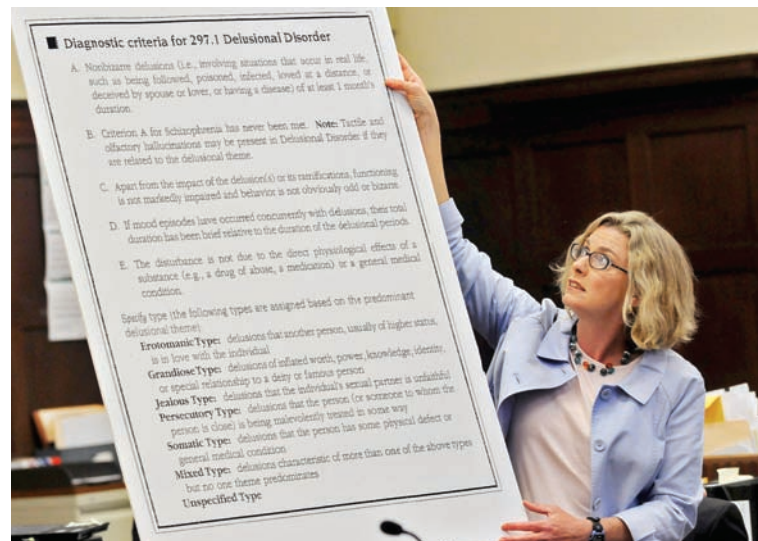
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"I'm a social scientist, Michael. That means I can't explain electricity or anything like that, but if you ever want to know about people I'm your man."

Psychology in court Forensic psychologists apply psychology's principles and methods in the criminal justice system. They may assess witness credibility, or testify in court on a defendant's state of mind and future risk.



Image Source/Punchstock



Ted Fitzgerald Ltd. Pool/AP Photo

The cluster of subfields we call psychology is a meeting ground for different disciplines. Thus, it's a perfect home for those with wide-ranging interests. In its diverse activities, from biological experimentation to cultural comparisons, psychology is united by a common quest: *describing and explaining behavior and the mind underlying it.*

Some psychologists conduct **basic research** that builds psychology's knowledge base. In the pages that follow we will meet a wide variety of such researchers, including *biological psychologists* exploring the links between brain and mind; *developmental psychologists* studying our changing abilities from womb to tomb; *cognitive psychologists* experimenting with how we perceive, think, and solve problems; *personality psychologists* investigating our persistent traits; and *social psychologists* exploring how we view and affect one another.

These and other psychologists also may conduct **applied research**, tackling practical problems. *Industrial-organizational psychologists*, for example, use psychology's concepts and methods in the workplace to help organizations and companies select and train employees, boost morale and productivity, design products, and implement systems.

Although most psychology textbooks focus on psychological science, psychology is also a helping profession devoted to such practical issues as how to have a happy marriage, how to overcome anxiety or depression, and how to raise thriving children. As a science, psychology at its best bases such interventions on *evidence of effectiveness*. **Counseling psychologists** help people to cope with challenges and crises (including academic, vocational, and marital issues) and to improve their personal and social functioning. **Clinical psychologists** assess and treat mental, emotional, and behavior disorders. Both counseling and clinical psychologists administer and interpret tests, provide counseling and therapy, and sometimes conduct basic and applied research. By contrast, **psychiatrists**, who also may provide psychotherapy, are medical doctors licensed to prescribe drugs and otherwise treat physical causes of psychological disorders.

To balance historic psychology's focus on human problems, Martin Seligman and others (2002, 2005, 2011) have called for more research on human strengths and human flourishing. Their **positive psychology** scientifically explores "positive emotions, positive character traits, and enabling institutions." What, they ask, can psychology contribute to a "good life" that engages one's skills, and to a "meaningful life" that points beyond oneself?

With perspectives ranging from the biological to the social, and with settings from the laboratory to the clinic, psychology relates to many fields. Psychologists teach not only in psychology departments, but also in medical schools, law schools, and theological seminaries, and they work in hospitals, factories, and corporate offices. They engage in interdisciplinary studies, such as psychohistory (the psychological analysis of historical characters), psycholinguistics (the study of language and thinking), and psychoceramics (the study of crackpots).¹

¹ Confession: I wrote the last part of this sentence on April Fools' Day.

basic research pure science that aims to increase the scientific knowledge base.

applied research scientific study that aims to solve practical problems.

counseling psychology a branch of psychology that assists people with problems in living (often related to school, work, or relationships) and in achieving greater well-being.

clinical psychology a branch of psychology that studies, assesses, and treats people with psychological disorders.

psychiatry a branch of medicine dealing with psychological disorders; practiced by physicians who sometimes provide medical (for example, drug) treatments as well as psychological therapy.

positive psychology the scientific study of human functioning, with the goals of discovering and promoting strengths and virtues that help individuals and communities to thrive.

Want to learn more? See Appendix C, Subfields of Psychology, at the end of this book, and go to the regularly updated **Careers in Psychology** at www.yourpsychportal.com/myers to learn about the many interesting options available to those with bachelor's, master's, and doctoral degrees in psychology.

Psychology: A science and a profession

Psychologists experiment with, observe, test, and treat behavior. Here we see psychologists testing a child, measuring emotion-related physiology, and doing face-to-face therapy.



Michael Newman/Photo Edit



© 2007 John Kish IV



Scott J. Ferrell/Congressional Quarterly/Getty Images

Psychology also influences culture. And psychology deepens our appreciation for how we humans perceive, think, feel, and act. By so doing it can indeed enrich our lives and enlarge our vision. Through this book I hope to help guide you toward that end. As educator Charles Eliot said a century ago: “Books are the quietest and most constant of friends, and the most patient of teachers.”

RETRIEVE IT

- Match the specialty on the left with the description on the right.
- | | |
|--------------------------|--|
| 1. Clinical psychology | a. Helps people cope with educational and life challenges. |
| 2. Psychiatry | b. Studies, assesses, and treats people with psychological disorders but usually does not provide medical therapy. |
| 3. Counseling psychology | c. Branch of medicine dealing with psychological disorders. |

ANSWERS: 1. b, 2. c, 3. a

The Need for Psychological Science

Although in some ways we outsmart the smartest computers, our intuition often goes awry. To err is human. Enter psychological science. With its procedures for gathering and sifting evidence, science restrains error. As we familiarize ourselves with its strategies and incorporate its underlying principles into our daily thinking, we can think smarter. *Psychologists use the science of behavior and mental processes to better understand why people think, feel, and act as they do.*

What About Intuition and Common Sense?



1-5: How do hindsight bias, overconfidence, and the tendency to perceive order in random events illustrate why science-based answers are more valid than those based on intuition and common sense?

Some people suppose that psychology merely documents and dresses in jargon what people already know: “So what else is new—you get paid for using fancy methods to prove what my grandmother knew?” Others place their faith in human intuition. Former President George W. Bush described the feeling to journalist Bob Woodward (2002) in explaining his decision to launch the Iraq war: “I’m a gut player. I rely on my instincts.” Today’s psychological science does document a vast intuitive mind. As we will see, our thinking, memory, and attitudes operate on two levels—conscious and unconscious—with the larger part operating off-screen, automatically. Like jumbo jets, we fly mostly on autopilot.

So, are we smart to listen to the whispers of our inner wisdom, to simply trust “the force within”? Or should we more often be subjecting our intuitive hunches to skeptical scrutiny?

This much seems certain: We often underestimate intuition’s perils. My geographical intuition tells me that Reno is east of Los Angeles, that Rome is south of New York, that Atlanta is east of Detroit. But I am wrong, wrong, and wrong. As novelist Madeleine L’Engle observed, “The naked intellect is an extraordinarily inaccurate instrument” (1973). Three phenomena—*hindsight bias*, *judgmental overconfidence*, and our *tendency to perceive patterns in random events*—illustrate why we cannot rely solely on intuition and common sense.



Asia Images Group Pte Ltd / Alamy

The limits of intuition Personnel interviewers tend to be overconfident of their gut feelings about job applicants. Their confidence stems partly from their recalling cases where their favorable impression proved right, and partly from their ignorance about rejected applicants who succeeded elsewhere.

“Those who trust in their own wits are fools.”

Proverbs 28:26

Did We Know It All Along? Hindsight Bias

Consider how easy it is to draw the bull's eye *after* the arrow strikes. After the stock market drops, people say it was “due for a correction.” After the football game, we credit the coach if a “gutsy play” wins the game, and fault the coach for the “stupid play” if it doesn't. After a war or an election, its outcome usually seems obvious. Although history may therefore seem like a series of inevitable events, the actual future is seldom foreseen. No one's diary recorded, “Today the Hundred Years War began.”

This **hindsight bias** (also known as the *I-knew-it-all-along phenomenon*) is easy to demonstrate: Give half the members of a group some purported psychological finding, and give the other half an opposite result. Tell the first group, “Psychologists have found that separation weakens romantic attraction. As the saying goes, ‘Out of sight, out of mind.’” Ask them to imagine why this might be true. Most people can, and nearly all will then view this true finding as unsurprising.

Tell the second group the opposite: “Psychologists have found that separation strengthens romantic attraction. As the saying goes, ‘Absence makes the heart grow fonder.’” People given this untrue result can also easily imagine it, and most will also see it as unsurprising. When two opposite findings both seem like common sense, there is a problem.

Such errors in our recollections and explanations show why we need psychological research. Just asking people how and why they felt or acted as they did can sometimes be misleading—not because common sense is usually wrong, but because common sense more easily describes what *has* happened than what *will* happen.

Nevertheless, Grandma's intuition is often right. As Yogi Berra once said, “You can observe a lot by watching.” (We have Berra to thank for other gems, such as “Nobody ever comes here—it's too crowded,” and “If the people don't want to come out to the ballpark, nobody's gonna stop 'em.”) Because we're all behavior watchers, it would be surprising if many of psychology's findings had *not* been foreseen. Many people believe that love breeds happiness, and they are right (we have what Chapter 10 calls a deep “need to belong”). Indeed, as Daniel Gilbert, Brett Pelham, and Douglas Krull (2003) have noted, “good ideas in psychology usually have an oddly familiar quality, and the moment we encounter them we feel certain that we once came close to thinking the same thing ourselves and simply failed to write it down.” Good ideas are like good inventions; once created, they seem obvious. (Why did it take so long for someone to invent suitcases on wheels and Post-it Notes?)

hindsight bias the tendency to believe, after learning an outcome, that one would have foreseen it. (Also known as the *I-knew-it-all-along phenomenon*.)

“Life is lived forwards, but understood backwards.”

*Philosopher Søren Kierkegaard,
1813–1855*

“Anything seems commonplace, once explained.”

Dr. Watson to Sherlock Holmes



REUTERS/U.S. Coast Guard/Handout

Hindsight bias When drilling the Deep-water Horizon oil well in 2010, BP employees took some shortcuts and ignored some warning signs, without intending to put their company and the environment at serious risk. *After* the resulting Gulf oil spill, with the benefit of 20/20 hindsight, the foolishness of those judgments became obvious.

Overconfidence in history:

“We don’t like their sound. Groups of guitars are on their way out.”

Decca Records, in turning down a recording contract with the Beatles in 1962

“Computers in the future may weigh no more than 1.5 tons.”

Popular Mechanics, 1949

“They couldn’t hit an elephant at this distance.”

General John Sedgwick, just before being killed during a U.S. Civil War battle, 1864

“The telephone may be appropriate for our American cousins, but not here, because we have an adequate supply of messenger boys.”

British expert group, evaluating the invention of the telephone

But sometimes Grandma’s intuition, informed by countless casual observations, has it wrong. In later chapters we will see how research has overturned popular ideas—that familiarity breeds contempt, that dreams predict the future, and that most of us use only 10 percent of our brain. We will also see how research has surprised us with discoveries about how the brain’s chemical messengers control our moods and memories, about other animals’ abilities, and about the effects of stress on our capacity to fight disease.

Overconfidence

We humans tend to think we know more than we do. Asked how sure we are of our answers to factual questions (*Is Boston north or south of Paris?*), we tend to be more confident than correct.² Or consider these three anagrams, which Richard Goranson (1978) asked people to unscramble:

WREAT → WATER
ETRYN → ENTRY
GRABE → BARGE

About how many seconds do you think it would have taken you to unscramble each of these? Knowing the answers tends to make us overconfident—surely the solution would take only 10 seconds or so? In reality, the average problem solver spends 3 minutes, as you also might, given a similar anagram without the solution: OCHSA.³

Are we any better at predicting social behavior? Ohio State University psychologist Philip Tetlock (1998, 2005) collected more than 27,000 expert predictions of world events, such as the future of South Africa or whether Quebec would separate from Canada. His repeated finding: These predictions, which experts made with 80 percent confidence on average, were right less than 40 percent of the time. Nevertheless, even those who erred maintained their confidence by noting they were “almost right.” “The Québécois separatists *almost* won the secessionist referendum.”

RETRIEVE IT

- Why, after friends start dating, do we often feel that we *knew* they were meant to be together?

ANSWER: We often suffer from hindsight bias—after we’ve learned a situation’s outcome, that outcome seems familiar and therefore obvious.

Perceiving Order in Random Events

In our natural eagerness to make sense of our world—what poet Wallace Stevens called our “rage for order”—we are prone to perceive patterns. People see a face on the moon, hear Satanic messages in music, or perceive the Virgin Mary’s image on a grilled cheese sandwich. Even in random data we often find order, because—here’s a curious fact of life—*random sequences often don’t look random* (Falk et al., 2009; Nickerson, 2002, 2005). In actual random sequences, patterns and streaks (such as repeating digits) occur more often than people expect (Oskarsson et al., 2009). To demonstrate this phenomenon for myself, I flipped a coin 51 times, with these results:

1. H	11. T	21. T	31. T	41. H	51. T
2. T	12. H	22. T	32. T	42. H	
3. T	13. H	23. H	33. T	43. H	
4. T	14. T	24. T	34. T	44. H	
5. H	15. T	25. T	35. T	45. T	
6. H	16. H	26. T	36. H	46. H	
7. H	17. T	27. H	37. T	47. H	
8. T	18. T	28. T	38. T	48. T	
9. T	19. H	29. H	39. H	49. T	
10. T	20. H	30. T	40. T	50. T	

² Boston is south of Paris.

³ The anagram solution: CHAOS.



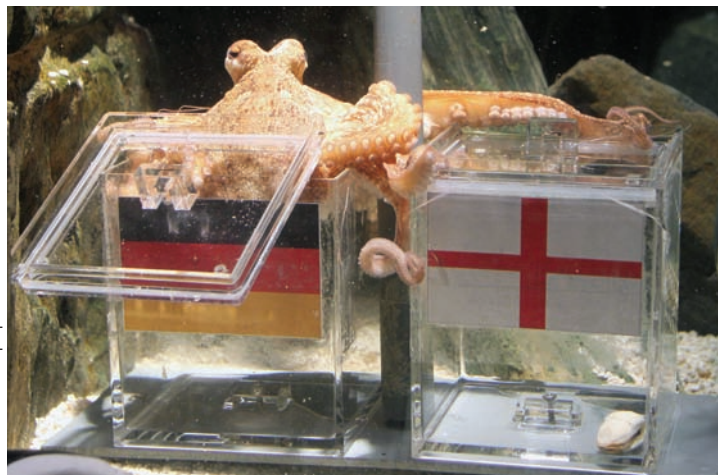
Maciej Oleksy / Shutterstock

Looking over the sequence, patterns jump out: Tosses 10 to 22 provided an almost perfect pattern of pairs of tails followed by pairs of heads. On tosses 30 to 38 I had a “cold hand,” with only one head in nine tosses. But my fortunes immediately reversed with a “hot hand”—seven heads out of the next nine tosses. Similar streaks happen—about as often as one would expect in random sequences—in basketball shooting, baseball hitting, and mutual fund stock pickers’ selections (Gilovich et al., 1985; Malkiel, 2007; Myers, 2002). These sequences often don’t look random and so are overinterpreted. (“When you’re hot, you’re hot!”)

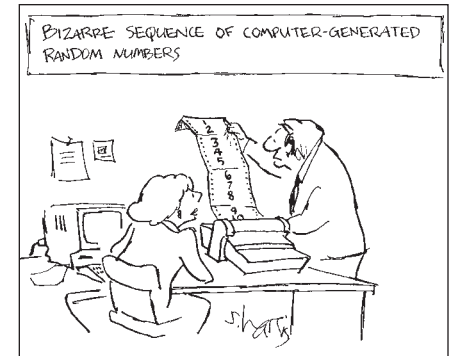
What explains these streaky patterns? Was I exercising some sort of paranormal control over my coin? Did I snap out of my tails funk and get in a heads groove? No such explanations are needed, for these are the sorts of streaks found in any random data. Comparing each toss to the next, 23 of the 50 comparisons yielded a changed result—just the sort of near 50–50 result we expect from coin tossing. Despite seeming patterns, the outcome of one toss gives no clue to the outcome of the next.

However, some happenings seem so extraordinary that we struggle to conceive an ordinary, chance-related explanation. In such cases, statisticians often are less mystified. When Evelyn Marie Adams won the New Jersey lottery *twice*, newspapers reported the odds of her feat as 1 in 17 trillion. Bizarre? Actually, 1 in 17 trillion are indeed the odds that a given person who buys a single ticket for each of two New Jersey lotteries will win both times. And given the millions of people who buy U.S. state lottery tickets, statisticians Stephen Samuels and George McCabe (1989) reported, it was “practically a sure thing” that someday, somewhere, someone would hit a state jackpot twice. Indeed, said fellow statisticians Persi Diaconis and Frederick Mosteller (1989), “with a large enough sample, any outrageous thing is likely to happen.” An event that happens to but 1 in 1 billion people every day occurs about 7 times a day, over 2500 times a year.

The point to remember: Hindsight bias, overconfidence, and our tendency to perceive patterns in random events often lead us to overestimate our intuition. But scientific inquiry can help us sift reality from illusion.



Roland Wehrauch/dpa/picture-alliance/Newscom



Bizarre looking, perhaps. But actually no more unlikely than any other number sequence.

© 1990 by Sidney Harris/American Scientist magazine.

“The really unusual day would be one where nothing unusual happens.”

Statistician Persi Diaconis (2002)

Given enough random events, some weird-seeming streaks will occur During the 2010 World Cup, a German octopus—Paul, “the oracle of Oberhausen”—was offered two boxes, each with mussels and with a national flag on one side. Paul selected the right box eight out of eight times in predicting the outcome of Germany’s seven matches and Spain’s triumph in the final.

The Scientific Attitude: Curious, Skeptical, and Humble

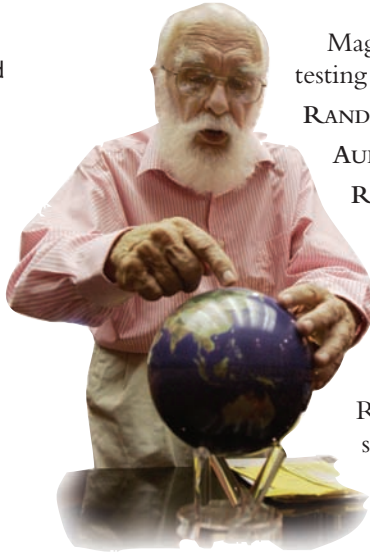


1-6: How do the scientific attitude’s three main components relate to critical thinking?

Underlying all science is, first, a hard-headed *curiosity*, a passion to explore and understand without misleading or being misled. Some questions (*Is there life after death?*) are beyond science. Answering them in any way requires a leap of faith. With many other ideas (*Can some people demonstrate ESP?*), the proof is in the pudding. Let the facts speak for themselves.

The Amazing Randi The magician James Randi exemplifies skepticism. He has tested and debunked a variety of psychic phenomena.

AP Photo/Alan Diaz



Magician James Randi has used this *empirical approach* when testing those claiming to see auras around people's bodies:

RANDI: *Do you see an aura around my head?*

AURA SEER: *Yes, indeed.*

RANDI: *Can you still see the aura if I put this magazine in front of my face?*

AURA SEER: *Of course.*

RANDI: *Then if I were to step behind a wall barely taller than I am, you could determine my location from the aura visible above my head, right?*

Randi told me that no aura seer has agreed to take this simple test.

No matter how sensible-seeming or wild an idea, the smart thinker asks: *Does it work?* When put to the test, can its predictions be confirmed? Subjected to such scrutiny, crazy-sounding ideas sometimes find support.

More often, science becomes society's garbage disposal, sending crazy-sounding ideas to the waste heap, atop previous claims of perpetual motion machines, miracle cancer cures, and out-of-body travels into centuries past. To sift reality from fantasy, sense from nonsense, therefore requires a scientific attitude: being skeptical but not cynical, open but not gullible.

"To believe with certainty," says a Polish proverb, "we must begin by doubting." As scientists, psychologists approach the world of behavior with a *curious skepticism*, persistently asking two questions: *What do you mean? How do you know?*

Putting a scientific attitude into practice requires not only curiosity and skepticism but also *humility*—an awareness of our own vulnerability to error and an openness to surprises and new perspectives. In the last analysis, what matters is not my opinion or yours, but the truths nature reveals in response to our questioning. If people or other animals don't behave as our ideas predict, then so much the worse for our ideas. This humble attitude was expressed in one of psychology's early mottos: "The rat is always right."

Historians of science tell us that these three attitudes—curiosity, skepticism, and humility—helped make modern science possible. Some deeply religious people today may view science, including psychological science, as a threat. Yet, many of the leaders of the scientific revolution, including Copernicus and Newton, were deeply religious people acting on the idea that "in order to love and honor God, it is necessary to fully appreciate the wonders of his handiwork" (Stark, 2003a,b).

Of course, scientists, like anyone else, can have big egos and may cling to their preconceptions. Nevertheless, the ideal of curious, skeptical, humble scrutiny of competing ideas unifies psychologists as a community as they check and recheck one another's findings and conclusions.

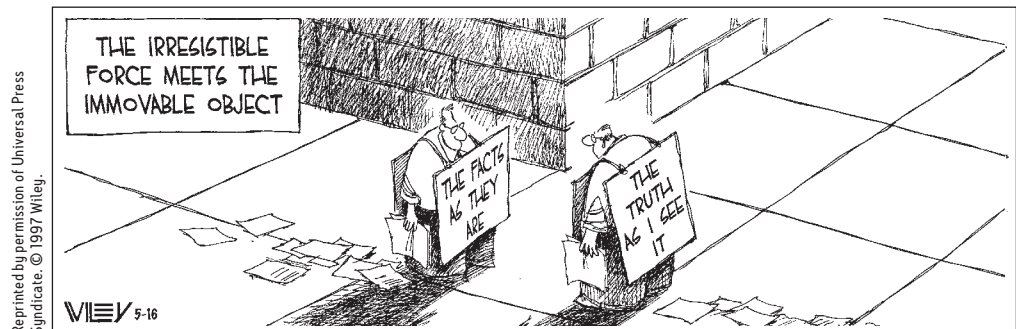
"I'm a skeptic not because I do not want to believe but because I want to *know*. I believe that the truth is out there. But how can we tell the difference between what we would like to be true and what is actually true? The answer is science."

Michael Shermer, "I Want to Believe,"
Scientific American, 2009

"My deeply held belief is that if a god anything like the traditional sort exists, our curiosity and intelligence are provided by such a god. We would be unappreciative of those gifts . . . if we suppressed our passion to explore the universe and ourselves."

Carl Sagan, *Broca's Brain*, 1979

Non Sequitur



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Critical Thinking

The scientific attitude prepares us to think smarter. Smart thinking, called **critical thinking**, examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions. Whether reading a news report or listening to a conversation, critical thinkers ask questions. Like scientists, they wonder, *How do they know that? What is this person's agenda? Is the conclusion based on anecdote and gut feelings, or on evidence? Does the evidence justify a cause-effect conclusion? What alternative explanations are possible?*

Has psychology's critical inquiry been open to surprising findings? The answer, as ensuing chapters illustrate, is plainly *Yes*. Believe it or not, massive losses of brain tissue early in life may have minimal long-term effects (see Chapter 2). Within days, newborns can recognize their mother's odor and voice (see Chapter 4). After brain damage, a person may be able to learn new skills yet be unaware of such learning (see Chapter 8). Diverse groups—men and women, old and young, rich and middle class, those with disabilities and without—report roughly comparable levels of personal happiness (see Chapter 11).

And has critical inquiry convincingly debunked popular presumptions? The answer, as ensuing chapters also illustrate, is again *Yes*. The evidence indicates that sleepwalkers are *not* acting out their dreams (see Chapter 3). Our past experiences are *not* all recorded verbatim in our brains; with brain stimulation or hypnosis, one *cannot* simply “hit the replay button” and relive long-buried or repressed memories (see Chapter 8). Most people do *not* suffer from unrealistically low self-esteem, and high self-esteem is not all good (see Chapter 12). Opposites do *not* generally attract (see Chapter 13). In each of these instances and more, what psychological science has learned is not what is widely believed.

“The real purpose of the scientific method is to make sure Nature hasn't misled you into thinking you know something you don't actually know.”

Robert M. Pirsig, *Zen and the Art of Motorcycle Maintenance*, 1974

RETRIEVE IT

- How does the scientific attitude contribute to critical thinking?

ANSWER: The scientific attitude combines (1) *curiosity* about the world around us, (2) *skepticism* toward various claims and ideas, and (3) *humility* about one's own understanding. Evaluating evidence, assessing conclusions, and examining our own assumptions are essential parts of critical thinking.

How Do Psychologists Ask and Answer Questions?

Psychologists arm their scientific attitude with the *scientific method*—a self-correcting process for evaluating ideas with observation and analysis. In its attempt to describe and explain human nature, psychological science welcomes hunches and plausible-sounding theories. And it puts them to the test. If a theory works—if the data support its predictions—so much the better for that theory. If the predictions fail, the theory will be revised or rejected.

The Scientific Method



1-7: How do theories advance psychological science?

In everyday conversation, we often use *theory* to mean “mere hunch.” In science, a **theory** *explains* with principles that *organize* observations and *predict* behaviors or events. By organizing isolated facts, a theory simplifies. By linking facts with deeper principles, a theory offers a useful summary. As we connect the observed dots, a coherent picture emerges.

critical thinking thinking that does not blindly accept arguments and conclusions. Rather, it examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions.

theory an explanation using an integrated set of principles that organizes observations and predicts behaviors or events.

hypothesis a testable prediction, often implied by a theory.

operational definition a statement of the procedures (operations) used to define research variables. For example, *human intelligence* may be operationally defined as “what an intelligence test measures.”

replication repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding extends to other participants and circumstances.

A good theory about sleep deprivation’s effects on memory, for example, helps us organize countless sleep-related observations into a short list of principles. Imagine that we observe over and over that people with good sleep habits tend to answer questions accurately in class, and they do well at test time. We might therefore theorize that sleep improves memory. So far so good: Our sleep-retention principle neatly summarizes a list of facts about the effects of sleep loss.

Yet no matter how reasonable a theory may sound—and it does seem reasonable to suggest that sleep loss could affect memory—we must put it to the test. A good theory produces testable predictions, called **hypotheses**. By enabling us to test and to reject or revise our theory, such predictions direct research. They specify what results would support the theory and what results would disconfirm it. To test our theory about the effects of sleep on memory, we might assess people’s retention of course materials after a good night’s sleep, or a shortened night’s sleep (**FIGURE 1.2**).

Our theories can bias our observations. Having theorized that better memory springs from more sleep, we may see what we expect: We may perceive sleepy people’s comments as less insightful. The urge to see what we expect is ever-present, both inside and outside the laboratory, as when people’s views of climate change influence their interpretation of local weather events.

As a check on their biases, psychologists report their research with precise **operational definitions** of procedures and concepts. *Hunger*, for example, might be defined as “hours without eating,” *generosity* as “money contributed,” *sleep loss* as “hours less” than one’s natural sleep. Using these carefully worded statements, others can **replicate** (repeat) the original observations with different participants, materials, and circumstances. If they get similar results, confidence in the finding’s reliability grows. The first study of hindsight bias aroused psychologists’ curiosity. Now, after many successful replications with different people and questions, we feel sure of the phenomenon’s power.

In the end, our theory will be useful if it (1) *organizes* a range of self-reports and observations, and (2) implies *predictions* that anyone can use to check the theory or to derive practical applications. (Does people’s sleep predict their retention?) Eventually, our research may lead to a revised theory that better organizes and predicts what we know. Or, our research may be replicated and supported by similar findings. (This has been the case for sleep and memory studies, as you will see in Chapter 3.)

As we will see next, we can test our hypotheses and refine our theories using *descriptive* methods (which describe behaviors, often through case studies, naturalistic

For more information about statistical methods that psychological scientists use in their work, see Appendix A, Statistical Reasoning in Everyday Life.

FIGURE 1.2

The scientific method A self-correcting process for asking questions and observing nature’s answers.



observations, or surveys), *correlational* methods (which associate different factors), and *experimental* methods (which manipulate factors to discover their effects). To think critically about popular psychology claims, we need to understand these methods and know what conclusions they allow.

RETRIEVE IT

- What does a good theory do?

ANSWER: 1. It organizes observed facts. 2. It implies hypotheses that offer testable predictions and, sometimes, practical applications.

- Why is replication important?

ANSWER: Psychologists watch eagerly for new findings, but they also proceed with caution—by awaiting other investigators' repeating the research. Can the finding be confirmed (the result replicated)?

Description



1-8: How do psychologists use case studies, naturalistic observations, and surveys to observe and describe behavior, and why is random sampling important?

The starting point of any science is description. In everyday life, we all observe and describe people, often drawing conclusions about why they act as they do. Professional psychologists do much the same, though more objectively and systematically, through

- *case studies* (in-depth analyses of special individuals).
- *naturalistic observation* (watching and recording individuals' behavior in their natural setting).
- *surveys* and interviews (self-reports in which people answer questions about their behavior or attitudes).

The Case Study

Among the oldest research methods, the **case study** examines one individual in depth in the hope of revealing things true of us all. Some examples: Much of our early knowledge about the brain came from case studies of individuals who suffered a particular impairment after damage to a certain brain region. Jean Piaget taught us about children's thinking after carefully observing and questioning only a few children. Studies of only a few chimpanzees revealed their capacity for understanding and language. Intensive case studies are sometimes very revealing. They show us what *can* happen, and they often suggest directions for further study.

But individual cases may mislead us if the individual is atypical. Unrepresentative information can lead to mistaken conclusions. Indeed, anytime a researcher mentions a finding (“*Smokers die younger: 95 percent of men over 85 are nonsmokers*”) someone is sure to offer a contradictory anecdote (“*Well, I have an uncle who smoked two packs a day and lived to be 89*”). Dramatic stories and personal experiences (even psychological case examples) command our attention and are easily remembered. Journalists understand that, and so begin an article about bank foreclosures with the sad story of one family put out of their house, not with foreclosure statistics. Stories move us. But stories can mislead. Which of the following do you find more memorable? (1) “In one study of 1300 dream reports concerning a kidnapped child, only 5 percent correctly envisioned the child as dead” (Murray & Wheeler, 1937). (2) “I know a man who dreamed his sister was in a car accident, and two days later she died in a head-on collision!” Numbers can be numbing, but the plural of *anecdote* is not *evidence*. As psychologist Gordon Allport (1954, p. 9) said, “Given a thimbleful of [dramatic] facts we rush to make generalizations as large as a tub.”

case study an observation technique in which one person is studied in depth in the hope of revealing universal principles.

“‘Well my dear,’ said Miss Marple, ‘human nature is very much the same everywhere, and of course, one has opportunities of observing it at closer quarters in a village.’”

Agatha Christie, *The Tuesday Club Murders, 1933*

Freud and Little Hans Sigmund Freud's case study of 5-year-old Hans' extreme fear of horses led Freud to his theory of childhood sexuality. He conjectured that Hans felt unconscious desire for his mother, feared castration by his rival father, and then transferred this fear into his phobia about being bitten by a horse. As Chapter 12 will explain, today's psychological science discounts Freud's theory of childhood sexuality but acknowledges that much of the human mind operates outside our conscious awareness.

Skye Hohmann/Alamy



naturalistic observation observing and recording behavior in naturally occurring situations without trying to manipulate and control the situation.

survey a technique for ascertaining the self-reported attitudes or behaviors of a particular group, usually by questioning a representative, random sample of the group.

The point to remember: Individual cases can suggest fruitful ideas. What's true of all of us can be glimpsed in any one of us. But to discern the general truths that cover individual cases, we must answer questions with other research methods.

RETRIEVE IT

- Case studies do not enable us to learn about general principles that apply to all of us. Why not?

ANSWER: Case studies involve only one individual, so we can't know for sure whether the principles observed would apply to a larger population.

Naturalistic Observation

A second descriptive method records behavior in natural environments. These **naturalistic observations** range from watching chimpanzee societies in the jungle, to unobtrusively videotaping (and later systematically analyzing) parent-child interactions in different cultures, to recording racial differences in students' self-seating patterns in a school lunchroom.

Like the case study, naturalistic observation does not *explain* behavior. It *describes* it. Nevertheless, descriptions can be revealing. We once thought, for example, that only humans use tools. Then naturalistic observation revealed that chimpanzees sometimes insert a stick in a termite mound and withdraw it, eating the stick's load of termites. Such unobtrusive naturalistic observations paved the way for later studies of animal thinking, language, and emotion, which further expanded our understanding of our fellow animals. "Observations, made in the natural habitat, helped to show that the societies and behavior of animals are far more complex than previously supposed," chimpanzee observer Jane Goodall noted (1998). Thanks to researchers' observations, we know that chimpanzees and baboons use deception. Psychologists Andrew Whiten and Richard Byrne (1988) repeatedly saw one young baboon pretending to have been attacked by another as a tactic to get its mother to drive the other baboon away from its food. The more developed a primate species' brain, the more likely it is that the animals will display deceptive behaviors (Byrne & Corp, 2004).

A natural observer Chimpanzee researcher Frans de Waal (2005) reported, "I am a born observer. . . . When picking a seat in a restaurant I want to face as many tables as possible. I enjoy following the social dynamics—love, tension, boredom, antipathy—around me based on body language, which I consider more informative than the spoken word. Since keeping track of others is something I do automatically, becoming a fly on the wall of an ape colony came naturally to me."



Photo by Jack Kearse, Emory University for Yerkes National Primate Research Center

Naturalistic observations also illuminate human behavior. Here are three findings you might enjoy:

- *A funny finding.* We humans laugh 30 times more often in social situations than in solitary situations. (Have you noticed how seldom you laugh when alone?) As we laugh, 17 muscles contort our mouth and squeeze our eyes, and we emit a series of 75-millisecond vowel-like sounds, spaced about one-fifth of a second apart (Provine, 2001).

- *Sounding out students.* What, really, are introductory psychology students saying and doing during their everyday lives? To find out, Matthias Mehl and James Pennebaker (2003) equipped 52 such students from the University of Texas with belt-worn Electronically Activated Recorders (EARs). For up to four days, the EAR captured 30 seconds of the student's waking hours every 12.5 minutes, thus enabling the researchers to eavesdrop on more than 10,000 half-minute life slices by the end of the study. On what percentage of the slices do you suppose they found the students talking with someone? What percentage captured the students at a computer keyboard? The answers: 28 and 9 percent. (What percentage of *your* waking hours are spent in these activities?)
- *Culture, climate, and the pace of life.* Naturalistic observation also enabled Robert Levine and Ara Norenzayan (1999) to compare the pace of life in 31 countries. (Their operational definition of *pace of life* included walking speed, the speed with which postal clerks completed a simple request, and the accuracy of public clocks.) Their conclusion: Life is fastest paced in Japan and Western Europe and slower paced in economically less-developed countries. People in colder climates also tend to live at a faster pace (and are more prone to die from heart disease).

Naturalistic observation offers interesting snapshots of everyday life, but it does so without controlling for all the factors that may influence behavior. It's one thing to observe the pace of life in various places, but another to understand what makes some people walk faster than others.

RETRIEVE IT

- What are the advantages and disadvantages of naturalistic observation, such as Mehl and Pennebaker used in their study?

ANSWER: Mehl and Pennebaker were able to carefully observe and record naturally occurring behaviors outside the artificiality of the lab. However, outside the lab they were not able to control for all the factors that may have influenced the everyday interactions they were recording.

The Survey

A **survey** looks at many cases in less depth. A survey asks people to report their behavior or opinions. Questions about everything from sexual practices to political opinions are put to the public. In recent surveys,

- half of all Americans reported experiencing more happiness and enjoyment than worry and stress on the previous day (Gallup, 2010).
- 1 in 5 people across 22 countries reported believing that alien beings have come to Earth and now walk among us disguised as humans (Ipsos, 2010b).
- 68 percent of all humans—some 4.6 billion people—say that religion is important in their daily lives (Diener et al., 2011).

But asking questions is tricky, and the answers often depend on question wording and respondent selection.

Wording Effects Even subtle changes in the order or wording of questions can have major effects. People are much more approving of “aid to the needy” than of “welfare,” of “affirmative action” than of “preferential treatment,” of “not allowing” televised cigarette ads and pornography than of “censoring” them, and of “revenue enhancers” than of “taxes.” In 2009, three in four Americans in one national survey approved of giving people “a choice” of public (government-run) or private health insurance. Yet in another survey, most Americans were not in favor of “creating a public health care plan administered by the federal government that would compete directly with private health insurance companies” (Stein, 2009). Because wording is such a delicate matter, critical thinkers will reflect on how the phrasing of a question might affect people's expressed opinions.



Courtesy of Matthias Mehl

An EAR for naturalistic observation

Psychologists Matthias Mehl and James Pennebaker have used Electronically Activated Recorders (EARs) to sample naturally occurring slices of daily life.



This Modern World by Tom Tomorrow © 1991.

With very large samples, estimates become quite reliable. *E* is estimated to represent 12.7 percent of the letters in written English. *E*, in fact, is 12.3 percent of the 925,141 letters in Melville's *Moby Dick*, 12.4 percent of the 586,747 letters in Dickens' *A Tale of Two Cities*, and 12.1 percent of the 3,901,021 letters in 12 of Mark Twain's works (*Chance News*, 1997).

Random Sampling In everyday thinking, we tend to generalize from cases we observe, especially vivid cases. Given (a) a statistical summary of a professor's student evaluations and (b) the vivid comments of a biased sample—two irate students—an administrator's impression of the professor may be influenced as much by the two unhappy students as by the many favorable evaluations in the statistical summary. The temptation to ignore the *sampling bias* and to generalize from a few vivid but unrepresentative cases is nearly irresistible.

So how do you obtain a *representative sample*—say, of the students at your college or university? It's not always possible to survey the whole group you want to study and describe. How could you choose a group that would represent the total student **population**? Typically, you would seek a **random sample**, in which every person in the entire group has an equal chance of participating. You might number the names in the general student listing and then use a random number generator to pick your survey participants. (Sending each student a questionnaire wouldn't work because the conscientious people who returned it would not be a random sample.) Large representative samples are better than small ones, but a small representative sample of 100 is better than an unrepresentative sample of 500.

Political pollsters sample voters in national election surveys just this way. Using only 1500 randomly sampled people, drawn from all areas of a country, they can provide a remarkably accurate snapshot of the nation's opinions. Without random sampling, large samples—including call-in phone samples and TV or website polls—often merely give misleading results.

The point to remember: Before accepting survey findings, think critically: Consider the sample. The best basis for generalizing is from a representative sample. You cannot compensate for an unrepresentative sample by simply adding more people.

RETRIEVE IT

- What is an unrepresentative sample, and how do researchers avoid it?

ANSWER: An unrepresentative sample is a survey group that does not represent the population being studied. Random sampling helps researchers form a representative sample because each member of the population has an equal chance of being included.

Correlation



1-9: What are positive and negative correlations, and why do they enable prediction but not cause-effect explanation?

Describing behavior is a first step toward predicting it. Naturalistic observations and surveys often show us that one trait or behavior is related to another. In such cases, we say the two **correlate**. A statistical measure (the **correlation coefficient**) indicates how closely two things vary together, and thus how well either one *predicts* the other. Knowing how much aptitude test scores *correlate* with school success tells us how well the scores *predict* school success.

A *positive correlation* (between 0 and +1.00) indicates a *direct* relationship, meaning that two things increase together or decrease together.

A *negative correlation* (between 0 and -1.00) indicates an *inverse* relationship: As one thing increases, the other decreases. The weekly number of hours spent in TV watching and video gaming correlates negatively with grades. Negative correlations could go as low as -1.00, which means that, like people on the opposite ends of a teeter-totter, one set of scores goes down precisely as the other goes up.

Though informative, psychology's correlations usually leave most of the variation among individuals unpredicted. As we will see, there is a positive correlation between parents' abusiveness and their children's later abusiveness when they become parents. But

population all those in a group being studied, from which samples may be drawn. (*Note:* Except for national studies, this does *not* refer to a country's whole population.)

random sample a sample that fairly represents a population because each member has an equal chance of inclusion.

correlation a measure of the extent to which two factors vary together, and thus of how well either factor predicts the other.

correlation coefficient a statistical index of the relationship between two things (from -1 to +1).

this does not mean that most abused children become abusive. The correlation simply indicates a statistical relationship: Most abused children do not grow into abusers, but nonabused children are even less likely to become abusive. Correlations point us toward predictions, but usually imperfect ones.

The point to remember: A correlation coefficient helps us see the world more clearly by revealing the extent to which two things relate.

RETRIEVE IT

- Indicate whether each of the following statements describes a positive correlation or a negative correlation.
 1. The more children and youth use various media, the less happy they are with their lives (Kaiser, 2010). _____
 2. The more sexual content teens see on TV, the more likely they are to have sex (Collins et al., 2004). _____
 3. The longer children were breast-fed, the greater their later academic achievement (Horwood & Ferguson, 1998). _____
 4. The more income rose among a sample of poor families, the fewer psychiatric symptoms their children experienced (Costello et al., 2003). _____

ANSWERS: 1. negative, 2. positive, 3. positive, 4. negative

Correlation and Causation

Correlations help us predict. The *New York Times* reports that U.S. counties with high gun ownership rates tend to have high murder rates (Luo, 2011). Gun ownership predicts homicide. What might explain this guns-homicide correlation?

I can almost hear someone thinking, “Well, of course, guns kill people, often in moments of passion.” If so, that could be an example of A (guns) causes B (murder). But I can hear other readers saying, “Not so fast. Maybe people in dangerous places buy more guns for self-protection—maybe B causes A.” Or maybe some third factor C causes both A and B.

Another example: Self-esteem correlates negatively with (and therefore predicts) depression. (The lower people’s self-esteem, the more they are at risk for depression.) So, does low self-esteem *cause* depression? If, based on the correlational evidence, you assume that it does, you have much company. A nearly irresistible thinking error is assuming that an association, sometimes presented as a correlation coefficient, proves causation. But no matter how strong the relationship, it does not.

RETRIEVE IT

- Length of marriage correlates with hair loss in men. Does this mean that marriage *causes* men to lose their hair (or that balding men make better husbands)?

ANSWER: In this case, as in many others, a third factor obviously explains the correlation: Golden anniversaries and baldness both accompany aging.

As options 2 and 3 in **FIGURE 1.3** on the next page show, we’d get the same negative correlation between self-esteem and depression if depression caused people to be down on themselves, or if some third factor—such as heredity or distressing events—caused both low self-esteem and depression.

This point is so important—so basic to thinking smarter with psychology—that it merits one more example. A survey of over 12,000 adolescents found that the more teens feel loved by their parents, the less likely they are to behave in unhealthy ways—having early sex, smoking, abusing alcohol and drugs, exhibiting violence (Resnick et al., 1997). “Adults have a powerful effect on their children’s

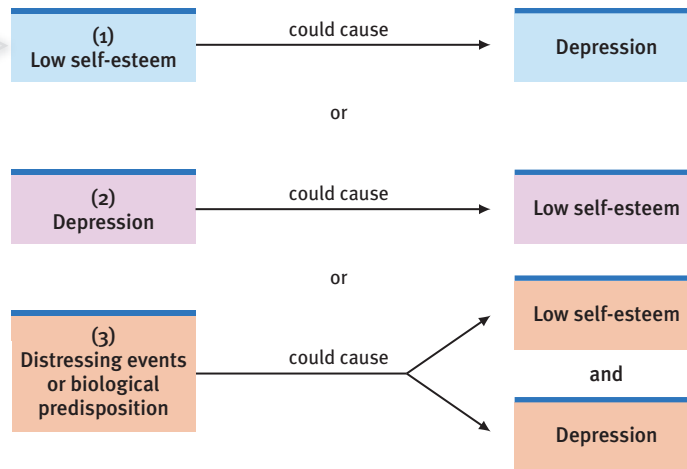


© Nancy Brown/Getty Images

FIGURE 1.3

Three possible cause-effect relationships

People low in self-esteem are more likely to report depression than are those high in self-esteem. One possible explanation of this negative correlation is that a bad self-image causes depressed feelings. But, as the diagram indicates, other cause-effect relationships are possible.



A *New York Times* writer reported a massive survey showing that “adolescents whose parents smoked were 50 percent more likely than children of nonsmokers to report having had sex.” He concluded (would you agree?) that the survey indicated a causal effect—that “to reduce the chances that their children will become sexually active at an early age” parents might “quit smoking” (O’Neil, 2002).

behavior right through the high school years,” gushed an Associated Press (AP) story reporting the finding. But this correlation comes with no built-in cause-effect arrow. The AP could as well have reported, “Well-behaved teens feel their parents’ love and approval; out-of-bounds teens more often think their parents are disapproving.”

The point to remember (turn the volume up here): *Association does not prove causation.* Correlation indicates the *possibility* of a cause-effect relationship *but does not prove such*. Remember this principle and you will be wiser as you read and hear news of scientific studies.

Experimentation

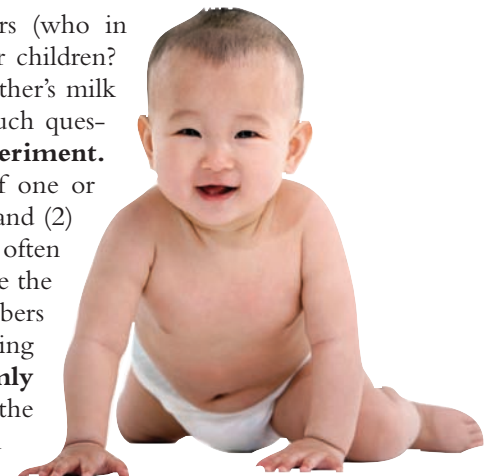


1-10: What are the characteristics of experimentation that make it possible to isolate cause and effect?

Happy are they, remarked the Roman poet Virgil, “who have been able to perceive the causes of things.” How might psychologists perceive causes in correlational studies, such as the correlation between breast feeding and intelligence?

Researchers have found that the intelligence scores of children who were breast-fed as infants are somewhat higher than the scores of children who were bottle-fed with cow’s milk (Angelsen et al., 2001; Mortensen et al., 2002; Quinn et al., 2001). In Britain, breast-fed babies have also been more likely than their bottle-fed counterparts to eventually move into a higher social class (Martin et al., 2007). But the “breast is best” intelligence effect shrinks when researchers compare breast-fed and bottle-fed children from the same families (Der et al., 2006).

What do such findings mean? Do smarter mothers (who in modern countries more often breast feed) have smarter children? Or, as some researchers believe, do the nutrients of mother’s milk contribute to brain development? To find answers to such questions—to isolate cause and effect—researchers can **experiment**. Experiments enable researchers to isolate the effects of one or more factors by (1) manipulating the factors of interest and (2) holding constant (*controlling*) other factors. To do so, they often create an **experimental group**, in which people receive the treatment, and a contrasting **control group** whose members do not receive the treatment. To minimize any preexisting differences between the two groups, researchers **randomly assign** people to the two conditions. If one-third of the volunteers for an experiment can wiggle their ears, then about one-third of the people in each group will be ear



Lane Oatey / Getty Images

experiment a research method in which an investigator manipulates one or more factors (independent variables) to observe the effect on some behavior or mental process (the dependent variable). By *random assignment* of participants, the experimenter aims to control other relevant factors.

experimental group in an experiment, the group exposed to the treatment, that is, to one version of the independent variable.

control group in an experiment, the group *not* exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment.

random assignment assigning participants to experimental and control groups by chance, thus minimizing preexisting differences between the different groups.

wigglers. So, too, with ages, attitudes, and other characteristics, which will be similar in the experimental and control groups. Thus, if the groups differ at the experiment's end, we can surmise that the treatment had an effect.

To experiment with breast feeding, one research team randomly assigned some 17,000 Belarus newborns and their mothers either to a breast-feeding-promotion group or to a normal pediatric care program (Kramer et al., 2008). At three months of age, 43 percent of the experimental group infants were being exclusively breast-fed, as were 6 percent in the control group. At age 6, when nearly 14,000 of the children were restudied, those who had been in the breast-feeding-promotion group had intelligence test scores averaging six points higher than their control group counterparts.

No single experiment is conclusive, of course. But randomly assigning participants to one feeding group or the other effectively eliminated all factors except nutrition. This supported the conclusion that breast is indeed best for developing intelligence: If a behavior (such as test performance) changes when we vary an experimental factor (such as infant nutrition), then we infer that the factor is having an effect.

The point to remember: Unlike correlational studies, which uncover naturally occurring relationships, an experiment manipulates a factor to determine its effect.

Consider, then, how we might assess therapeutic interventions. Our tendency to seek new remedies when we are ill or emotionally down can produce misleading testimonies. If three days into a cold we start taking vitamin C tablets and find our cold symptoms lessening, we may credit the pills rather than the cold naturally subsiding. In the 1700s, bloodletting *seemed* effective. People sometimes improved after the treatment; when they didn't, the practitioner inferred the disease was too advanced to be reversed. So, whether or not a remedy is truly effective, enthusiastic users will probably endorse it. To determine its effect, we must control for other factors.

And that is precisely how investigators evaluate new drug treatments and new methods of psychological therapy (Chapter 15). They randomly assign participants either to the group receiving a treatment (such as a medication), or to a group receiving a pseudo-treatment—an inert *placebo* (perhaps a pill with no drug in it). The participants are often *blind* (uninformed) about what treatment, if any, they are receiving. If the study is using a **double-blind procedure**, neither the participants nor those who administer the drug or placebo and collect the data will know which group is receiving the treatment.

In such studies, researchers can check a treatment's actual effects apart from the participants' and the staff's belief in its healing powers. Just *thinking* you are getting a treatment can boost your spirits, relax your body, and relieve your symptoms. This **placebo effect** is well documented in reducing pain, depression, and anxiety (Kirsch, 2010). And the more expensive the placebo, the more “real” it seems to us—a fake pill that costs \$2.50 works better than one costing 10 cents (Waber et al., 2008). To know how effective a therapy really is, researchers must control for a possible placebo effect.

double-blind procedure an experimental procedure in which both the research participants and the research staff are ignorant (blind) about whether the research participants have received the treatment or a placebo. Commonly used in drug-evaluation studies.

placebo [pluh-SEE-bo; Latin for “I shall please”] **effect** experimental results caused by expectations alone; any effect on behavior caused by the administration of an inert substance or condition, which the recipient assumes is an active agent.



“If I don’t think it’s going to work, will it still work?”

© The New Yorker Collection, 2007, P.C. Veij from cartoonbank.com. All Rights Reserved.

RETRIEVE IT

- What measure do researchers use to prevent the *placebo effect* from confusing their results?

ANSWER: Research designed to prevent the placebo effect randomly assigns participants to an experimental group (which receives the real treatment) or to a control group (which receives a placebo). A comparison of the results will demonstrate whether the real treatment produces better results than belief in that treatment.

Independent and Dependent Variables

Here is an even more potent example: The drug Viagra was approved for use after 21 clinical trials. One trial was an experiment in which researchers randomly assigned 329 men with erectile dysfunction to either an experimental group (Viagra takers) or a control group (placebo takers). It was a double-blind procedure—neither the men nor the person giving them the pills knew what they were receiving. The result: At peak doses, 69 percent of Viagra-assisted attempts at intercourse were successful, compared with 22 percent for men receiving the placebo (Goldstein et al., 1998). Viagra worked.

FIGURE 1.4

Experimentation To discern causation, psychologists may randomly assign some participants to an experimental group, others to a control group. Measuring the dependent variable (intelligence score in later childhood) will determine the effect of the independent variable (whether breast milk was promoted).

Random assignment
(controlling for other variables
such as parental intelligence
and environment)



Group	Independent variable	Dependent variable
Experimental	Promoted breast feeding	Intelligence score, age 6
Control	Did not promote breast feeding	Intelligence score, age 6

This simple experiment manipulated just one factor: the drug dosage (none versus peak dose). We call this experimental factor the **independent variable** because we can vary it *independently* of other factors, such as the men's age, weight, and personality. These other factors, which could influence the experiment's results, are called **confounding variables**. Random assignment controls for possible confounding variables.

Experiments examine the effect of one or more independent variables on some measurable behavior, called the **dependent variable** because it can vary *depending* on what takes place during the experiment. Both variables are given precise *operational definitions*, which specify the procedures that manipulate the independent variable (in this study, the precise drug dosage and timing) or measure the dependent variable (the questions that assessed the men's responses). These definitions answer the "What do you mean?" question with a level of precision that enables others to repeat the study. (See **FIGURE 1.4** for the breast milk experiment's design.)

Let's pause to check your understanding using a simple psychology experiment: To test the effect of perceived ethnicity on the availability of rental housing, Adrian Carpusor and William Loges (2006) sent identically worded e-mail inquiries to 1115 Los Angeles-area landlords. The researchers varied the ethnic connotation of the sender's name and tracked the percentage of positive replies (invitations to view the apartment in person). "Patrick McDougall," "Said Al-Rahman," and "Tyrell Jackson" received, respectively, 89 percent, 66 percent, and 56 percent invitations.

RETRIEVE IT

- In the apartment rental experiment, what was the independent variable? The dependent variable?

ANSWER: The independent variable, which the researchers manipulated, was the ethnicity-related names. The dependent variable, which they measured, was the positive response rate.

independent variable the experimental factor that is manipulated; the variable whose effect is being studied.

confounding variable a factor other than the independent variable that might produce an effect in an experiment.

dependent variable the outcome factor; the variable that may change in response to manipulations of the independent variable.

Experiments can also help us evaluate social programs. Do early childhood education programs boost impoverished children's chances for success? What are the effects of different anti-smoking campaigns? Do school sex-education programs reduce teen pregnancies? To answer such questions, we can experiment: If an intervention is welcomed but resources are scarce, we could use a lottery to randomly assign some people (or regions) to experience the new program and others to a control condition. If later the two groups differ, the intervention's effect will be confirmed (Passell, 1993).

Let's recap. A *variable* is anything that can vary (infant nutrition, intelligence, TV exposure—anything within the bounds of what is feasible and ethical). Experiments aim to *manipulate* an *independent variable*, *measure* the *dependent variable*, and control *confounding variables*. An experiment has at least two different conditions: an *experimental condition* and a *comparison* or *control condition*. *Random assignment* works to minimize preexisting

Table 1.2

Comparing Research Methods

Research Method	Basic Purpose	How Conducted	What Is Manipulated	Weaknesses
<i>Descriptive</i>	To observe and record behavior	Do case studies, naturalistic observations, or surveys	Nothing	No control of variables; single cases may be misleading
<i>Correlational</i>	To detect naturally occurring relationships; to assess how well one variable predicts another	Collect data on two or more variables; no manipulation	Nothing	Does not specify cause and effect
<i>Experimental</i>	To explore cause and effect	Manipulate one or more factors; use random assignment	The independent variable(s)	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

differences between the groups before any treatment effects occur. In this way, an experiment tests the effect of at least one independent variable (what we manipulate) on at least one dependent variable (the outcome we measure). **TABLE 1.2** compares the features of psychology's research methods.

RETRIEVE IT

- Match the term on the left with the description on the right.

- double-blind procedure a. helps researchers generalize from a small set of survey responses to a larger population
- random sampling b. helps minimize preexisting differences between experimental and control groups
- random assignment c. controls for the placebo effect; neither researchers nor participants know who receives the real treatment

ANSWERS: 1. c, 2. a, 3. b

- Why, when testing a new drug to control blood pressure, would we learn more about its effectiveness from giving it to half the participants in a group of 1000 than to all 1000 participants?

ANSWER: To determine the drug's effectiveness, we must compare its effect on those randomly assigned to receive it (the experimental group) with the other half of the participants (the control group), who receive a placebo. If we gave the drug to all 1000 participants, we would have no way of knowing whether the drug is serving as a placebo or is actually medically effective.

Frequently Asked Questions About Psychology

We have reflected on how a scientific approach can restrain biases. We have seen how case studies, naturalistic observations, and surveys help us describe behavior. We have also noted that correlational studies assess the association between two factors, which indicates how well one thing predicts another. We have examined the logic that underlies experiments, which use control conditions and random assignment of participants to isolate the effects of an independent variable on a dependent variable.

Yet, even knowing this much, you may still be approaching psychology with a mixture of curiosity and apprehension. So before we plunge in, let's entertain some frequently asked questions.

culture the enduring behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next.



1-11: Can laboratory experiments illuminate everyday life?

When you see or hear about psychological research, do you ever wonder whether people's behavior in the lab will predict their behavior in real life? For example, does detecting the blink of a faint red light in a dark room reveal anything useful about flying a plane at night? After viewing a violent, sexually explicit film, does an aroused man's increased willingness to push buttons that he thinks will electrically shock a woman really say anything about whether violent pornography makes a man more likely to abuse a woman?

Before you answer, consider: The experimenter *intends* the laboratory environment to be a simplified reality—one that simulates and controls important features of everyday life. Just as a wind tunnel lets airplane designers re-create airflow forces under controlled conditions, a laboratory experiment lets psychologists re-create psychological forces under controlled conditions.

An experiment's purpose is not to re-create the exact behaviors of everyday life but to test *theoretical principles* (Mook, 1983). In aggression studies, deciding whether to push a button that delivers a shock may not be the same as slapping someone in the face, but the principle is the same. *It is the resulting principles—not the specific findings—that help explain everyday behaviors.*

When psychologists apply laboratory research on aggression to actual violence, they are applying theoretical principles of aggressive behavior, principles refined through many experiments. Similarly, it is the principles of the visual system, developed from experiments in artificial settings (such as looking at red lights in the dark), that researchers apply to more complex behaviors such as night flying. And many investigations have demonstrated that principles derived in the laboratory do typically generalize to the everyday world (Anderson et al., 1999).

The point to remember: Psychological science focuses less on particular behaviors than on seeking general principles that help explain many behaviors.



1-12: Does behavior depend on one's culture and gender?

What can we learn about people in general from psychological studies done in one time and place—often with people from what Joseph Henrich, Steven Heine, and Ara Norenzayan (2010) call the WEIRD cultures (*W*estern, *E*ducated, *I*ndustrialized, *R*ich, and *D*emocratic cultures that contribute most study participants but are only 12 percent of humanity)? As we will see time and again, **culture**—shared ideas and behaviors that one generation passes on to the next—matters. Our culture shapes our standards of promptness and frankness, our attitudes toward premarital sex and varying body shapes, our tendency to be casual or formal, our willingness to make eye contact, our conversational distance, and much, much more. Being aware of such differences, we can restrain our assumptions that others will think and act as we do. Given the growing mixing and clashing of cultures, our need for such awareness is urgent.

It is also true, however, that our shared biological heritage unites us as a universal human family. The same underlying processes guide people everywhere:

- People diagnosed with dyslexia, a reading disorder, exhibit the same brain malfunction whether they are Italian, French, or British (Paulesu et al., 2001).
- Variation in languages may impede communication across cultures. Yet all languages share deep principles of grammar, and people from opposite hemispheres can communicate with a smile or a frown.
- People in different cultures vary in feelings of loneliness. But across cultures, loneliness is magnified by shyness, low self-esteem, and being unmarried (Jones et al., 1985; Rokach et al., 2002).

We are each in certain respects like all others, like some others, and like no other. Studying people of all races and cultures helps us discern our similarities and our differences, our human kinship and our diversity.

India is not Indiana Because culture shapes people's understanding of social behavior, actions that seem ordinary to us may seem quite odd to visitors from far away. Yet underlying these differences are powerful similarities. Supporters of newly elected leaders everywhere typically greet them with pleased deference, though not necessarily with bows and folded hands, as supporters of influential and popular Indian politician Sonia Gandhi did here.



You will see throughout this book that *gender* matters, too. Researchers report gender differences in what we dream, in how we express and detect emotions, and in our risk for alcohol dependence, depression, and eating disorders. Gender differences fascinate us, and studying them is potentially beneficial. For example, many researchers believe that women carry on conversations more readily to build relationships, while men talk more to give information and advice (Tannen, 2001). Knowing this difference can help us prevent conflicts and misunderstandings in everyday relationships.

But again, psychologically as well as biologically, women and men are overwhelmingly similar. Whether female or male, we learn to walk at about the same age. We experience the same sensations of light and sound. We feel the same pangs of hunger, desire, and fear. We exhibit similar overall intelligence and well-being.

The point to remember: Even when specific attitudes and behaviors vary by gender or across cultures, as they often do, the underlying processes are much the same.



1-13: Why do psychologists study animals, and what ethical guidelines safeguard human and animal research participants?

Many psychologists study animals because they find them fascinating. They want to understand how different species learn, think, and behave. Psychologists also study animals to learn about people. We humans are not *like* animals; we *are* animals, sharing a common biology. Animal experiments have therefore led to treatments for human diseases—insulin for diabetes, vaccines to prevent polio and rabies, transplants to replace defective organs.

Humans are more complex, but the same processes by which we learn are present in rats, monkeys, and even sea slugs. The simplicity of the sea slug's nervous system is precisely what makes it so revealing of the neural mechanisms of learning.

Sharing such similarities, should we respect rather than experiment on our animal relatives? The animal protection movement protests the use of animals in psychological, biological, and medical research.

Out of this heated debate, two issues emerge. The basic one is whether it is right to place the well-being of humans above that of animals. In experiments on stress and cancer, is it right that mice get tumors in the hope that people might not? Should some monkeys be exposed to an HIV-like virus in the search for an AIDS vaccine? Is our use and consumption of other animals as natural as the behavior of carnivorous hawks, cats, and whales? The answers to such questions vary by culture. In Gallup surveys in Canada and the United States, about 60 percent of adults have deemed medical testing on animals “morally acceptable.” In Britain, only 37 percent have (Mason, 2003).

If we give human life first priority, what safeguards should protect the well-being of animals in research? In one survey of animal researchers, 98 percent supported government regulations protecting primates, dogs, and cats, and 74 percent supported regulations providing for the humane care of rats and mice (Plous & Herzog, 2000). Many professional associations and funding agencies already have such guidelines. British Psychological Society guidelines call for housing animals under reasonably natural living conditions, with companions for social animals (Lea, 2000). American Psychological Association (APA) guidelines state that researchers must ensure the “comfort, health, and humane treatment” of animals and minimize “infection, illness, and pain” (APA, 2002). The European Parliament now mandates standards for animal care and housing (Vogel, 2010).

Animals have themselves benefited from animal research. One Ohio team of research psychologists measured stress hormone levels in samples of millions of dogs brought each year to animal shelters. They devised handling and stroking methods to reduce stress and ease the dogs' transition to adoptive homes (Tuber et al., 1999). Other studies have helped improve care and management in animals' natural habitats. By revealing our behavioral kinship with animals and the remarkable intelligence of chimpanzees, gorillas, and other animals, experiments have also led to increased empathy and protection for them. At its best, a psychology concerned for humans and sensitive to animals serves the welfare of both.

“All people are the same; only their habits differ.”

Confucius, 551–479 B.C.E

“Rats are very similar to humans except that they are not stupid enough to purchase lottery tickets.”

Dave Barry, July 2, 2002

“Please do not forget those of us who suffer from incurable diseases or disabilities who hope for a cure through research that requires the use of animals.”

Psychologist Dennis Feeney (1987)

“The greatness of a nation can be judged by the way its animals are treated.”

Mahatma Gandhi, 1869–1948

Animal research benefiting animals

Thanks partly to research on the benefits of novelty, control, and stimulation, these gorillas have enjoyed an improved quality of life in New York's Bronx Zoo.



What about human participants? Does the image of white-coated scientists delivering electric shocks trouble you? If so, you'll be relieved to know that most psychological studies are free of such stress. With people, blinking lights, flashing words, and pleasant social interactions are more common. Moreover, psychology's experiments are mild compared with the stress and humiliation often inflicted by reality TV shows. In one episode of *The Bachelor*, a man dumped his new fiancée—on camera, at the producers' request—for the woman who earlier had finished second (Collins, 2009).

Occasionally, though, researchers do temporarily stress or deceive people, but only when they believe it is essential to a justifiable end, such as understanding and controlling violent behavior or studying mood swings. Some experiments won't work if participants know everything beforehand. (Wanting to be helpful, the participants might try to confirm the researcher's predictions.)

The APA ethics code urges researchers to (1) obtain human participants' **informed consent** before the experiment, (2) protect them from harm and discomfort, (3) keep information about individual participants confidential, and (4) fully **debrief** people (explain the research afterward). Moreover, university ethics committees screen research proposals and safeguard participants' well-being.



1-14: Is psychology free of value judgments?

Psychology is definitely not value free. Values affect what we study, how we study it, and how we interpret results. Researchers' values influence their choice of topics. Should we study worker productivity or worker morale? Sex discrimination or gender differences? Conformity or independence? Values can also color "the facts." As we noted earlier, our preconceptions can bias our observations and interpretations; sometimes we see what we want or expect to see (**FIGURE 1.5**).

Even the words we use to describe something can reflect our values. Are the sex acts we do not practice "perversions" or "sexual variations"? In psychology and in everyday speech, labels describe and labels evaluate: One person's *rigidity* is another's *consistency*. One person's *faith* is another's *fanaticism*. One country's *enhanced interrogation techniques*, such as cold-water immersion, become *torture* when practiced by its enemies. Our labeling someone as *firm* or *stubborn*, *careful* or *picky*, *discreet* or *secretive* reveals our own attitudes.

Popular applications of psychology also contain hidden values. If you defer to "professional" guidance about how to live—how to raise children, how to achieve self-fulfillment, what to do with sexual feelings, how to get ahead at work—you are accepting value-laden advice. A science of behavior and mental processes can help us reach our goals. But it cannot decide what those goals should be.

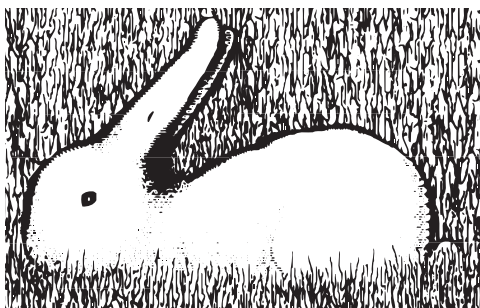
Knowledge transforms us. Learning about the solar system and the germ theory of disease alters the way people think and act. Learning about psychology's findings also changes people: They less often judge psychological disorders as moral failings, treatable by punishment and ostracism. They less often regard and treat women as men's mental inferiors. They less often view and rear children as ignorant, willful beasts in need of taming. "In each case," noted Morton Hunt (1990, p. 206), "knowledge has modified attitudes, and, through them, behavior." Once aware of psychology's well-researched ideas—about how body and mind connect, how a child's mind grows, how we construct our perceptions, how we remember (and misremember) our experiences, how people across the world differ (and are alike)—your mind may never again be quite the same.

But bear in mind psychology's limits. Don't expect it to answer the ultimate questions, such as those posed by Russian novelist Leo Tolstoy (1904): "Why should I live? Why should I do anything? Is there in life any purpose which the inevitable death that awaits me does not undo and destroy?"

Although many of life's significant questions are beyond psychology, some very important ones are illuminated by even a first psychology course. Through painstaking research, psychologists have gained insights into brain and mind, dreams and memories, depression and joy. Even the unanswered questions can renew our sense of mystery



Mike Kemp/Getty Images



© Roger Shepard

FIGURE 1.5

What do you see? Our expectations influence what we perceive. Did you see a duck or a rabbit? Show some friends this image with the rabbit photo above covered up and see if they are more likely to perceive a duck lying on its back instead. (From Shepard, 1990.)

about “things too wonderful” for us yet to understand. Moreover, your study of psychology can help teach you how to ask and answer important questions—how to think critically as you evaluate competing ideas and claims.

If some people see psychology as merely common sense, others have a different concern—that it is becoming dangerously powerful. Is it an accident that astronomy is the oldest science and psychology the youngest? To some, exploring the external universe seems far safer than exploring our own inner universe. Might psychology, they ask, be used to manipulate people?

Knowledge, like all power, can be used for good or evil. Nuclear power has been used to light up cities—and to demolish them. Persuasive power has been used to educate people—and to deceive them. Although psychology does indeed have the power to deceive, its purpose is to enlighten. Every day, psychologists are exploring ways to enhance learning, creativity, and compassion. Psychology speaks to many of our world’s great problems—war, overpopulation, prejudice, family crises, crime—all of which involve attitudes and behaviors. Psychology also speaks to our deepest longings—for nourishment, for love, for happiness. Psychology cannot address all of life’s great questions, but it speaks to some mighty important ones.

RETRIEVE IT

- How are human research participants protected?

ANSWER: Ethical principles developed by international psychological organizations urge researchers using human participants to obtain *informed consent*, to protect them from harm and discomfort, to treat their personal information confidentially, and to fully *debrief* all participants.

Improve Your Retention— and Your Grades



1-15: How can psychological principles help you learn and remember?

Do you, like most students, assume that the way to cement your new learning is to reread? What helps even more—and what this book therefore encourages—is repeated self-testing and rehearsal of previously studied material. Memory researchers Henry Roediger and Jeffrey Karpicke (2006) call this phenomenon the **testing effect**. (It is also sometimes called the *retrieval practice effect* or *test-enhanced learning*.) They note that “testing is a powerful means of improving learning, not just assessing it.” In one of their studies, students recalled the meaning of 40 previously learned Swahili words much better if tested repeatedly than if they spent the same time restudying the words (Karpicke & Roediger, 2008).

As you will see in Chapter 8, to master information you must *actively process it*. Your mind is not like your stomach, something to be filled passively; it is more like a muscle that grows stronger with exercise. Countless experiments reveal that people learn and remember best when they put material in their own words, rehearse it, and then retrieve and review it again.

The **SQ3R** study method incorporates these principles (McDaniel et al., 2009; Robinson, 1970). SQ3R is an acronym for its five steps: Survey, Question, Read, Retrieve⁴, Review.

To study a chapter, first *survey*, taking a bird’s-eye view. Scan the headings, and notice how the chapter is organized.

Before you read each main section, try to answer its numbered Learning Objective *Question* (for this section: “How can psychological principles help you learn and



Office of Public Affairs at Columbia University

Psychology speaks In making its historic 1954 school desegregation decision, the U.S. Supreme Court cited the expert testimony and research of psychologists Kenneth Clark and Mamie Phipps Clark (1947). The Clarks had reported that, when given a choice between Black and White dolls, most African-American children chose the White doll, which seemingly indicated internalized anti-Black prejudice.

informed consent giving potential participants enough information about a study to enable them to decide whether they wish to participate.

debriefing the postexperimental explanation of a study, including its purpose and any deceptions, to its participants.

testing effect enhanced memory after retrieving, rather than simply rereading, information. Also sometimes referred to as a *retrieval practice effect* or *test-enhanced learning*.

SQ3R a study method incorporating five steps: Survey, Question, Read, Retrieve, Review.

⁴ Also sometimes called “Recite.”

remember?”). Roediger and Bridgid Finn (2009) have found that “trying and failing to retrieve the answer is actually helpful to learning.” Those who test their understanding *before* reading, and discover what they don’t yet know, will learn and remember better.

Then *read*, actively searching for the answer to the question. At each sitting, read only as much of the chapter (usually a single main section) as you can absorb without tiring. Read actively and critically. Ask questions. Take notes. Make the ideas your own: How does what you’ve read relate to your own life? Does it support or challenge your assumptions? How convincing is the evidence?

Having read a section, *retrieve* its main ideas. *Test yourself*. This will help you figure out what you know. Moreover, the testing itself will help you learn and retain the information more effectively. Even better, test yourself repeatedly. To facilitate this, I offer periodic Retrieve It opportunities throughout each chapter (see, for example, the questions on pages 29 and 31). After trying to answer these questions yourself, you can check the inverted answers, and reread as needed.

Finally, *review*: Read over any notes you have taken, again with an eye on the chapter’s organization, and quickly review the whole chapter. Write or say what a concept is before rereading to check your understanding.

Survey, question, read, retrieve, review. I have organized this book’s chapters to facilitate your use of the SQ3R study system. Each chapter begins with a chapter outline that aids your *survey*. Headings and Learning Objective *Questions* suggest issues and concepts you should consider as you read. The material is organized into sections of readable length. The Retrieve It questions will challenge you to *retrieve* what you have learned, and thus better remember it. The end-of-chapter *Review* provides more opportunities for active processing and self-testing, focusing on the chapter’s key terms and Learning Objective Questions. Complete Chapter Reviews can be found in Appendix D, at the end of this book.

Four additional study tips may further boost your learning:

Distribute your study time. One of psychology’s oldest findings is that *spaced practice* promotes better retention than does *massed practice*. You’ll remember material better if you space your practice time over several study periods—perhaps one hour a day, six days a week—rather than cram it into one long study blitz. For example, rather than trying to read an entire chapter in a single sitting, read just one main section and then turn to something else. *Interleaving* your study of psychology with your study of other subjects will boost your long-term retention and will protect against overconfidence (Kornell & Bjork, 2008; Taylor & Rohrer, 2010).

Spacing your study sessions requires a disciplined approach to managing your time. (Richard O. Straub explains time management in a helpful preface at the beginning of this text.)

Learn to think critically. Whether you are reading or in class, note people’s assumptions and values. What perspective or bias underlies an argument? Evaluate evidence. Is it anecdotal? Or is it based on informative experiments? Assess conclusions. Are there alternative explanations?

Process class information actively. Listen for a lecture’s main ideas and sub-ideas. *Write them down*. Ask questions during and after class. In class, as in your private study, process the information actively and you will understand and retain it better. As psychologist William James urged a century ago, “*No reception without reaction, no impression without . . . expression.*” Make the information your own. Take notes in your own words. Relate what you read to what you already know. Tell someone else about it. (As any teacher will confirm, to teach is to remember.)

Overlearn. Psychology tells us that overlearning improves retention. We are prone to overestimating how much we know. You may understand a chapter as you read it, but that feeling of familiarity can be deceptively comforting. Using the Retrieve It opportunities, devote extra study time to testing your knowledge.

Memory experts Elizabeth Bjork and Robert Bjork (2011, p. 63) offer the bottom line for how to improve your retention and your grades:



Spend less time on the input side and more time on the output side, such as summarizing what you have read from memory or getting together with friends and asking each other questions. Any activities that involve testing yourself—that is, activities that require you to retrieve or generate information, rather than just representing information to yourself—will make your learning both more durable and flexible.

RETRIEVE IT

- The _____ describes the enhanced memory that results from repeated retrieval (as in self-testing) rather than from simple rereading of new information.
- What does the acronym SQ3R stand for?

ANSWER: testing effect

ANSWER: Survey, Question, Read, Retrieve, and Review

CHAPTER REVIEW

Thinking Critically With Psychological Science

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

What is Psychology?

- 1-1:** What are some important milestones in psychology's development?

Contemporary Psychology

- 1-2:** What is psychology's historic big issue?
- 1-3:** What are psychology's levels of analysis and related perspectives?
- 1-4:** What are psychology's main subfields?

The Need for Psychological Science

- 1-5:** How do hindsight bias, overconfidence, and the tendency to perceive order in random events illustrate why science-based answers are more valid than those based on intuition and common sense?
- 1-6:** How do the scientific attitude's three main components relate to critical thinking?

How Do Psychologists Ask and Answer Questions?

- 1-7:** How do theories advance psychological science?
- 1-8:** How do psychologists use case studies, naturalistic observations, and surveys to observe and describe behavior, and why is random sampling important?
- 1-9:** What are positive and negative correlations, and why do they enable prediction but not cause-effect explanation?
- 1-10:** What are the characteristics of experimentation that make it possible to isolate cause and effect?

Frequently Asked Questions About Psychology

- 1-11:** Can laboratory experiments illuminate everyday life?
- 1-12:** Does behavior depend on one's culture and gender?
- 1-13:** Why do psychologists study animals, and what ethical guidelines safeguard human and animal research participants?
- 1-14:** Is psychology free of value judgments?

Improve Your Retention—and Your Grades

- 1-15:** How can psychological principles help you learn and remember?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

structuralism, p. 3

functionalism, p. 3

behaviorism, p. 4

humanistic psychology, p. 4

cognitive neuroscience, p. 4

psychology, p. 4

nature–nurture issue, p. 5

natural selection, p. 6

levels of analysis, p. 6

biopsychosocial approach, p. 6

basic research, p. 9

applied research, p. 9

counseling psychology, p. 9

clinical psychology, p. 9

psychiatry, p. 9

positive psychology, p. 9

hindsight bias, p. 11

critical thinking, p. 15

theory, p. 15

hypothesis, p. 16

operational definition, p. 16

replication, p. 16

case study, p. 17

naturalistic observation, p. 18

survey, p. 19

population, p. 20

random sample, p. 20

correlation, p. 20

correlation coefficient, p. 20

experiment, p. 22

experimental group, p. 22

control group, p. 22

random assignment, p. 22

double-blind procedure, p. 23

placebo effect, p. 23

independent variable, p. 24

confounding variable, p. 24

dependent variable, p. 24

culture, p. 26

informed consent, p. 28

debriefing, p. 28

testing effect, p. 29

SQ3R, p. 29

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- In 1879, in psychology's first experiment, _____ and his students measured the time lag between hearing a ball hit a platform and pressing a key.
- William James would be considered a(n) _____. Wilhelm Wundt and Edward Titchener would be considered _____.
 - functionalist; structuralists
 - structuralist; functionalists
 - evolutionary theorist; structuralists
 - functionalist; evolutionary theorists
- In the early twentieth century, _____ redefined psychology as “the science of observable behavior.”
 - John B. Watson
 - Abraham Maslow
 - William James
 - Sigmund Freud
- Nature is to nurture as
 - personality is to intelligence.
 - biology is to experience.
 - intelligence is to biology.
 - psychological traits are to behaviors.
- “Nurture works on what nature endows.” Describe what this means, using your own words.
- A psychologist treating emotionally troubled adolescents at a local mental health agency is most likely to be a(n)
 - research psychologist.
 - psychiatrist.
 - industrial–organizational psychologist.
 - clinical psychologist.
- A mental health professional with a medical degree who can prescribe medication is a _____.
- A psychologist conducting basic research to expand psychology's knowledge base would be most likely to
 - design a computer screen with limited glare and assess the effect on computer operators' eyes after a day's work.
 - treat older people who are overcome by depression.
 - observe 3- and 6-year-olds solving puzzles and analyze differences in their abilities.
 - interview children with behavioral problems and suggest treatments.
- _____ _____ refers to our tendency to perceive events as obvious or inevitable after the fact.
- As scientists, psychologists
 - approach research with a negative cynicism.
 - assume that an article published in a reputable journal must be true.
 - believe that every important human question can be studied scientifically.
 - are willing to ask questions and to reject claims that cannot be verified by research.

11. How can you use your knowledge of the scientific attitude to help you evaluate claims in the media, even if you're not a scientific expert on the issue?
12. The predictions implied by a theory are called _____.
13. Which of the following is NOT one of the techniques psychologists use to observe and describe behavior?
 - a. A case study
 - b. Naturalistic observation
 - c. Correlational research
 - d. A phone survey
14. You wish to take an accurate poll in a certain country by questioning people who truly represent the country's adult population. Therefore, you need to ensure that you question a _____ sample of the population.
15. A study finds that the more childbirth training classes women attend, the less pain medication they require during childbirth. This finding can be stated as a _____ (positive/negative) correlation.
16. Knowing that two events are correlated provides
 - a. a basis for prediction.
 - b. an explanation of why the events are related.
 - c. proof that as one increases, the other also increases.
 - d. an indication that an underlying third factor is at work.
17. Here are some recently reported correlations, with interpretations drawn by journalists. Knowing just these correlations, can you come up with other possible explanations for each of these?
 - a. Alcohol use is associated with violence. (One interpretation: Drinking triggers or unleashes aggressive behavior.)
 - b. Educated people live longer, on average, than less-educated people. (One interpretation: Education lengthens life and enhances health.)
 - c. Teens engaged in team sports are less likely to use drugs, smoke, have sex, carry weapons, and eat junk food than are teens who do not engage in team sports. (One interpretation: Team sports encourage healthy living.)
 - d. Adolescents who frequently see smoking in movies are more likely to smoke. (One interpretation: Movie stars' behavior influences impressionable teens.)
18. To explain behaviors and clarify cause and effect, psychologists use _____.
19. To test the effect of a new drug on depression, we randomly assign people to control and experimental groups. Those in the control group take a pill that contains no medication. This is a _____.
20. In a double-blind procedure,
 - a. only the participants know whether they are in the control group or the experimental group.
 - b. experimental and control group members will be carefully matched for age, sex, income, and education level.
 - c. neither the participants nor the researchers know who is in the experimental group or control group.
 - d. someone separate from the researcher will ask people to volunteer for the experimental group or the control group.
21. A researcher wants to determine whether noise level affects workers' blood pressure. In one group, she varies the level of noise in the environment and records participants' blood pressure. In this experiment, the level of noise is the _____.
22. The laboratory environment is designed to
 - a. exactly re-create the events of everyday life.
 - b. re-create psychological forces under controlled conditions.
 - c. create opportunities for naturalistic observation.
 - d. minimize the use of animals and humans in psychological research.
23. Which of the following is true regarding gender differences and similarities?
 - a. Differences between the genders outweigh any similarities.
 - b. Despite some gender differences, the underlying processes of human behavior are the same.
 - c. Both similarities and differences between the genders depend more on biology than on environment.
 - d. Gender differences are so numerous that it is difficult to make meaningful comparisons.
24. In defending their experimental research with animals, psychologists have noted that
 - a. animals' physiology and behavior can tell us much about our own.
 - b. animal experimentation sometimes helps animals as well as humans.
 - c. advancing the well-being of humans justifies animal experimentation.
 - d. All of these statements are correct.

Find answers to these questions in Appendix E, in the back of the book.



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BIOLOGY AND BEHAVIOR

NEURAL COMMUNICATION

- Neurons
- The Neural Impulse
- How Neurons Communicate
- How Neurotransmitters Influence Us

THE NERVOUS SYSTEM

- The Peripheral Nervous System
- The Central Nervous System

THE ENDOCRINE SYSTEM

THE BRAIN

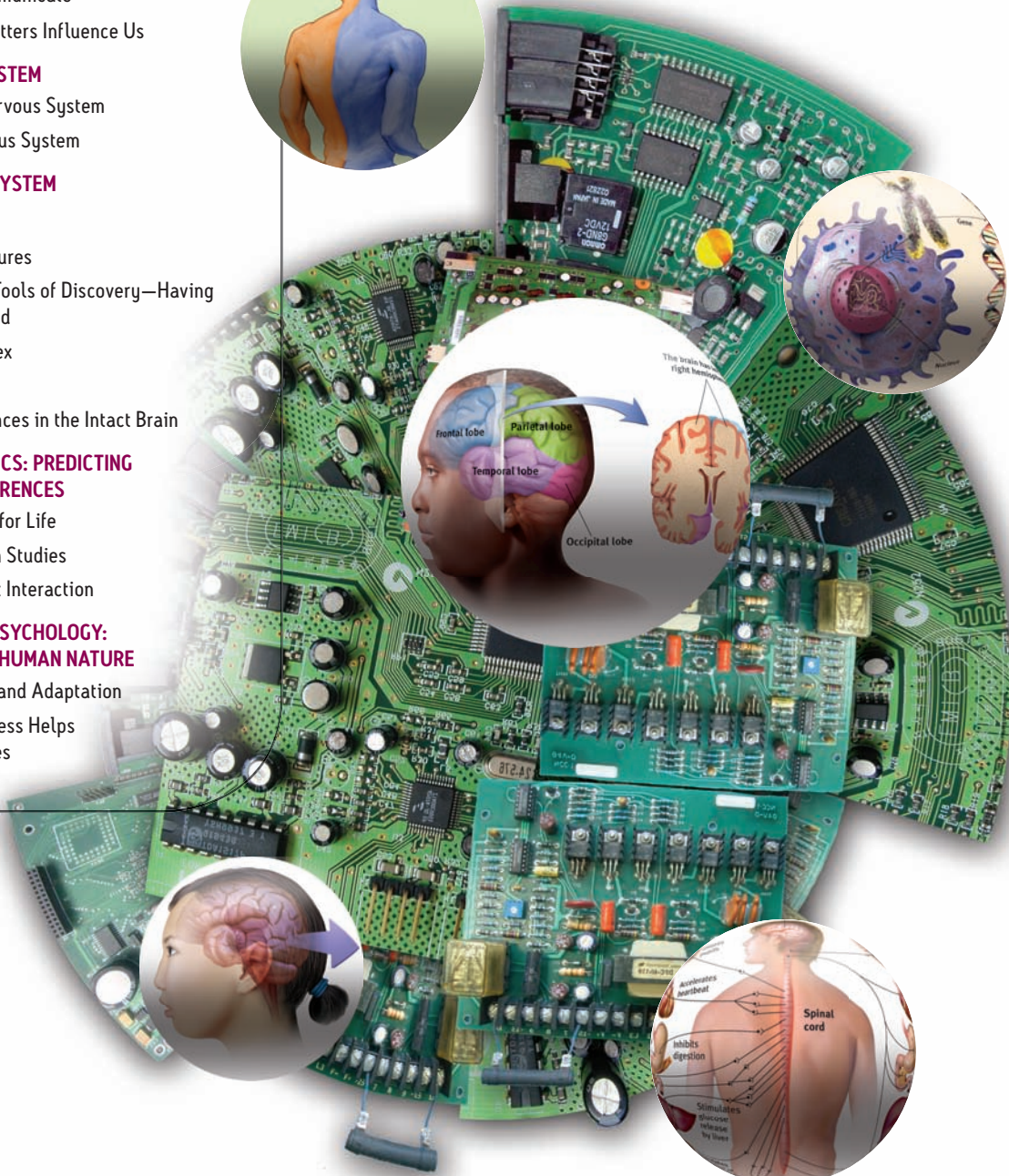
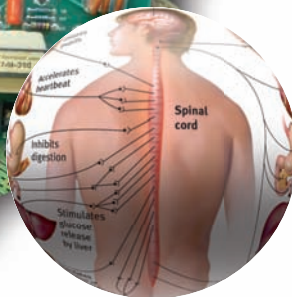
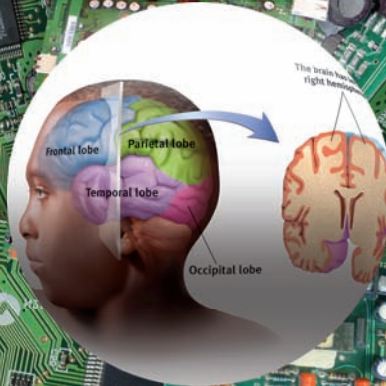
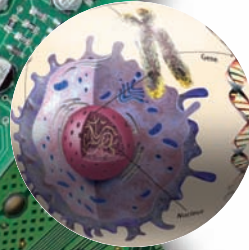
- Older Brain Structures
- CLOSE-UP:** The Tools of Discovery—Having Our Head Examined
- The Cerebral Cortex
- Our Divided Brain
- Right-Left Differences in the Intact Brain

BEHAVIOR GENETICS: PREDICTING INDIVIDUAL DIFFERENCES

- Genes: Our Codes for Life
- Twin and Adoption Studies
- Gene-Environment Interaction

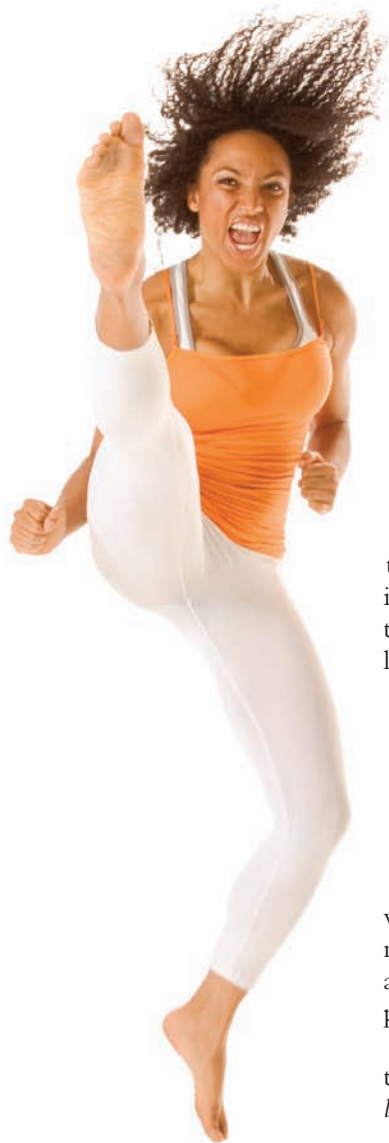
EVOLUTIONARY PSYCHOLOGY: UNDERSTANDING HUMAN NATURE

- Natural Selection and Adaptation
- Evolutionary Success Helps Explain Similarities





The Biology of Behavior

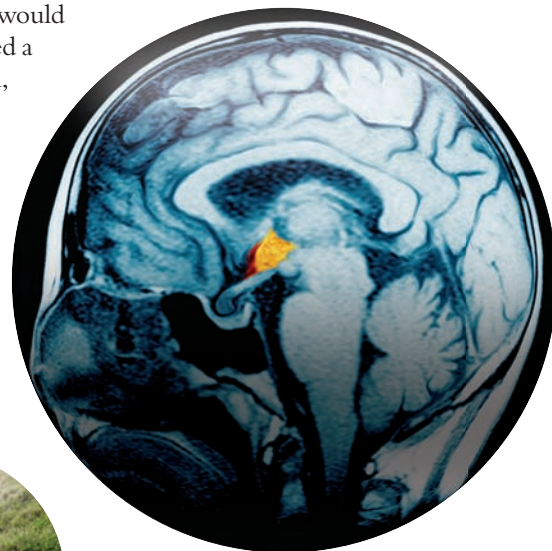


In 2000, a Virginia teacher began collecting sex magazines, visiting child pornography websites, and then making subtle advances on his young stepdaughter. When his wife called the police, he was arrested and later convicted of child molestation. Though put into a sexual addiction rehabilitation program, he still felt overwhelmed by his sexual urges. The day before being sentenced to prison, he went to his local emergency room complaining of a headache and thoughts of suicide. He was also distraught over his uncontrollable impulses, which led him to proposition nurses.

A brain scan located the problem—in his mind’s biology. Behind his right temple there was an egg-sized brain tumor. After surgeons removed the tumor, his lewd impulses faded and he returned home to his wife and stepdaughter. Alas, a year later the tumor partially grew back, and with it the sexual urges. A second tumor removal again lessened the urges (Burns & Swerdlow, 2003).

This case illustrates what you likely believe: that you reside in your head. If surgeons transplanted all your organs below your neck, and even your skin and limbs, you would (*Yes?*) still be you. An acquaintance of mine received a new heart from a woman who, in a rare operation, had required a matched heart-lung transplant. When the two chanced to meet in their hospital ward, she introduced herself: “I think you have my heart.” But only her heart. Her self, she assumed, still resided inside her skull. We rightly presume that our brain enables our mind.

Indeed, no principle is more central to today’s psychology than this: *Everything psychological is simultaneously biological.*



biological psychology the scientific study of the links between biological (genetic, neural, hormonal) and psychological processes. (Some biological psychologists call themselves *behavioral neuroscientists*, *neuropsychologists*, *behavior geneticists*, *physiological psychologists*, or *biopsychologists*.)

neuron a nerve cell; the basic building block of the nervous system.

dendrites a neuron's bushy, branching extensions that receive messages and conduct impulses toward the cell body.

axon the neuron extension that passes messages through its branches to other neurons or to muscles or glands.

myelin [MY-uh-lin] sheath a fatty tissue layer segmentally encasing the axons of some neurons; enables vastly greater transmission speed as neural impulses hop from one node to the next.

glial cells (glia) cells in the nervous system that support, nourish, and protect neurons; they may also play a role in learning and thinking.

action potential a neural impulse; a brief electrical charge that travels down an axon.

threshold the level of stimulation required to trigger a neural impulse.

Biology and Behavior



2-1: Why are psychologists concerned with human biology?

Your every idea, every mood, every urge is a biological happening. You love, laugh, and cry with your body. Without your body—your genes, your brain, your appearance—you would, indeed, be nobody. Although we find it convenient to talk separately of biological and psychological influences on behavior, we need to remember: To think, feel, or act without a body would be like running without legs.

Biological psychologists study the links between our biology and behavior. In this chapter we start small and build from the bottom up—from nerve cells to the brain. We then consider how our genetic histories predispose our shared human nature, and, in combination with our environments, our individual differences.

Neural Communication

For scientists, it is a happy fact of nature that the information systems of humans and other animals operate similarly—so similarly that you could not distinguish between small samples of brain tissue from a human and a monkey. This similarity allows researchers to study relatively simple animals to discover how our neural systems operate. Cars differ, but all have engines, accelerators, steering wheels, and brakes. A Martian could study any one of them and grasp the operating principles. Likewise, animals differ, yet their nervous systems operate similarly. Though the human brain is more complex than a rat's, both follow the same principles.

Neurons



2-2: What are neurons, and how do they transmit information?

Our body's neural information system is complexity built from simplicity. Its building blocks are **neurons**, or nerve cells. To fathom our thoughts and actions, memories and moods, we must first understand how neurons work and communicate.

Neurons differ, but all are variations on the same theme (**FIGURE 2.1**). Each consists of a *cell body* and its branching fibers. The bushy **dendrite** fibers receive information and conduct it toward the cell body. From there, the cell's lengthy **axon** fiber passes the message through its terminal branches to other neurons or to muscles or glands. Dendrites listen. Axons speak.

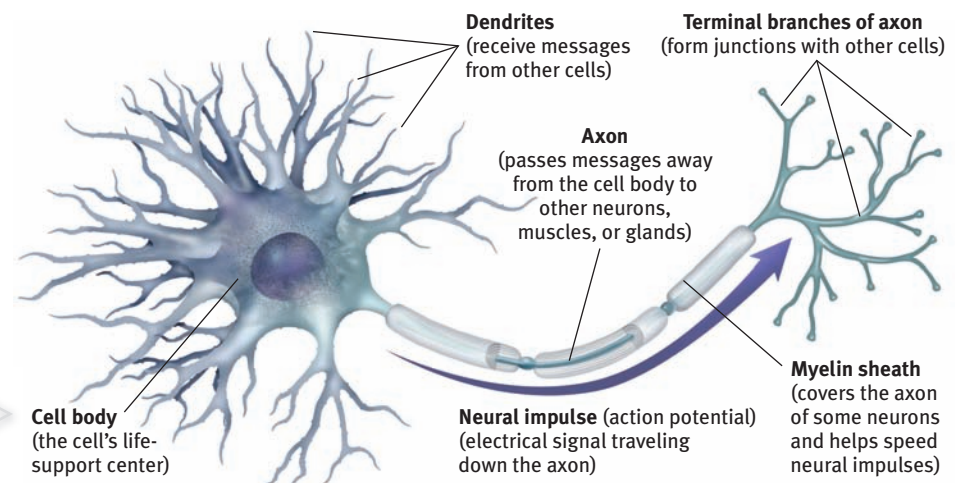


FIGURE 2.1
A motor neuron

Unlike the short dendrites, axons may be very long, projecting several feet through the body. A human neuron carrying orders to a leg muscle, for example, has a cell body and axon roughly on the scale of a basketball attached to a rope 4 miles long. Much as home electrical wire is insulated, some axons are encased in a **myelin sheath**, a layer of fatty tissue that insulates them and speeds their impulses. As myelin is laid down up to about age 25, neural efficiency, judgment, and self-control grows (Fields, 2008). If the myelin sheath degenerates, *multiple sclerosis* results: Communication to muscles slows, with eventual loss of muscle control.

Supporting our billions of nerve cells are nine times as many spidery **glial cells** (“glue cells”). Neurons are like queen bees; on their own they cannot feed or sheathe themselves. Glial cells are worker bees. They provide nutrients and insulating myelin, guide neural connections, and clean up after neurons send messages to one another. Glia may also play a role in learning and thinking. By “chatting” with neurons they may participate in information transmission and memory (Fields, 2009; Miller, 2005).

In more complex animal brains, the proportion of glia to neurons increases. A postmortem analysis of Einstein’s brain did not find more or larger-than-usual neurons, but it did reveal a much greater concentration of glial cells than found in an average Albert’s head (Fields, 2004).

The Neural Impulse

Neurons transmit messages when stimulated by signals from our senses or when triggered by chemical signals from neighboring neurons. In response, a neuron fires an impulse, called the **action potential**—a brief electrical charge that travels down its axon.

Depending on the type of fiber, a neural impulse travels at speeds ranging from a sluggish 2 miles per hour to a breakneck 180 miles per hour. But even this top speed is 3 million times slower than that of electricity through a wire. We measure brain activity in milliseconds (thousandths of a second) and computer activity in nanoseconds (billionths of a second). Thus, unlike the nearly instantaneous reactions of a computer, your reaction to a sudden event, such as a child darting in front of your car, may take a quarter-second or more. Your brain is vastly more complex than a computer but slower at executing simple responses. And if you were an elephant—whose round-trip message travel time from a yank on the tail to the brain and back to the tail is 100 times longer than that of a tiny shrew—your reflexes would be slower yet (More et al., 2010).

Like batteries, neurons generate electricity from chemical events. In the neuron’s chemistry-to-electricity process, *ions* (electrically charged atoms) are exchanged. The fluid outside an axon’s membrane has mostly positively charged ions; a resting axon’s fluid interior has mostly negatively charged ions. When a neuron fires, the first section of the axon opens its gates, rather like sewer covers flipping open, and positively charged sodium ions flood in through the cell membrane (**FIGURE 2.2** on the next page). This *depolarizes* that axon section, causing the next axon channel to open, and then the next, like a line of falling dominos, each tripping the next. During a resting pause, the neuron pumps the positively charged sodium ions back outside. Then it can fire again. The mind boggles when imagining this electrochemical process repeating up to 100 or even 1000 times a second. But this is just the first of many astonishments.

Each neuron is itself a miniature decision-making device performing complex calculations as it receives signals from hundreds, even thousands, of other neurons. Most signals are *excitatory*, somewhat like pushing a neuron’s accelerator. Some are *inhibitory*, more like pushing its brake. If excitatory signals minus inhibitory signals exceed a minimum intensity, or **threshold**, the combined signals trigger an action potential. (Think of it this way: If the excitatory party animals outvote the inhibitory party poopers, the party’s on.) The action potential then travels down the axon, which branches into junctions with hundreds or thousands of other neurons or with the body’s muscles and glands.



Neuron by sculptor Roxy Paine

AP Photo/ Frederik Meijer Gardens & Sculpture Park, Chuck Heiney

“What one neuron tells another neuron is simply how much it is excited.”

Francis Crick, *The Astonishing Hypothesis*, 1994

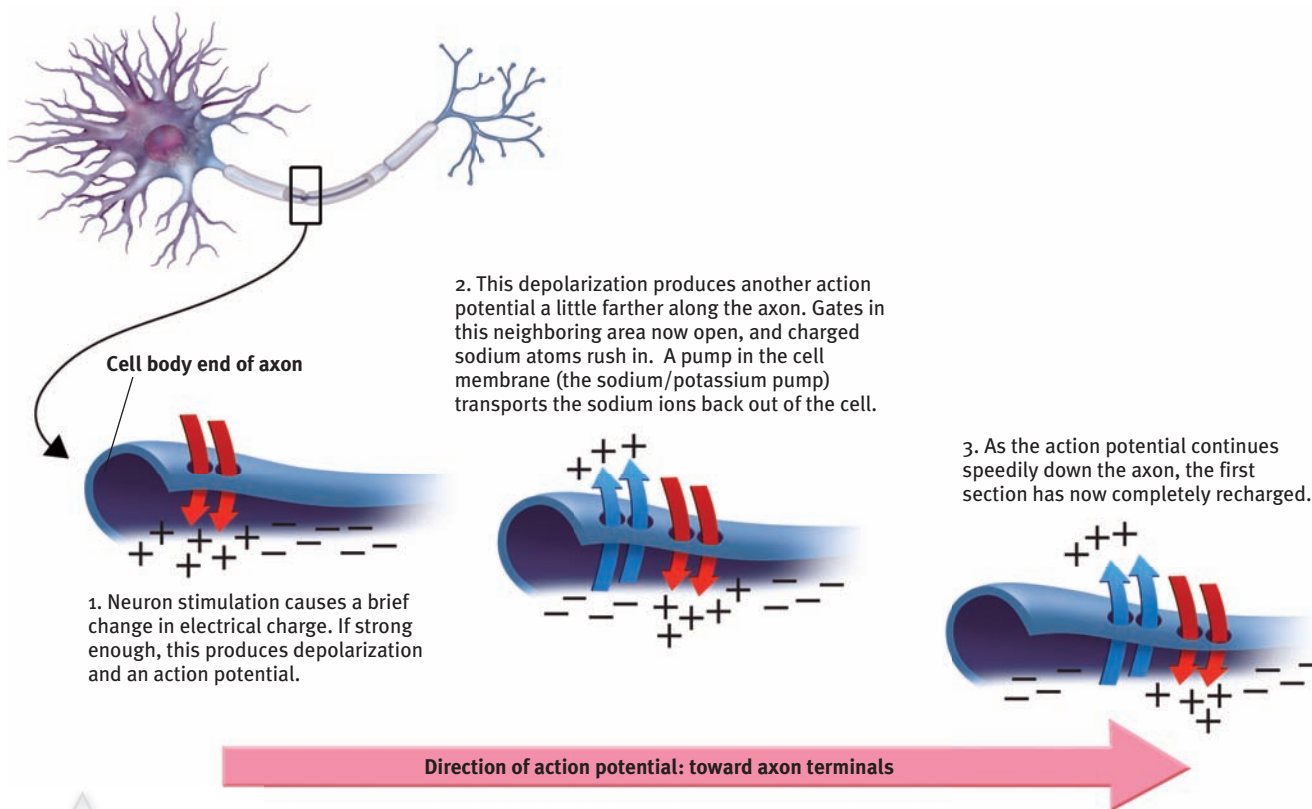


FIGURE 2.2
Action potential

Increasing the level of stimulation above the threshold will not increase the neural impulse's intensity. The neuron's reaction is an *all-or-none response*: Like guns, neurons either fire or they don't. How, then, do we detect the intensity of a stimulus? How do we distinguish a gentle touch from a big hug? A strong stimulus can trigger *more* neurons to fire, and to fire more often. But it does not affect the action potential's strength or speed. Squeezing a trigger harder won't make a bullet go faster.

RETRIEVE IT

- When a neuron fires an action potential, the information travels through the axon, the dendrites, and the axon's terminal branches, but not in that order. Place these three structures in the correct order.

ANSWER: dendrites, axon, axon's terminal branches

- How does our nervous system allow us to experience the difference between a slap and a tap on the back?

ANSWER: Stronger stimuli (the slap) cause more neurons to fire and to fire more frequently than happens with weaker stimuli (the tap).

How Neurons Communicate



2-3: How do nerve cells communicate with other nerve cells?

Neurons interweave so intricately that even with a microscope you would have trouble seeing where one neuron ends and another begins. Scientists once believed that the axon of one cell fused with the dendrites of another in an uninterrupted fabric. Then British physiologist Sir Charles Sherrington (1857–1952) noticed that neural impulses were taking an unexpectedly long time to travel a neural pathway.

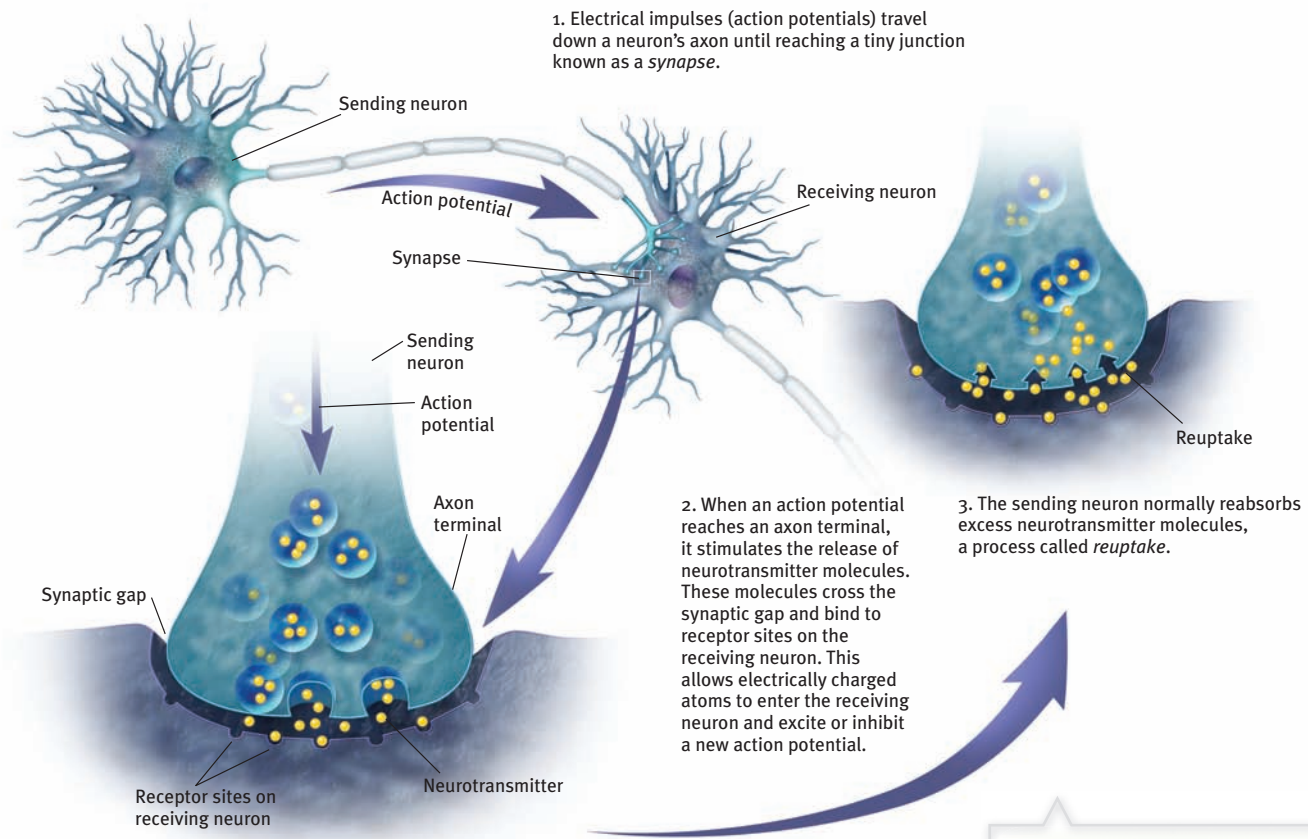


FIGURE 2.3
How neurons communicate

Inferring that there must be a brief interruption in the transmission, Sherrington called the meeting point between neurons a **synapse**.

We now know that the axon terminal of one neuron is in fact separated from the receiving neuron by a *synaptic gap* (or *synaptic cleft*) less than a millionth of an inch wide. Spanish anatomist Santiago Ramón y Cajal (1852–1934) marveled at these near-unions of neurons, calling them “protoplasmic kisses.” “Like elegant ladies air-kissing so as not to muss their makeup, dendrites and axons don’t quite touch,” noted poet Diane Ackerman (2004). How do the neurons execute this protoplasmic kiss, sending information across the tiny synaptic gap? The answer is one of the important scientific discoveries of our age.

When an action potential reaches the knob-like terminals at an axon’s end, it triggers the release of chemical messengers, called **neurotransmitters** (FIGURE 2.3). Within 1/10,000th of a second, the neurotransmitter molecules cross the synaptic gap and bind to receptor sites on the receiving neuron—as precisely as a key fits a lock. For an instant, the neurotransmitter unlocks tiny channels at the receiving site, and electrically charged atoms flow in, exciting or inhibiting the receiving neuron’s readiness to fire. Then, in a process called *reuptake*, the sending neuron reabsorbs the excess neurotransmitters from the synapse.

“All information processing in the brain involves neurons ‘talking to’ each other at synapses.”

Neuroscientist Solomon H. Snyder (1984)

synapse [SIN-aps] the junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron. The tiny gap at this junction is called the *synaptic gap* or *synaptic cleft*.

neurotransmitters chemical messengers that cross the synaptic gaps between neurons. When released by the sending neuron, neurotransmitters travel across the synapse and bind to receptor sites on the receiving neuron, thereby influencing whether that neuron will generate a neural impulse.

RETRIEVE IT

- What happens in the *synaptic gap*?

ANSWER: Neurons send neurotransmitters (chemical messengers) across this tiny space between one neuron’s terminal branch and the next neuron’s dendrite or cell body.

How Neurotransmitters Influence Us

“When it comes to the brain, if you want to see the action, follow the neurotransmitters.”

Neuroscientist Floyd Bloom (1993)

Physician Lewis Thomas, on the endorphins: “There it is, a biologically universal act of mercy. I cannot explain it, except to say that I would have put it in had I been around at the very beginning, sitting as a member of a planning committee.”

The Youngest Science, 1983



2-4: How do neurotransmitters influence behavior?

In their quest to understand neural communication, researchers have discovered dozens of different neurotransmitters and almost as many new questions: Are certain neurotransmitters found only in specific places? How do they affect our moods, memories, and mental abilities? Can we boost or diminish these effects through drugs or diet?

Later chapters explore neurotransmitter influences on hunger and thinking, depression and euphoria, addictions and therapy. For now, let’s glimpse how neurotransmitters influence our motions and emotions. A particular neurotransmitter may affect specific behaviors and emotions (**TABLE 2.1**), and a particular brain pathway may use only one or two neurotransmitters (**FIGURE 2.4**).

Acetylcholine (ACh), which plays a role in learning and memory, is one of the best-understood neurotransmitters. In addition, it is the messenger at every junction between motor neurons (which carry information from the brain and spinal cord to the body’s tissues) and skeletal muscles. When ACh is released to our muscle cell receptors, the muscle contracts. If ACh transmission is blocked, as happens during some kinds of anesthesia, the muscles cannot contract and we are paralyzed.

Candace Pert and Solomon Snyder (1973) made an exciting discovery about neurotransmitters when they attached a radioactive tracer to morphine, showing where it was taken up in an animal’s brain. The morphine, an opiate drug that elevates mood and eases pain, bound to receptors in areas linked with mood and pain sensations. But why would the brain have these “opiate receptors”? Why would it have a chemical lock, unless it also had a natural key to open it?

Researchers soon confirmed that the brain does indeed produce its own naturally occurring opiates. Our body releases several types of neurotransmitter molecules similar to morphine in response to pain and vigorous exercise. These **endorphins** (short for *endogenous* [produced within] *morphine*) help explain good feelings such as the “runner’s high,” the painkilling effects of acupuncture, and the indifference to pain in some severely injured people.



Table 2.1

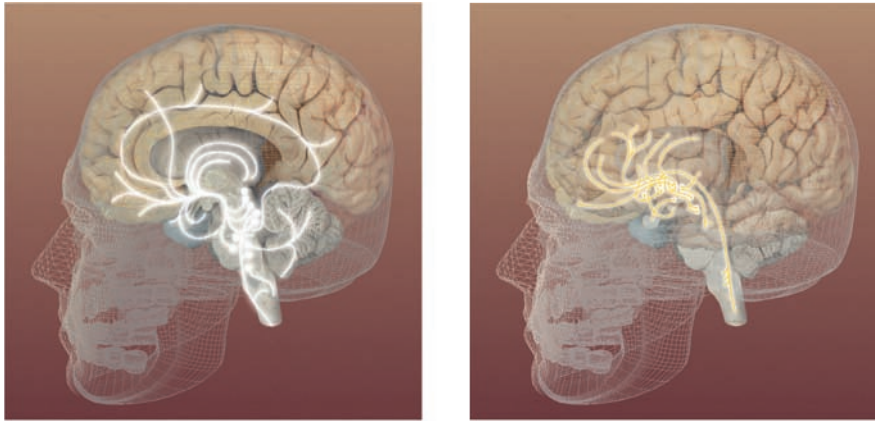
Some Neurotransmitters and Their Functions

Neurotransmitter	Function	Examples of Malfunctions
<i>Acetylcholine (ACh)</i>	Enables muscle action, learning, and memory.	With Alzheimer’s disease, ACh-producing neurons deteriorate.
<i>Dopamine</i>	Influences movement, learning, attention, and emotion.	Oversupply linked to schizophrenia. Undersupply linked to tremors and decreased mobility in Parkinson’s disease.
<i>Serotonin</i>	Affects mood, hunger, sleep, and arousal.	Undersupply linked to depression. Some antidepressant drugs raise serotonin levels.
<i>Norepinephrine</i>	Helps control alertness and arousal.	Undersupply can depress mood.
<i>GABA (gamma-aminobutyric acid)</i>	A major inhibitory neurotransmitter.	Undersupply linked to seizures, tremors, and insomnia.
<i>Glutamate</i>	A major excitatory neurotransmitter; involved in memory.	Oversupply can overstimulate brain, producing migraines or seizures (which is why some people avoid MSG, monosodium glutamate, in food).



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Both photos from *Mapping the Mind*, Rita Carter, © 1989 University of California Press



Serotonin pathways

Dopamine pathways

FIGURE 2.4

Neurotransmitter pathways Each of the brain's differing chemical messengers has designated pathways where it operates, as shown here for serotonin and dopamine (Carter, 1998).

If indeed the endorphins lessen pain and boost mood, why not flood the brain with artificial opiates, thereby intensifying the brain's own “feel-good” chemistry? One problem is that when flooded with opiate drugs such as heroin and morphine, the brain may stop producing its own natural opiates. When the drug is withdrawn, the brain may then be deprived of any form of opiate, causing intense discomfort. For suppressing the body's own neurotransmitter production, nature charges a price.

RETRIEVE IT

- The endorphins, serotonin, and dopamine are all chemical messengers called _____.

ANSWER: neurotransmitters

The Nervous System



2-5: What are the functions of the nervous system's main divisions, and what are the three main types of neurons?

To live is to take in information from the world and the body's tissues, to make decisions, and to send back information and orders to the body's tissues. All this happens thanks to our body's **nervous system** (FIGURE 2.5 on the next page). The brain and spinal cord form the **central nervous system (CNS)**, the body's decision maker. The **peripheral nervous system (PNS)** is responsible for gathering information and for transmitting CNS decisions to other body parts. **Nerves**, electrical cables formed of bundles of axons, link the CNS with the body's sensory receptors, muscles, and glands. The optic nerve, for example, bundles a million axons into a single cable carrying the messages each eye sends to the brain (Mason & Kandel, 1991).

Information travels in the nervous system through three types of neurons. **Sensory neurons** carry messages from the body's tissues and sensory receptors inward to the brain and spinal cord for processing. **Motor neurons** carry instructions from the central nervous system out to the body's muscles. Between the sensory input and motor output, information is processed via the brain's **interneurons**. Our complexity resides mostly in our interneuron systems. Our nervous system has a few million sensory neurons, a few million motor neurons, and billions and billions of interneurons.

endorphins [en-DOR-fins] “morphine within”—natural, opiate-like neurotransmitters linked to pain control and to pleasure.

nervous system the body's speedy, electrochemical communication network, consisting of all the nerve cells of the peripheral and central nervous systems.

central nervous system (CNS) the brain and spinal cord.

peripheral nervous system (PNS) the sensory and motor neurons that connect the central nervous system (CNS) to the rest of the body.

nerves bundled axons that form neural “cables” connecting the central nervous system with muscles, glands, and sense organs.

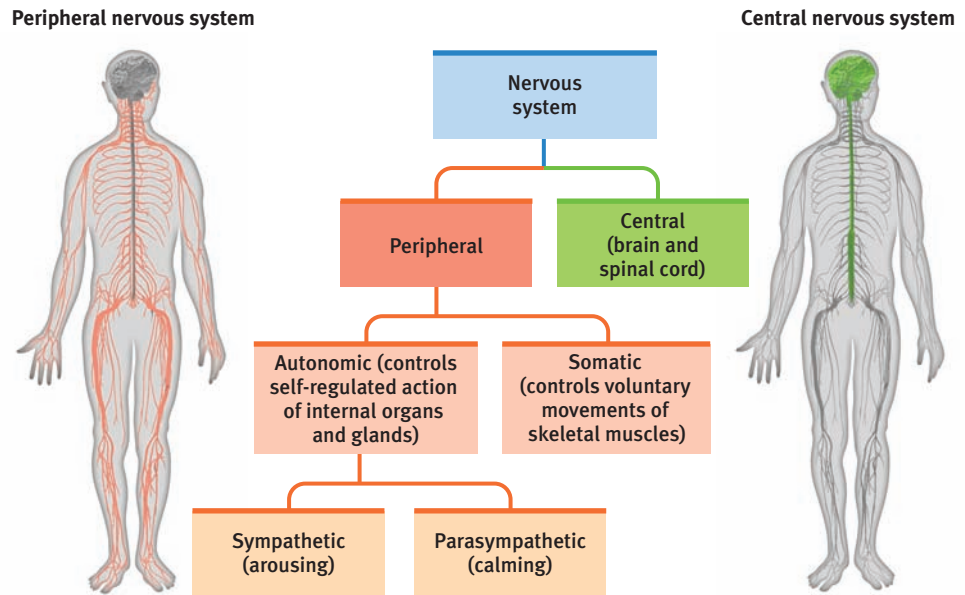
sensory (afferent) neurons neurons that carry incoming information from the sensory receptors to the brain and spinal cord.

motor (efferent) neurons neurons that carry outgoing information from the brain and spinal cord to the muscles and glands.

interneurons neurons within the brain and spinal cord that communicate internally and intervene between the sensory inputs and motor outputs.

FIGURE 2.5

The functional divisions of the human nervous system



The Peripheral Nervous System

Our peripheral nervous system has two components—somatic and autonomic. Our **somatic nervous system** enables voluntary control of our skeletal muscles (and is also called the *skeletal nervous system*). As you reach the bottom of the next page, your somatic nervous system will report to your brain the current state of your skeletal muscles and carry instructions back, triggering your hand to turn the page.

Our **autonomic nervous system (ANS)** controls our glands and the muscles of our internal organs, influencing such functions as glandular activity, heartbeat, and digestion. (*Autonomic* means “self-regulating.”) Like an automatic pilot, this system may be consciously overridden, but usually it operates on its own (autonomously).

The autonomic nervous system serves two important, basic functions (**FIGURE 2.6**). The **sympathetic nervous system** arouses and expends energy. If something alarms or challenges you (such as a longed-for job interview), your sympathetic nervous system will accelerate your heartbeat, raise your blood pressure, slow your digestion, raise your blood sugar, and cool you with perspiration, making you alert and ready for action. When the stress subsides (the interview is over), your **parasympathetic nervous system** will produce the opposite effects, conserving energy as it calms you by decreasing your heartbeat, lowering your blood sugar, and so forth. In everyday situations, the sympathetic and parasympathetic nervous systems work together to keep you in a steady internal state called *homeostasis* (more on this in Chapter 10).

I recently experienced my ANS in action. Before sending me into an MRI machine for a routine shoulder scan, the technician asked if I had issues with claustrophobia. “No, I’m fine,” I assured her, with perhaps a hint of macho swagger. Moments later, as I found myself on my back, stuck deep inside a coffin-sized box and unable to move, my sympathetic nervous system had a different idea. As claustrophobia overtook me, my heart began pounding and I felt a desperate urge to escape. Just as I was about to cry out for release, I felt my calming parasympathetic nervous system kick in. My heart rate slowed and my body relaxed, though my arousal surged again before the 20-minute confinement ended. “You did well!” the technician said, unaware of my ANS roller-coaster ride.

somatic nervous system the division of the peripheral nervous system that controls the body’s skeletal muscles. Also called the *skeletal nervous system*.

autonomic [aw-tuh-NAHM-ik] **nervous system (ANS)** the part of the peripheral nervous system that controls the glands and the muscles of the internal organs (such as the heart). Its sympathetic division arouses; its parasympathetic division calms.

sympathetic nervous system the division of the autonomic nervous system that arouses the body, mobilizing its energy in stressful situations.

parasympathetic nervous system the division of the autonomic nervous system that calms the body, conserving its energy.

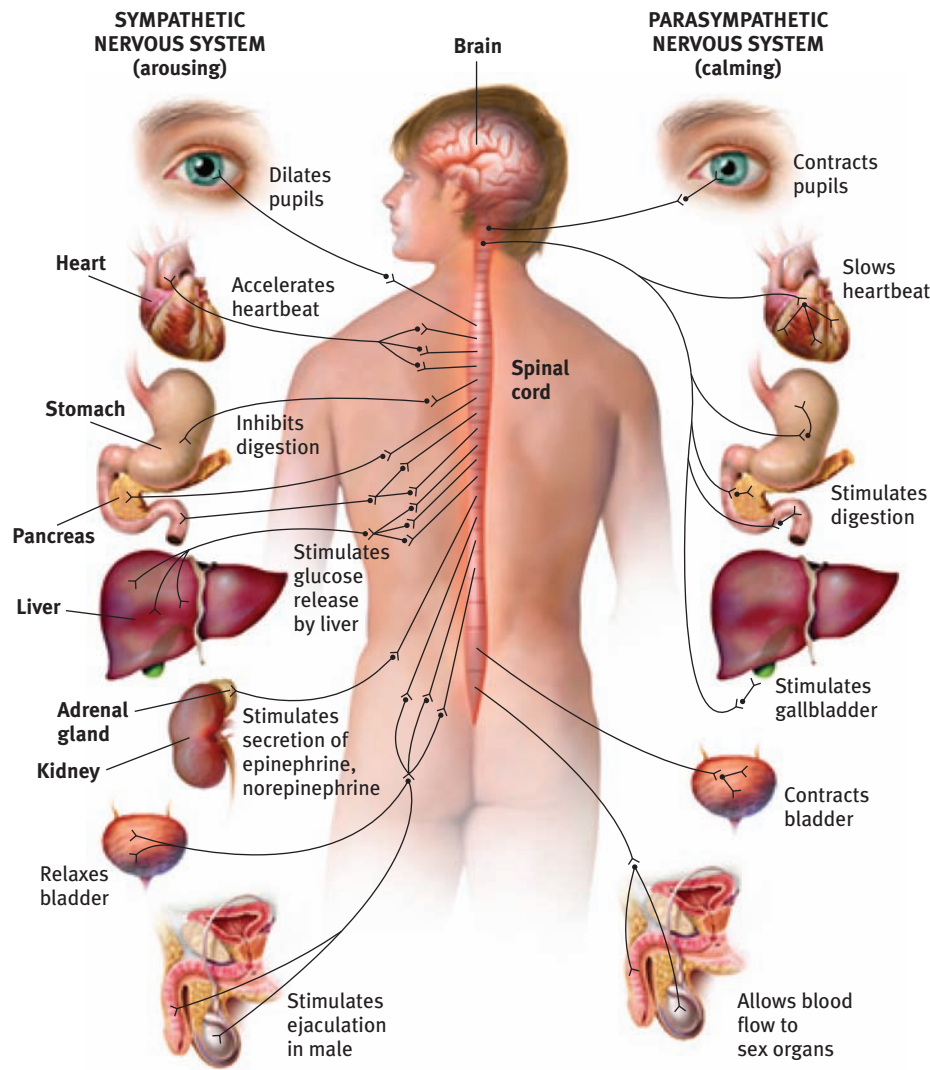


FIGURE 2.6

The dual functions of the autonomic nervous system The autonomic nervous system controls the more autonomous (or self-regulating) internal functions. Its sympathetic division arouses and expends energy. Its parasympathetic division calms and conserves energy, allowing routine maintenance activity. For example, sympathetic stimulation accelerates heartbeat, whereas parasympathetic stimulation slows it.

RETRIEVE IT

- Match the type of neuron to its description.

Type	Description
1. Motor neurons	a. carry incoming messages from sensory receptors to the CNS.
2. Sensory neurons	b. communicate within the CNS and intervene between incoming and outgoing messages.
3. Interneurons	c. carry outgoing messages from the CNS to muscles and glands.

ANSWERS: 1, c; 2, a; 3, b

- What bodily changes does your autonomic nervous system (ANS) direct before and after you give an important speech?

ANSWER: Responding to this challenge, your ANS' sympathetic division will arouse you. It accelerates your heartbeat, raises your blood pressure and blood sugar, slows your digestion, and cools you with perspiration. After you give the speech, your ANS' parasympathetic division will reverse these effects.

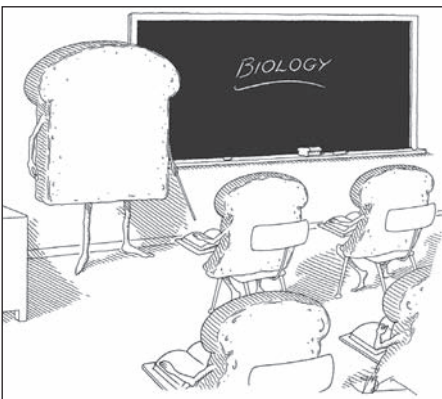
reflex a simple, automatic response to a sensory stimulus, such as the knee-jerk response.

endocrine [EN-duh-krin] system the body's "slow" chemical communication system; a set of glands that secrete hormones into the bloodstream.

hormones chemical messengers that are manufactured by the endocrine glands, travel through the bloodstream, and affect other tissues.

adrenal [ah-DREEN-el] glands a pair of endocrine glands that sit just above the kidneys and secrete hormones (epinephrine and norepinephrine) that help arouse the body in times of stress.

pituitary gland the endocrine system's most influential gland. Under the influence of the hypothalamus, the pituitary regulates growth and controls other endocrine glands.



© Tom Swick

"The body is made up of millions and millions of crumbs."

The Central Nervous System

From the simplicity of neurons "talking" to other neurons arises the complexity of the central nervous system's brain and spinal cord.

It is the brain that enables our humanity—our thinking, feeling, and acting. Tens of billions of neurons, each communicating with thousands of other neurons, yield an ever-changing wiring diagram. With some 40 billion neurons, each connecting with roughly 10,000 other neurons, we end up with perhaps 400 trillion synapses—places where neurons meet and greet their neighbors (de Courten-Myers, 2005).¹

The brain's neurons cluster into work groups called *neural networks*. To understand why, Stephen Kosslyn and Olivier Koenig (1992, p. 12) have invited us to "think about why cities exist; why don't people distribute themselves more evenly across the countryside?" Like people networking with people, neurons network with nearby neurons with which they can have short, fast connections.

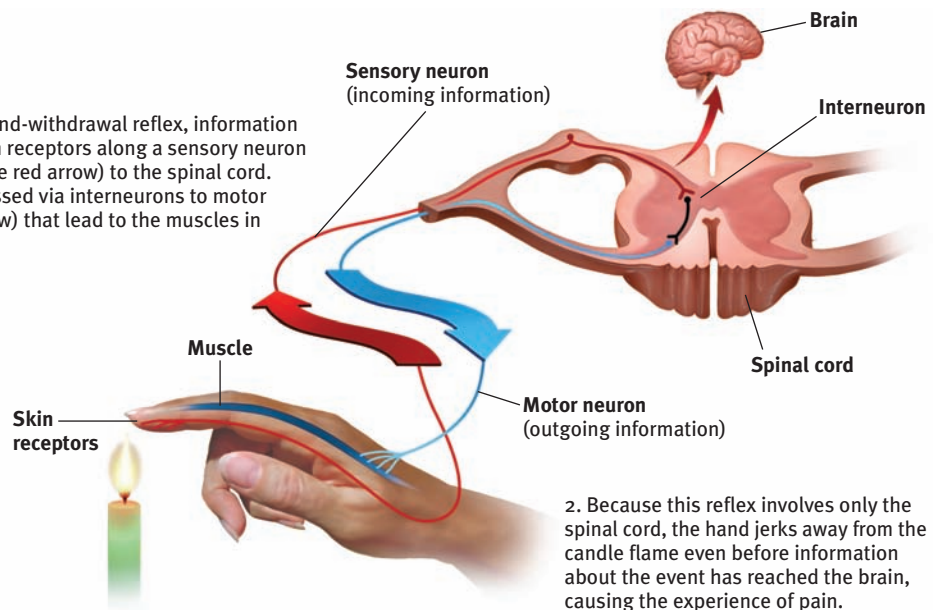
The other part of the CNS, the *spinal cord*, is a two-way information highway connecting the peripheral nervous system and the brain. Ascending neural fibers send up sensory information, and descending fibers send back motor-control information. The neural pathways governing our **reflexes**, our automatic responses to stimuli, illustrate the spinal cord's work. A simple spinal reflex pathway is composed of a single sensory neuron and a single motor neuron. These often communicate through an interneuron. The knee-jerk response, for example, involves one such simple pathway. A headless warm body could do it.

Another neural circuit enables the pain reflex (**FIGURE 2.7**). When your finger touches a flame, neural activity (excited by the heat) travels via sensory neurons to interneurons in your spinal cord. These interneurons respond by activating motor neurons leading to the muscles in your arm. Because the simple pain-reflex circuit runs through the spinal cord and right back out, your hand jerks away from the candle's flame *before* your brain receives and responds to the information that causes you to feel pain. That's why it feels as if your hand jerks away not by your choice, but on its own.

¹ Another research team, projecting from representative tissue samples, has estimated that the adult human male brain contains 86 billion neurons—give or take 8 billion (Azevedo et al., 2009). One moral: Distrust big round numbers, such as the familiar, undocumented claim that the human brain contains 100 billion neurons.

FIGURE 2.7
A simple reflex

1. In this simple hand-withdrawal reflex, information is carried from skin receptors along a sensory neuron (shown by the large red arrow) to the spinal cord. From there it is passed via interneurons to motor neurons (blue arrow) that lead to the muscles in the hand and arm.



2. Because this reflex involves only the spinal cord, the hand jerks away from the candle flame even before information about the event has reached the brain, causing the experience of pain.

Information travels to and from the brain by way of the spinal cord. Were the top of your spinal cord severed, you would not feel pain from your body below. Nor would you feel pleasure. With your brain literally out of touch with your body, you would lose all sensation and voluntary movement in body regions with sensory and motor connections to the spinal cord below its point of injury. You would exhibit the knee jerk without feeling the tap. When the brain center keeping the brakes on erections is severed, men paralyzed below the waist may be capable of an erection (a simple reflex) if their genitals are stimulated (Goldstein, 2000). Women similarly paralyzed may respond with vaginal lubrication. But, depending on where and how completely the spinal cord is severed, they may be genitally unresponsive to erotic images and have no genital feeling (Kennedy & Over, 1990; Sipski & Alexander, 1999). To produce bodily pain or pleasure, the sensory information must reach the brain.

“If the nervous system be cut off between the brain and other parts, the experiences of those other parts are nonexistent for the mind. The eye is blind, the ear deaf, the hand insensible and motionless.”

William James, *Principles of Psychology*, 1890

The Endocrine System



2-6: How does the endocrine system transmit information and interact with the nervous system?

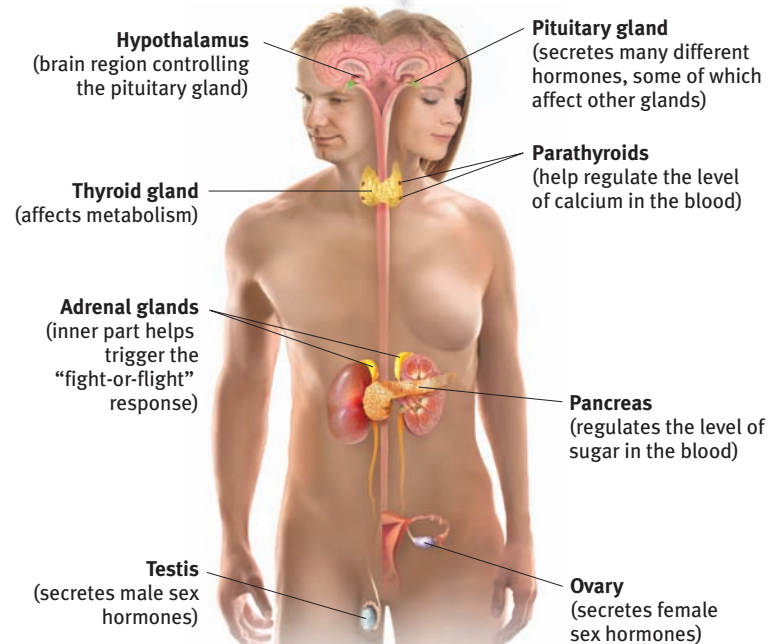
So far, we have focused on the body’s speedy electrochemical information system. Interconnected with your nervous system is a second communication system, the **endocrine system** (FIGURE 2.8). The endocrine system’s glands secrete another form of chemical messengers, **hormones**, which travel through the bloodstream and affect other tissues, including the brain. When hormones act on the brain, they influence our interest in sex, food, and aggression.

Some hormones are chemically identical to neurotransmitters (the chemical messengers that diffuse across a synapse and excite or inhibit an adjacent neuron). The endocrine system and nervous system are therefore close relatives: Both produce molecules that act on receptors elsewhere. Like many relatives, they also differ. The speedy nervous system zips messages from eyes to brain to hand in a fraction of a second. Endocrine messages trudge along in the bloodstream, taking several seconds or more to travel from the gland to the target tissue. If the nervous system delivers information to a specific receptor site with the speed of a text message, the endocrine system is more like a snail-mail bulk mailing.

Endocrine messages tend to outlast the effects of neural messages. That helps explain why upset feelings may linger beyond our awareness of what upset us. When this happens, it takes time for us to “simmer down.” In a moment of danger, for example, the ANS orders the **adrenal glands** on top of the kidneys to release *epinephrine* and *norepinephrine* (also called *adrenaline* and *noradrenaline*). These hormones increase heart rate, blood pressure, and blood sugar, providing a surge of energy. When the emergency passes, the hormones—and the feelings of excitement—linger a while.

The most influential endocrine gland is the **pituitary gland**, a pea-sized structure located in the core of the brain, where it is controlled by an adjacent brain area, the *hypothalamus* (more on that shortly). Among the hormones released by the pituitary is a growth hormone that stimulates physical development. Another is *oxytocin*, which enables contractions associated with birthing, milk flow during nursing, and orgasm. Oxytocin also promotes pair bonding, group cohesion, and social trust (De Dreu et al., 2010). During a laboratory game, those given a nasal squirt of oxytocin rather than a placebo were more likely to trust strangers with their money (Kosfeld et al., 2005).

FIGURE 2.8
The endocrine system



lesion [LEE-zhuhn] tissue destruction. A brain lesion is a naturally or experimentally caused destruction of brain tissue.

brainstem the oldest part and central core of the brain, beginning where the spinal cord swells as it enters the skull; the brainstem is responsible for automatic survival functions.

medulla [muh-DUL-uh] the base of the brainstem; controls heartbeat and breathing.

Pituitary secretions also influence the release of hormones by other endocrine glands. The pituitary, then, is a master gland (whose own master is the hypothalamus). For example, under the brain's influence, the pituitary triggers your sex glands to release sex hormones. These in turn influence your brain and behavior.

This feedback system (brain → pituitary → other glands → hormones → body and brain) reveals the intimate connection of the nervous and endocrine systems. The nervous system directs endocrine secretions, which then affect the nervous system. Conducting and coordinating this whole electrochemical orchestra is that maestro we call the brain.

RETRIEVE IT

- Why is the pituitary gland called the “master gland”?

ANSWER: Responding to signals from the hypothalamus, the pituitary releases hormones that trigger other endocrine glands to secrete hormones, which in turn influence our brain and our behavior.

- How are the nervous and endocrine systems alike, and how do they differ?

ANSWER: Both of these communication systems produce chemical molecules that act on the body's receptors to influence our behavior and emotions. The endocrine system, which secretes hormones into the bloodstream, delivers its messages much more slowly than the speedy nervous system, and the effects of the endocrine system's messages tend to linger much longer than those of the nervous system.

The Brain



2-7: How do neuroscientists study the brain's connections to behavior and mind?

The mind seeking to understand the brain—that is indeed among the ultimate scientific challenges. And so it will always be. To paraphrase cosmologist John Barrow, a brain simple enough to be understood is too simple to produce a mind able to understand it.

When you think *about* your brain, you're thinking *with* your brain—sending billions of neurotransmitter molecules across countless millions of synapses. Indeed, say neuroscientists, “the mind is what the brain does” (Minsky, 1986).

A century ago, scientists had no tools high powered yet gentle enough to reveal a living brain's activity. Clinical observations had unveiled some brain-mind connections. Physicians had noted that damage to one side of the brain often caused numbness or paralysis on the opposite side, suggesting that the body's right side is wired to the brain's left side, and vice versa. Others noticed that damage to the back of the brain disrupted vision, and that damage to the left-front part of the brain produced speech difficulties. Gradually, these early explorers were mapping the brain.

Now, within a lifetime, the whole brain-mapping process has changed. The known universe's most amazing organ is being probed and mapped by a new generation of neural mapmakers. Whether in the interests of science or medicine, they can selectively **lesion** (destroy) tiny clusters of normal or defective brain cells, leaving the surrounding tissue unharmed. Today's scientists can snoop on the messages of individual neurons, using modern microelectrodes with tips small enough to detect the electrical pulse in a single neuron. For example, they can now detect exactly where the information goes in a cat's brain when someone strokes its whisker. They can also stimulate various brain parts—electrically, chemically, or magnetically—and note the effects; eavesdrop on the chatter of billions of neurons; and see color representations of the brain's energy-consuming activity.

These techniques for peering into the thinking, feeling brain are doing for psychology what the microscope did for biology and the telescope did for astronomy. Close-Up: The Tools of Discovery on the next page looks at some techniques that enable neuroscientists to study the working brain.

“I am a brain, Watson. The rest of me is a mere appendix.”

Sherlock Holmes, in Arthur Conan Doyle's “The Adventure of the Mazarin Stone”

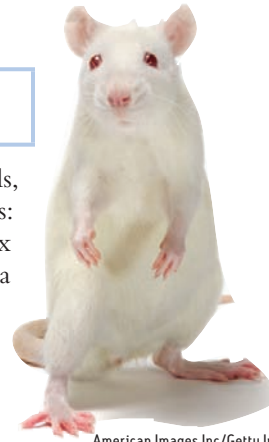
Older Brain Structures



2-8: What structures make up the brainstem, and what are the functions of the brainstem, thalamus, and cerebellum?

An animal's capacities come from its brain structures. In primitive animals, such as sharks, a not-so-complex brain primarily regulates basic survival functions: breathing, resting, and feeding. In lower mammals, such as rodents, a more complex brain enables emotion and greater memory. In advanced mammals, such as humans, a brain that processes more information enables increased foresight as well.

This increasing complexity arises from new brain systems built on top of the old, much as the Earth's landscape covers the old with the new. Digging down, one discovers the fossil remnants of the past—brainstem components performing for us much as they did for our distant ancestors. Let's start with the brain's basement and work up to the newer systems.



American Images Inc/Getty Images

The Brainstem

The brain's oldest and innermost region is the **brainstem**. It begins where the spinal cord swells slightly after entering the skull. This slight swelling is the **medulla** (FIGURE 2.9). Here lie the controls for your heartbeat and breathing. As brain-damaged patients in a vegetative state illustrate, we need no higher brain or conscious mind to orchestrate our heart's pumping and lungs' breathing. The brainstem handles those tasks. Just above the medulla sits the *pons*, which helps coordinate movements.

If a cat's brainstem is severed from the rest of the brain above it, the animal will still breathe and live—and even run, climb, and groom (Klemm, 1990). But cut off from the brain's higher regions, it won't purposefully run or climb to get food.

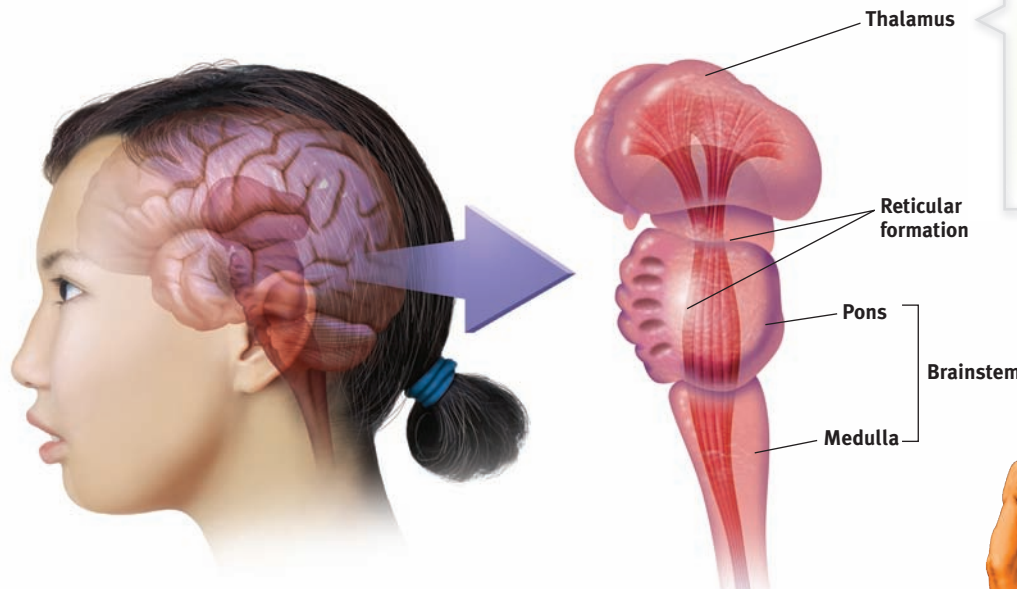


FIGURE 2.9

The brainstem and thalamus The brainstem, including the pons and medulla, is an extension of the spinal cord. The thalamus is attached to the top of the brainstem. The reticular formation passes through both structures.

The brainstem is a crossover point, where most nerves to and from each side of the brain connect with the body's opposite side (FIGURE 2.10). This peculiar cross-wiring is but one of the brain's many surprises.

RETRIEVE IT

- Nerves from the left side of the brain are mostly linked to the _____ side of the body, and vice versa.

ANSWER: right



FIGURE 2.10

The body's wiring

CLOSE UP:

The Tools of Discovery—Having Our Head Examined

Right now, your mental activity is emitting telltale electrical, metabolic, and magnetic signals that would enable neuroscientists to observe your brain at work. Electrical activity in your brain's billions of neurons sweeps in regular waves across its surface. An **electroencephalogram (EEG)** is an amplified readout of such waves (FIGURE 2.11). Researchers record the brain waves through a shower-cap-like hat that is filled with electrodes covered with a conductive gel.



© Philip Channing

Minding minds Neuroscientists Hanna Damasio and Antonio Damasio explore how the brain makes mind.

“You must look into people, as well as at them,” advised Lord Chesterfield in a 1746 letter to his son. Unlike EEGs, newer neuroimaging techniques give us that Superman-like ability to see inside the living brain. One such tool, the **PET (positron emission tomography) scan** (FIGURE 2.12), depicts brain activity by showing each brain area's consumption of its chemical fuel, the sugar glucose. Active neurons are glucose hogs, and after a person receives temporarily radioactive glucose, the PET scan can track the gamma rays released by this “food for thought” as the person performs a given task. Rather like weather radar showing rain activity, PET-scan “hot spots” show which brain areas are most active as the person does mathematical calculations, looks at images of faces, or daydreams.

In **MRI (magnetic resonance imaging)** brain scans, the person's head is put in a strong magnetic field, which aligns the spinning atoms of brain molecules. Then, a radio-wave pulse momentarily disorients the atoms. When the atoms return to their normal spin, they emit

signals that provide a detailed picture of soft tissues, including the brain. MRI scans have revealed a larger-than-average neural area in the left hemisphere of musicians who display perfect pitch (Schlaug et al., 1995). They have also revealed enlarged *ventricles*—fluid-filled brain areas (marked by the red arrows in FIGURE 2.13)—in some patients who have schizophrenia, a disabling psychological disorder.

A special application of MRI—**fMRI (functional MRI)**—can reveal the brain's functioning as well as its structure. Where the brain is especially active, blood goes. By comparing MRI scans taken less than a second apart, researchers can watch the brain activate (with increased oxygen-laden bloodflow) as a person performs different mental functions. As the person looks at a scene, for example, the fMRI machine detects blood rushing to the back of the brain, which processes visual information (see Figure 2.21, in the discussion of cortex functions).

Such snapshots of the brain's changing activity are providing new insights into

FIGURE 2.11
An electroencephalograph providing amplified tracings of waves of electrical activity in the brain



A.J. Photo/Photo Researchers, Inc.

thalamus [THAL-uh-muss] the brain's sensory router, located on top of the brainstem; it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla.

The Thalamus

Sitting atop the brainstem is the **thalamus**, a pair of egg-shaped structures that act as the brain's sensory router (Figure 2.9). The thalamus receives information from all the senses except smell, and it routes that information to higher brain regions that deal with seeing, hearing, tasting, and touching. The thalamus also receives some of the higher brain's replies, which it then directs to the medulla and to the cerebellum (see the next page). Think of the thalamus as being to sensory information what London is to England's trains: a hub through which traffic passes en route to various destinations.

how the brain divides its labor. A mountain of recent fMRI studies suggests which brain areas are most active when people feel pain or rejection, listen to angry voices, think about scary things, feel happy, or become sexually excited. The technology enables a very crude sort of mind reading. After scanning 129 people's brains as they did eight different mental tasks (such as reading, gambling, or rhyming), neuroscientists were able, with 80 percent accuracy, to predict which of these mental activities people were doing (Poldrack et al., 2009).

To be learning about the neurosciences now is like studying world geography while Magellan was exploring the seas. This truly is the golden age of brain science.

.....
electroencephalogram (EEG) an amplified recording of the waves of electrical activity sweeping across the brain's surface. These waves are measured by electrodes placed on the scalp.

PET (positron emission tomography) scan a visual display of brain activity that detects where a radioactive form of glucose goes while the brain performs a given task.

MRI (magnetic resonance imaging) a technique that uses magnetic fields and radio waves to produce computer-generated images of soft tissue. MRI scans show brain anatomy.

fMRI (functional MRI) a technique for revealing bloodflow and, therefore, brain activity by comparing successive MRI scans. fMRI scans show brain function.

FIGURE 2.12

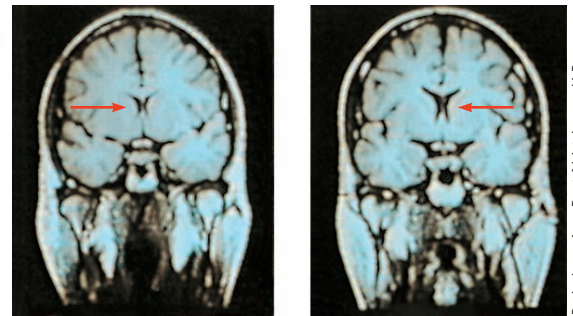
The PET scan To obtain a PET scan, researchers inject volunteers with a low and harmless dose of a short-lived radioactive sugar. Detectors around the person's head pick up the release of gamma rays from the sugar, which has concentrated in active brain areas. A computer then processes and translates these signals into a map of the brain at work.



Mark Harmel/Getty Images

FIGURE 2.13

MRI scan of a healthy individual (left) and a person with schizophrenia (right) Note the enlarged ventricle, the fluid-filled brain region at the tip of the arrow in the image on the right.



Both photos from Daniel Weinberger, M.D., CBDB, NIMH

RETRIEVE IT

- Match the scanning technique with the correct description.

Technique	Description
1. fMRI scan	a. tracks radioactive glucose to reveal brain activity.
2. PET scan	b. tracks successive images of brain tissue to show brain function.
3. MRI scan	c. uses magnetic fields and radio waves to show brain anatomy.

ANSWERS: 1. b, 2. a, 3. c

The Reticular Formation

Inside the brainstem, between your ears, lies the **reticular** (“net-like”) **formation**, a finger-shaped network of neurons extending from the spinal cord right up through the thalamus. As the spinal cord’s sensory input flows up to the thalamus, some of it travels through the reticular formation, which filters incoming stimuli, relays important information to other brain areas, and controls arousal.

In 1949, Giuseppe Moruzzi and Horace Magoun discovered that electrically stimulating a sleeping cat’s reticular formation almost instantly produced an awake, alert

reticular formation a nerve network that travels through the brainstem and plays an important role in controlling arousal.

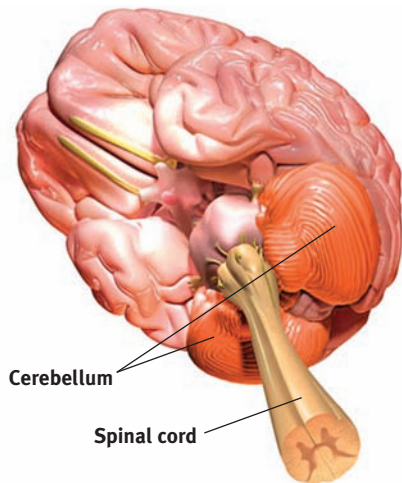


FIGURE 2.14
The brain's organ of agility Hanging at the back of the brain, the cerebellum coordinates our voluntary movements.



animal. When Magoun *severed* a cat's reticular formation without damaging nearby sensory pathways, the effect was equally dramatic: The cat lapsed into a coma from which it never awakened.

The Cerebellum

Extending from the rear of the brainstem is the baseball-sized **cerebellum**, meaning “little brain,” which is what its two wrinkled halves resemble (**FIGURE 2.14**). As you will see in Chapter 8, the cerebellum enables nonverbal learning and memory. It also helps us judge time, modulate our emotions, and discriminate sounds and textures (Bower & Parsons, 2003). And it coordinates voluntary movement. When a soccer player executes a perfect bicycle kick, give his cerebellum some credit. Under alcohol's influence on the cerebellum, coordination suffers. And if you injured your cerebellum, you would have difficulty walking, keeping your balance, or shaking hands. Your movements would be jerky and exaggerated. Gone would be any dreams of being a dancer or guitarist.

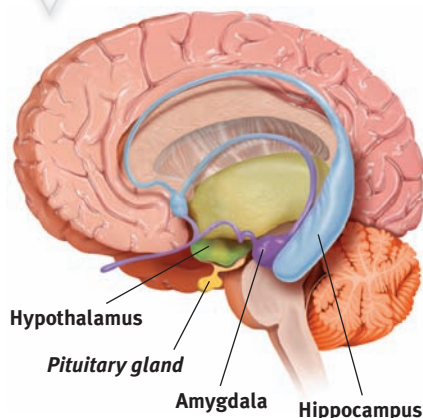
Note: These older brain functions all occur without any conscious effort. This illustrates another of our recurring themes: *Our brain processes most information outside of our awareness.* We are aware of the *results* of our brain's labor (say, our current visual experience) but not of *how* we construct the visual image. Likewise, whether we are asleep or awake, our brainstem manages its life-sustaining functions, freeing our newer brain regions to think, talk, dream, or savor a memory.

RETRIEVE IT

- In what brain region would damage be most likely to (1) disrupt your ability to skip rope? (2) disrupt your ability to hear and taste? (3) perhaps leave you in a coma? (4) cut off the very breath and heartbeat of life?

ANSWERS: 1. cerebellum, 2. thalamus, 3. reticular formation, 4. medulla

FIGURE 2.15
The limbic system This neural system sits between the brain's older parts and its cerebral hemispheres. The limbic system's hypothalamus controls the nearby pituitary gland.



The Limbic System

2-9: What are the limbic system's structures and functions?

We've considered the brain's oldest parts, but we've not yet reached its newest and highest regions, the *cerebral hemispheres* (the two halves of the brain). Between the oldest and newest brain areas lies the **limbic system** (*limbus* means “border”). This system contains the *amygdala*, the *hypothalamus*, and the *hippocampus* (**FIGURE 2.15**). The hippocampus processes conscious memories. Animals or humans who lose their hippocampus to surgery or injury also lose their ability to form new memories of facts and events. Chapter 8 explains how our two-track mind processes our memories. For now, let's look at the limbic system's links to emotions such as fear and anger, and to basic motives such as those for food and sex.

The Amygdala Research has linked the **amygdala**, two lima-bean-sized neural clusters, to aggression and fear. In 1939, psychologist Heinrich Klüver and neurosurgeon Paul Bucy surgically removed a rhesus monkey's amygdala, turning the normally ill-tempered animal into the most mellow of creatures.

What then might happen if we electrically stimulated the amygdala of a normally placid domestic animal, such as a cat? Do so in one spot and the cat prepares to attack,

hissing with its back arched, its pupils dilated, its hair on end. Move the electrode only slightly within the amygdala, cage the cat with a small mouse, and now it cowers in terror.

These and other experiments have confirmed the amygdala's role in rage and fear, including the perception of these emotions and the processing of emotional memories (Anderson & Phelps, 2000; Poremba & Gabriel, 2001). But we must be careful. The brain is not neatly organized into structures that correspond to our behavior categories. When we feel or act in aggressive or fearful ways, there is neural activity in many areas of our brain. Even within the limbic system, stimulating structures other than the amygdala can evoke aggression or fear. If you charge a car's dead battery, you can activate the engine. Yet the battery is merely one link in an integrated system.



Jane Burton/Dorling Kindersley/Getty Images

cerebellum [sehr-uh-BELL-um] the “little brain” at the rear of the brainstem; functions include processing sensory input, coordinating movement output and balance, and enabling nonverbal learning and memory.

limbic system neural system (including the *hippocampus*, *amygdala*, and *hypothalamus*) located below the cerebral hemispheres; associated with emotions and drives.

amygdala [uh-MIG-duh-la] two lima-bean-sized neural clusters in the limbic system; linked to emotion.

hypothalamus [hi-po-THAL-uh-muss] a neural structure lying below (*hypo*) the thalamus; it directs several maintenance activities (eating, drinking, body temperature), helps govern the endocrine system via the pituitary gland, and is linked to emotion and reward.

RETRIEVE IT

- Electrical stimulation of a cat's amygdala provokes angry reactions, suggesting the amygdala's role in aggression. Which ANS division is activated by such stimulation?

ANSWER: The sympathetic nervous system

The Hypothalamus Just below (*hypo*) the thalamus is the **hypothalamus** (FIGURE 2.16), an important link in the command chain governing bodily maintenance. Some neural clusters in the hypothalamus influence hunger; others regulate thirst, body temperature, and sexual behavior. Together, they help maintain a steady (*homeostatic*) internal state.

As the hypothalamus monitors the state of your body, it tunes into your blood chemistry and any incoming orders from other brain parts. For example, picking up signals from your brain's cerebral cortex that you are thinking about sex, your hypothalamus will secrete hormones. These hormones will in turn trigger the adjacent “master gland,” your pituitary (see Figure 2.15), to influence your sex glands to release their hormones. These will intensify the thoughts of sex in your cerebral cortex. (Once again, we see the interplay between the nervous and endocrine systems: The brain influences the endocrine system, which in turn influences the brain.)

A remarkable discovery about the hypothalamus illustrates how progress in science often occurs—when curious, open-minded investigators make an unexpected observation. Two young McGill University neuropsychologists, James Olds and Peter Milner (1954), were trying to implant an electrode in a rat's reticular formation when they made a magnificent mistake: They placed the electrode incorrectly (Olds, 1975). Curiously, as if seeking more stimulation, the rat kept returning to the location where it had been stimulated by this misplaced electrode. On discovering that they had actually placed the device in a region of the hypothalamus, Olds and Milner realized they had stumbled upon a brain center that provides pleasurable rewards (Olds, 1975).

In a meticulous series of experiments, Olds (1958) went on to locate other “pleasure centers,” as he called them. (What the rats actually experience only they know, and they aren't telling. Rather than attribute human feelings to rats, today's scientists refer to *reward centers*, not “pleasure centers.”) When allowed to press pedals to trigger their own stimulation in these areas, rats would sometimes do so at a feverish pace—up to 7000 times per hour—until they dropped from exhaustion. Moreover, to get this stimulation, they would even cross an electrified floor that a starving rat would not cross to reach food (FIGURE 2.17 on the next page).

Researchers later discovered other limbic system reward centers, such as the *nucleus accumbens* in front of the hypothalamus, in many other species, including dolphins and monkeys. In fact, animal research has revealed both a general dopamine-related reward system and specific centers associated with the pleasures of eating, drinking, and sex.

FIGURE 2.16

The hypothalamus This small but important structure, colored yellow/orange in this MRI-scan photograph, helps keep the body's internal environment in a steady state.

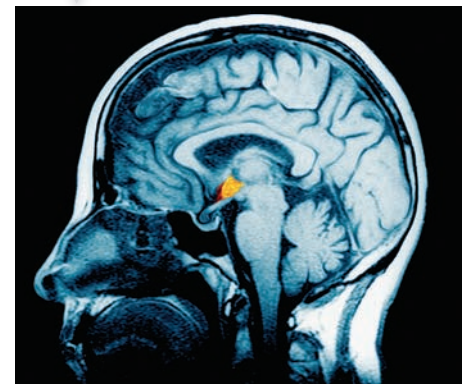
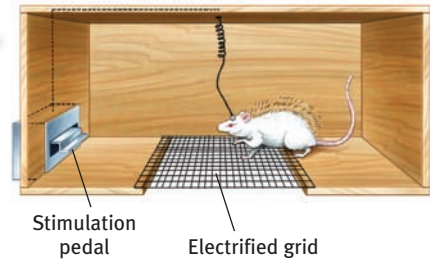


FIGURE 2.17

Rat with an implanted electrode

With an electrode implanted in a reward center of its hypothalamus, the rat readily crosses an electrified grid, accepting the painful shocks, to press a pedal that sends electrical impulses to that center.



“If you were designing a robot vehicle to walk into the future and survive, . . . you’d wire it up so that behavior that ensured the survival of the self or the species—like sex and eating—would be naturally reinforcing.”

Candace Pert (1986)

Animals, it seems, come equipped with built-in systems that reward activities essential to survival.

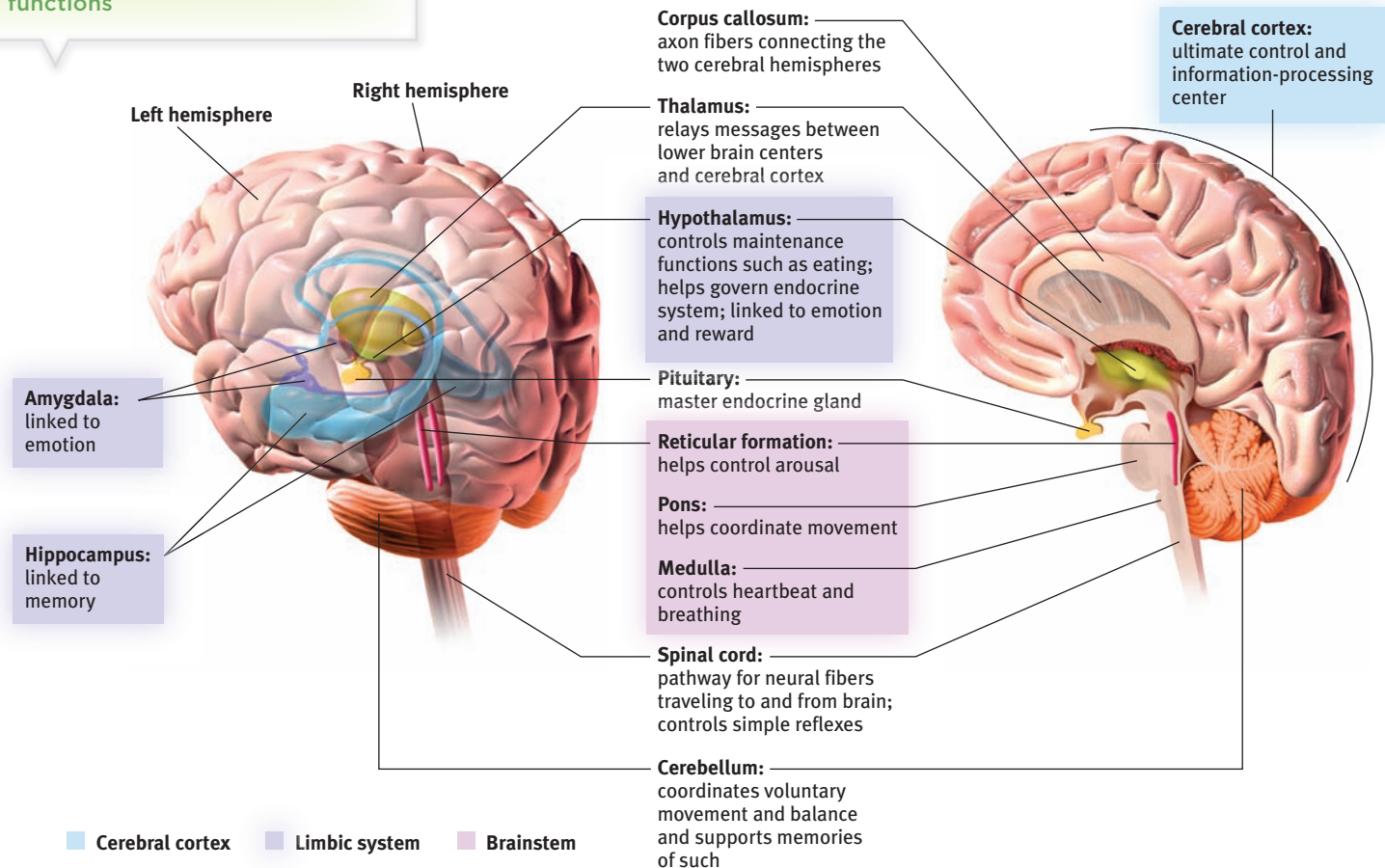
Do humans have limbic centers for pleasure? Indeed we do. To calm violent patients, one neurosurgeon implanted electrodes in such areas. Stimulated patients reported mild pleasure; unlike Olds’ rats, however, they were not driven to a frenzy (Deutsch, 1972; Hooper & Teresi, 1986).

Some researchers believe that addictive disorders, such as alcohol dependence, drug abuse, and binge eating, may stem from malfunctions in natural brain systems for pleasure and well-being. People genetically predisposed to this *reward deficiency syndrome* may crave whatever provides that missing pleasure or relieves negative feelings (Blum et al., 1996).

FIGURE 2.18 locates the brain areas we’ve discussed, as well as the *cerebral cortex*, our next topic.

FIGURE 2.18

Review: Brain structures and their functions



RETRIEVE IT

- What are the three key structures of the limbic system, and what functions do they serve?

ANSWERS: (1) The amygdala is involved in aggression and fear responses. (2) The hypothalamus is involved in bodily maintenance, pleasurable rewards, and control of the hormonal systems. (3) The hippocampus processes memory.

The Cerebral Cortex



2-10: What are the functions of the various cerebral cortex regions?

Older brain networks sustain basic life functions and enable memory, emotions, and basic drives. Newer neural networks within the *cerebrum*—the two cerebral hemispheres contributing 85 percent of the brain’s weight—form specialized work teams that enable our perceiving, thinking, and speaking. Like other structures above the brainstem (including the thalamus, hippocampus, and amygdala), the cerebral hemispheres come as a pair. Covering those hemispheres, like bark on a tree, is the **cerebral cortex**, a thin surface layer of interconnected neural cells. It is your brain’s thinking crown, your body’s ultimate control and information-processing center.

As we move up the ladder of animal life, the cerebral cortex expands, tight genetic controls relax, and the organism’s adaptability increases. Frogs and other small-cortex amphibians operate extensively on preprogrammed genetic instructions. The larger cortex of mammals offers increased capacities for learning and thinking, enabling them to be more adaptable. What makes us distinctively human mostly arises from the complex functions of our cerebral cortex.

RETRIEVE IT

- Which area of the human brain is most similar to that of less complex animals? Which part of the human brain distinguishes us most from less complex animals?

ANSWERS: The brainstem; the cerebral cortex.

cerebral [seh-REE-bruhl] **cortex** the intricate fabric of interconnected neural cells covering the cerebral hemispheres; the body’s ultimate control and information-processing center.

frontal lobes portion of the cerebral cortex lying just behind the forehead; involved in speaking and muscle movements and in making plans and judgments.

parietal [puh-RYE-uh-tuhl] **lobes** portion of the cerebral cortex lying at the top of the head and toward the rear; receives sensory input for touch and body position.

occipital [ahk-SIP-uh-tuhl] **lobes** portion of the cerebral cortex lying at the back of the head; includes areas that receive information from the visual fields.

temporal lobes portion of the cerebral cortex lying roughly above the ears; includes the auditory areas, each receiving information primarily from the opposite ear.

The people who first dissected and labeled the brain used the language of scholars—Latin and Greek. Their words are actually attempts at graphic description: For example, *cortex* means “bark,” *cerebellum* is “little brain,” and *thalamus* is “inner chamber.”

Structure of the Cortex

If you opened a human skull, exposing the brain, you would see a wrinkled organ, shaped somewhat like the meat of an oversized walnut. Without these wrinkles, a flattened cerebral cortex would require triple the area—roughly that of a large pizza. The brain’s ballooning left and right hemispheres are filled mainly with axons connecting the cortex to the brain’s other regions. The cerebral cortex—that thin surface layer—contains some 20 to 23 billion nerve cells and 300 trillion synaptic connections (de Courten-Myers, 2005). Being human takes a lot of nerve.

Each hemisphere’s cortex is subdivided into four *lobes*, separated by prominent *fissures*, or folds (FIGURE 2.19). Starting at the front of your brain and moving over the top, there are the **frontal lobes** (behind your forehead), the **parietal lobes** (at the top and to the rear), and the **occipital lobes** (at the back of your head). Reversing direction and moving forward, just above your ears, you find the **temporal lobes**. Each of the four lobes carries out many functions, and many functions require the interplay of several lobes.

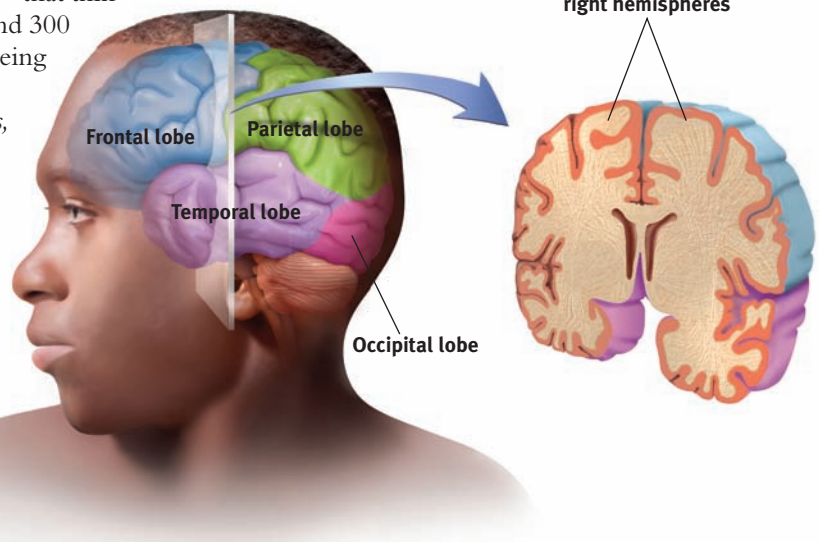


FIGURE 2.19
The cortex and its basic subdivisions

Functions of the Cortex

More than a century ago, surgeons found damaged cortical areas during autopsies of people who had been partially paralyzed or speechless. This rather crude evidence did not prove that specific parts of the cortex control complex functions like movement or speech. After all, if the entire cortex controlled speech and movement, damage to almost any area might produce the same effect. A TV with its power cord cut would go dead, but we would be fooling ourselves if we thought we had “localized” the picture in the cord.

Motor Functions Scientists had better luck in localizing simpler brain functions. For example, in 1870, German physicians Gustav Fritsch and Eduard Hitzig made an important discovery: Mild electrical stimulation to parts of an animal’s cortex made parts of its body move. The effects were selective: Stimulation caused movement only when applied to an arch-shaped region at the back of the frontal lobe, running roughly ear-to-ear across the top of the brain. Moreover, stimulating parts of this region in the left or right hemisphere caused movements of specific body parts on the *opposite* side of the body. Fritsch and Hitzig had discovered what is now called the **motor cortex**.

RETRIEVE IT

- Try moving your right hand in a circular motion, as if polishing a table. Then start your right foot doing the same motion, synchronized with your hand. Now reverse the right foot’s motion, but not the hand’s. Finally, try moving the *left* foot opposite to the right hand.
 1. Why is reversing the right foot’s motion so hard?
 2. Why is it easier to move the left foot opposite to the right hand?

ANSWERS: 1. The right limbs’ opposed activities interfere with each other because both are controlled by the same (left) side of your brain. 2. Opposite sides of your brain control your left and right limbs, so the reversed motion causes less interference.

MAPPING THE MOTOR CORTEX Lucky for brain surgeons and their patients, the brain has no sensory receptors. Knowing this, Otfried Foerster and Wilder Penfield were able to map the motor cortex in hundreds of wide-awake patients by stimulating different cortical areas and observing the body’s responses. They discovered that body areas requiring precise control, such as the fingers and mouth, occupy the greatest amount of cortical space (**FIGURE 2.20**).

In one of his many demonstrations of motor behavior mechanics, Spanish neuroscientist José Delgado stimulated a spot on a patient’s left motor cortex, triggering the right hand to make a fist. Asked to keep the fingers open during the next stimulation, the patient, whose fingers closed despite his best efforts, remarked, “I guess, Doctor, that your electricity is stronger than my will” (Delgado, 1969, p. 114).

More recently, scientists were able to predict a monkey’s arm motion a tenth of a second *before* it moved—by repeatedly measuring motor cortex activity preceding specific arm movements (Gibbs, 1996). Such findings have opened the door to research on brain-controlled computers.

What might happen, some researchers are asking, if we implanted a device to detect motor cortex activity? Could such devices help severely paralyzed people learn to command a cursor to write e-mail or work online? Clinical trials are now under way with people who have suffered paralysis or amputation (Andersen et al., 2010; Nurmikko et al., 2010). The first patient, a paralyzed 25-year-old man, was able to mentally control a TV, draw shapes on a computer screen, and play video games—all thanks to an aspirin-sized chip with 100 microelectrodes recording activity in his motor cortex (Hochberg et al., 2006).

motor cortex an area at the rear of the frontal lobes that controls voluntary movements.

sensory cortex area at the front of the parietal lobes that registers and processes body touch and movement sensations.

Sensory Functions If the motor cortex sends messages out to the body, where does the cortex receive incoming messages? Penfield identified a cortical area—at the front of the parietal lobes, parallel to and just behind the motor cortex—that specializes in receiving information from the skin senses and from the movement of body parts. We

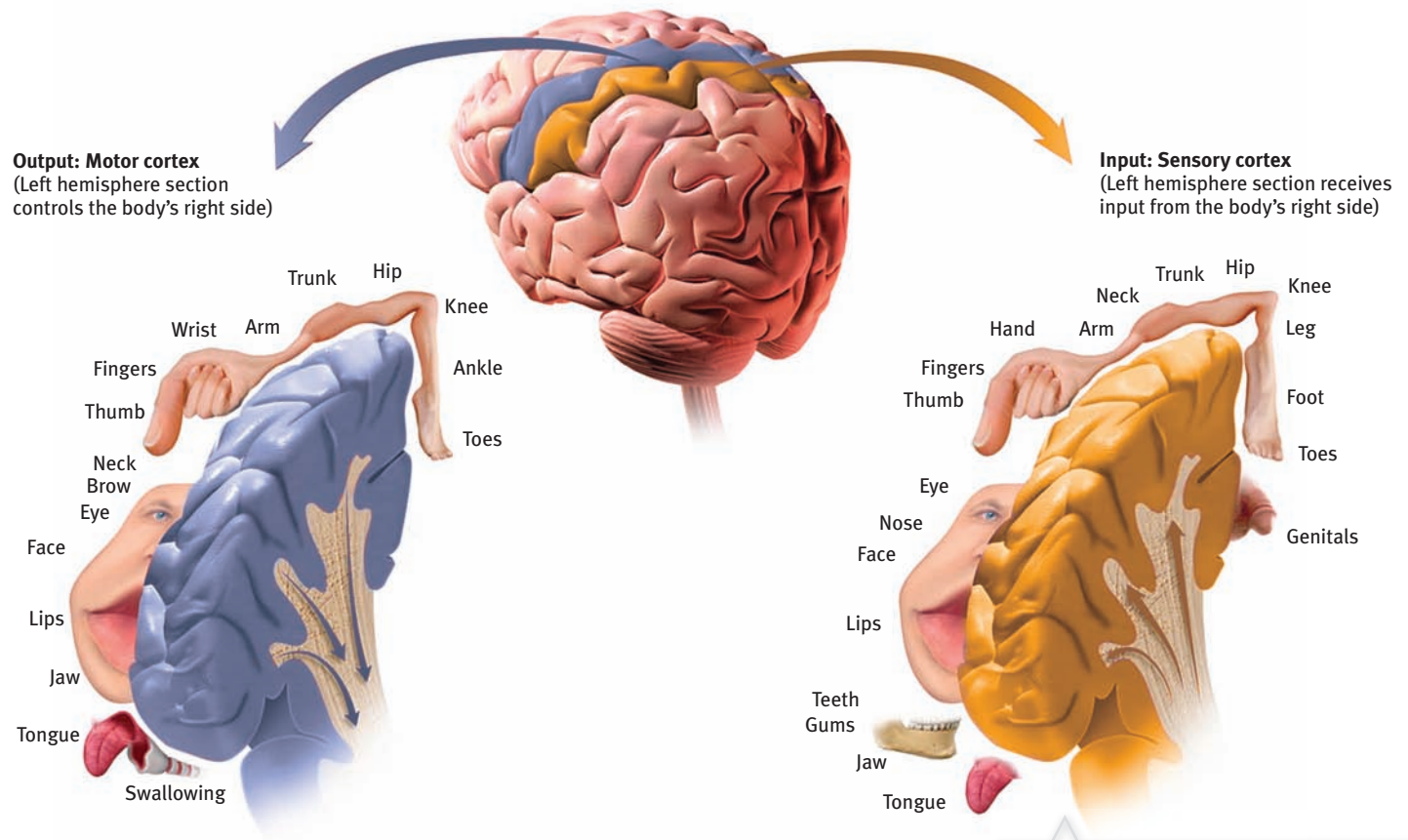


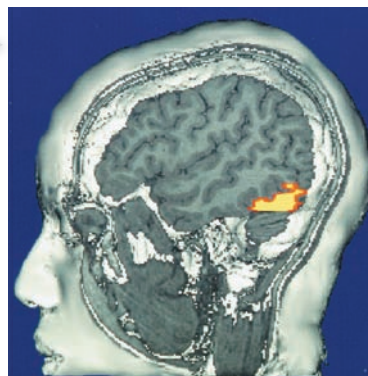
FIGURE 2.20
Left hemisphere tissue devoted to each body part in the motor cortex and the sensory cortex As you can see from this classic though inexact representation, the area devoted to a body part in the motor cortex (in the frontal lobes) or in the sensory cortex (in the parietal lobes) is not proportional to the body part's size. Rather, the brain devotes more tissue to sensitive areas and to areas requiring precise control. Thus, the fingers have a greater representation in the cortex than does the upper arm.

now call this area the **sensory cortex** (Figure 2.20). Stimulate a point on the top of this band of tissue and a person may report being touched on the shoulder; stimulate some point on the side and the person may feel something on the face.

The more sensitive the body region, the larger the sensory cortex area devoted to it (Figure 2.20). Your supersensitive lips project to a larger brain area than do your toes, which is one reason we kiss with our lips rather than touch toes. Rats have a large area of the brain devoted to their whisker sensations, and owls to their hearing sensations.

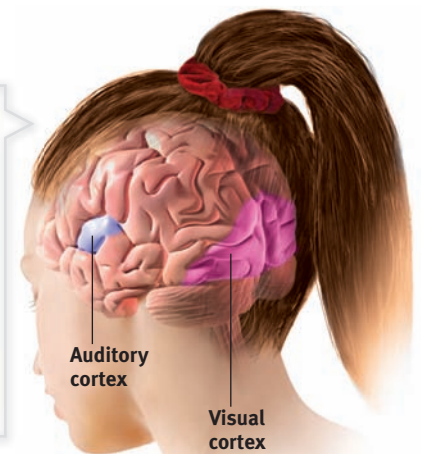
Scientists have identified additional areas where the cortex receives input from senses other than touch. At this moment, you are receiving visual information in the visual cortex in your occipital lobes, at the back of your brain (FIGURES 2.21 and 2.22). Stimulated in the occipital lobes, you might see flashes of light or dashes of color. (In a sense, we *do* have eyes in the back of our head!) A friend of mine, having lost much of his right occipital lobe to a tumor removal, is now blind to the left half of his field of vision. Visual information travels from the occipital lobes to other areas that specialize in tasks such as identifying words, detecting emotions, and recognizing faces.

FIGURE 2.21
The brain in action This fMRI (functional MRI) scan shows the visual cortex in the occipital lobes activated (color representation of increased bloodflow) as a research participant looks at a photo. When the person stops looking, the region instantly calms down.



Courtesy of V. P. Clark, K. Keili, J. Ma, Maisog, S. Courtney, L. G. Ungerleider, and J. V. Haaxby, National Institute of Mental Health

FIGURE 2.22
The visual cortex and auditory cortex The visual cortex in the occipital lobes at the rear of your brain receives input from your eyes. The auditory cortex, in your temporal lobes—above your ears—receives information from your ears.



association areas areas of the cerebral cortex that are not involved in primary motor or sensory functions; rather, they are involved in higher mental functions such as learning, remembering, thinking, and speaking.

Any sound you now hear is processed by your auditory cortex in your temporal lobes (just above your ears; see Figure 2.22). Most of this auditory information travels a circuitous route from one ear to the auditory receiving area above your opposite ear. If stimulated in your auditory cortex, you might hear a sound. MRI scans of people with schizophrenia have revealed active auditory areas in the temporal lobes during auditory hallucinations (Lennox et al., 1999). Even the phantom ringing sound experienced by people with hearing loss is—if heard in one ear—associated with activity in the temporal lobe on the brain’s opposite side (Muhlnickel, 1998).

RETRIEVE IT

- Our brain’s _____ cortex registers and processes body touch and movement sensations. The _____ cortex controls our voluntary movements.

ANSWERS: sensory; motor

Association Areas So far, we have pointed out small cortical areas that either receive sensory input or direct muscular output. Together, these occupy about one-fourth of the human brain’s thin, wrinkled cover. What, then, goes on in the remaining vast regions of the cortex? In these **association areas** (the peach-colored areas in **FIGURE 2.23**), neurons are busy with higher mental functions—many of the tasks that make us human.

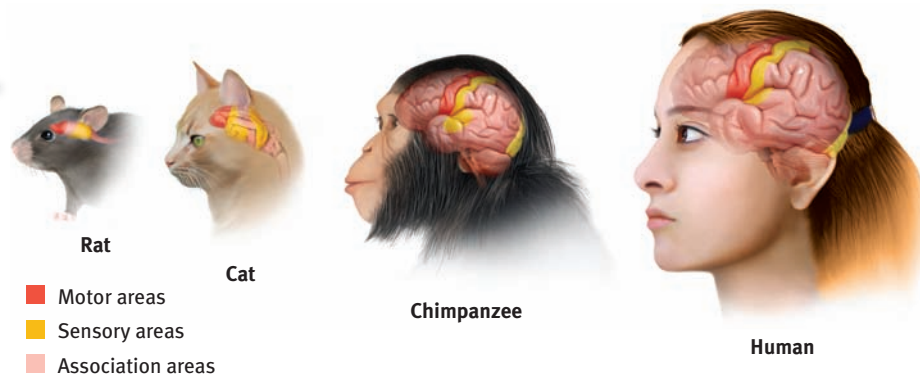
Electrically probing an association area won’t trigger any observable response. So, unlike the sensory and motor areas, association area functions cannot be neatly mapped. Their silence has led to what Donald McBurney (1996, p. 44) called “one of the hardiest weeds in the garden of psychology”: the claim that we ordinarily use only 10 percent of our brain. (If true, wouldn’t this imply a 90 percent chance that a bullet to your brain would land in an unused area?) Surgically lesioned animals and brain-damaged humans bear witness that association areas are not dormant. Rather, these areas interpret, integrate, and act on sensory information and link it with stored memories—a very important part of thinking.

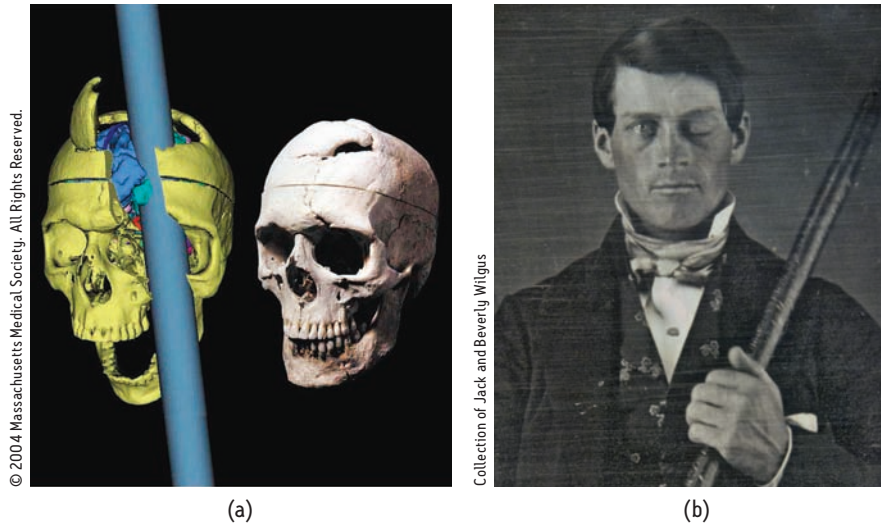
Association areas are found in all four lobes. In the frontal lobes, they enable judgment, planning, and processing of new memories. People with damaged frontal lobes may have intact memories, high scores on intelligence tests, and great cake-baking skills. Yet they would not be able to plan ahead to *begin* baking a cake for a birthday party (Huey et al., 2006).

Frontal lobe damage also can alter personality and remove a person’s inhibitions. Consider the classic case of railroad worker Phineas Gage. One afternoon in 1848, Gage, then 25 years old, was using a tamping iron to pack gunpowder into a rock. A spark ignited the gunpowder, shooting the rod up through his left cheek and out the top of his skull, leaving his frontal lobes massively damaged (**FIGURE 2.24**). To everyone’s amazement, he was immediately able to sit up and speak, and after the wound healed he returned to work. But the affable, soft-spoken man was now irritable, profane, and dishonest. This person, said his friends, was “no longer Gage.” His mental abilities and memories were intact, but his personality was not. (Although Gage lost his railroad job, he did, over time, adapt to his injury and find work as a stage coach driver [Macmillan & Lena, 2010].)

FIGURE 2.23

Areas of the cortex in four mammals More intelligent animals have increased “uncommitted” or association areas of the cortex. These vast areas of the brain are responsible for interpreting, integrating, and acting on sensory information and linking it with stored memories.



**FIGURE 2.24**

A blast from the past (a) Phineas Gage's skull was kept as a medical record. Using measurements and modern neuroimaging techniques, researchers have reconstructed the probable path of the rod through Gage's brain (Damasio et al., 1994). (b) This recently discovered photo shows Gage after his accident. The image has been reversed to show the features correctly. (Early photos, such as this one, were actually mirror images.)

More recent studies of people with damaged frontal lobes have revealed similar impairments. Not only may they become less inhibited (without the frontal lobe brakes on their impulses), but their moral judgments seem unrestrained by normal emotions. Would you advocate pushing one person in front of a runaway boxcar to save five others? Most people do not, but those with damage to a brain area behind the eyes often do (Koenigs et al., 2007). With their frontal lobes ruptured, people's moral compass seems to disconnect from their behavior.

Association areas also perform other mental functions. The parietal lobes, parts of which were large and unusually shaped in Einstein's normal-weight brain, enable mathematical and spatial reasoning (Witelson et al., 1999).

On the underside of the right temporal lobe, another association area enables us to recognize faces. If a stroke or head injury destroyed this area of your brain, you would still be able to describe facial features and to recognize someone's gender and approximate age, yet be strangely unable to identify the person as, say, Lady Gaga, or even your grandmother.

Nevertheless, complex mental functions don't reside in any one place. There is no one spot in a rat's small association cortex that, when damaged, will obliterate its ability to learn or remember a maze. And as we'll see in Chapter 9, distinct neural networks in the human brain coordinate to enable language. Memory, language, and attention result from the synchronized activity among distinct brain areas (Knight, 2007). Ditto for religious experience. More than 40 distinct brain regions become active in different religious states, such as prayer and meditation, indicating that there is no simple "God spot" (Fingelkurts & Fingelkurts, 2009). *The point to remember:* Our mental experiences arise from coordinated brain activity.

RETRIEVE IT

- Why are association areas important?

ANSWER: Association areas are involved in higher mental functions—interpreting, integrating, and acting on information processed in other areas.

The Brain's Plasticity

2-11: To what extent can a damaged brain reorganize itself, and what is neurogenesis?

Our brains are sculpted not only by our genes but also by our experiences. In Chapter 4, we'll focus more on how experience molds the brain. For now, let's turn to another aspect of the brain's **plasticity**: its ability to modify itself after damage.

plasticity the brain's ability to change, especially during childhood, by reorganizing after damage or by building new pathways based on experience.

neurogenesis the formation of new neurons.

Some brain-damage effects described earlier can be traced to two hard facts: (1) Severed brain and spinal cord neurons, unlike cut skin, usually do not regenerate. (If your spinal cord were severed, you would probably be permanently paralyzed.) And (2) some brain functions seem preassigned to specific areas. One newborn who suffered damage to temporal lobe facial recognition areas later remained unable to recognize faces (Farah et al., 2000). But there is good news: Some neural tissue can *reorganize* in response to damage. Under the surface of our awareness, the brain is constantly changing, building new pathways as it adjusts to little mishaps and new experiences.

Plasticity may also occur after serious damage, especially in young children (Kolb, 1989; see also **FIGURE 2.25**). The brain's plasticity is good news for those blind or deaf. Blindness or deafness makes unused brain areas available for other uses (Amedi et al., 2005). If a blind person uses one finger to read Braille, the brain area dedicated to that finger expands as the sense of touch invades the visual cortex that normally helps people see (Barinaga, 1992a; Sadato et al., 1996). If magnetic stimulation temporarily "knocks out" the visual cortex, lifelong-blind people make more errors on a *language* task (Amedi et al., 2004). Plasticity also helps explain why some studies have found that deaf people have enhanced peripheral vision (Bosworth & Dobkins, 1999). In deaf people whose native language is sign, the temporal lobe area normally dedicated to hearing waits in vain for stimulation. Finally, it looks for other signals to process, such as those from the visual system.

Similar reassignment may occur when disease or damage frees up other brain areas normally dedicated to specific functions. If a slow-growing left hemisphere tumor disrupts language (which resides mostly in the left hemisphere), the right hemisphere may compensate (Thiel et al., 2006). If a finger is amputated, the sensory cortex that received its input will begin to receive input from the adjacent fingers, which then become more sensitive (Fox, 1984). So what do you suppose was the sexual intercourse experience of one patient whose lower leg had been amputated? "I actually experience my orgasm in my foot. [Note that in Figure 2.20, the toes region is adjacent to the genitals.] And there it's much bigger than it used to be because it's no longer just confined to my genitals" (Ramachandran & Blakeslee, 1998, p. 36).

Although the brain often attempts self-repair by reorganizing existing tissue, it sometimes attempts to mend itself by producing new brain cells. This process, known as **neurogenesis**, has been found in adult mice, birds, monkeys, and humans (Jessberger et al., 2008). These baby neurons originate deep in the brain and may then migrate elsewhere and form connections with neighboring neurons (Aimone et al., 2010; Gould, 2007).

Master stem cells that can develop into any type of brain cell have also been discovered in the human embryo. If mass-produced in a lab and injected into a damaged brain, might neural stem cells turn themselves into replacements for lost brain cells? Might surgeons someday be able to rebuild damaged brains, much as landscapers reseed damaged lawns? Might new drugs spur the production of new nerve cells? Stay tuned. Today's biotech companies are hard at work on such possibilities. In the meantime, we can all benefit from other natural promoters of neurogenesis, such as exercise, sleep, and nonstressful but stimulating environments (Iso et al., 2007; Pereira et al., 2007; Stranahan et al., 2006).

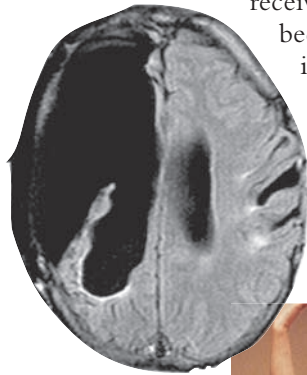


FIGURE 2.25

Brain plasticity This 6-year-old had surgery to end her life-threatening seizures. Although most of an entire hemisphere was removed (see MRI of hemispherectomy above), her remaining hemisphere compensated by putting other areas to work. One Johns Hopkins medical team reflected on the child hemispherectomies they had performed. Although use of the opposite arm was compromised, the team reported being "awed" by how well the children had retained their memory, personality, and humor (Vining et al., 1997). The younger the child, the greater the chance that the remaining hemisphere can take over the functions of the one that was surgically removed (Choi, 2008).



Joe McNally/ Joe McNally Photography

Our Divided Brain



2-12: What do split brains reveal about the functions of our two brain hemispheres?

We have seen that our brain's look-alike left and right hemispheres serve differing functions. This *lateralization* is apparent after brain damage. Research spanning more than a century has shown that left hemisphere accidents, strokes, and tumors can impair reading, writing, speaking, arithmetic reasoning, and understanding. Similar right hemisphere lesions seldom have such dramatic effects.

Does this mean that the right hemisphere is just along for the ride—a silent, “subordinate” or “minor” hemisphere? Many believed this was the case until 1960, when a fascinating chapter in psychology's history began to unfold: Researchers found that the “minor” right hemisphere was not so limited after all.

Splitting the Brain

In 1961, two Los Angeles neurosurgeons, Philip Vogel and Joseph Bogen, speculated that major epileptic seizures were caused by an amplification of abnormal brain activity bouncing back and forth between the two cerebral hemispheres. If so, they wondered, could they put an end to this biological tennis game by severing the **corpus callosum**, the wide band of axon fibers connecting the two hemispheres and carrying messages between them (**FIGURE 2.26**)? Vogel and Bogen knew that psychologists Roger Sperry, Ronald Myers, and Michael Gazzaniga had divided cats' and monkeys' brains in this manner, with no serious ill effects.

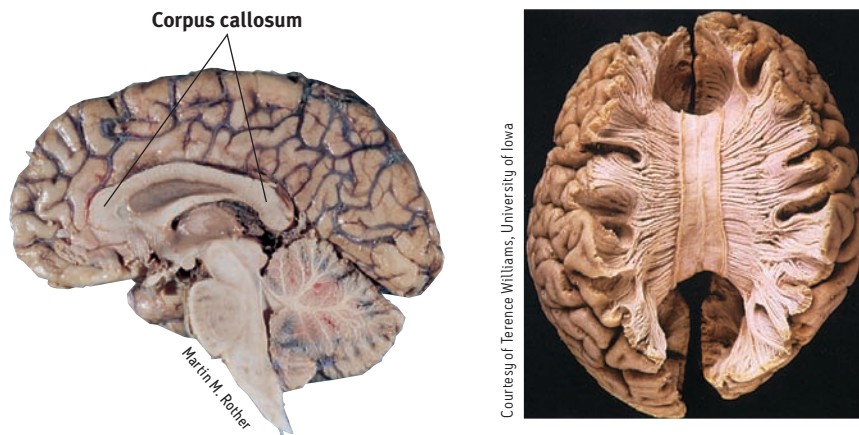


FIGURE 2.26

The corpus callosum This large band of neural fibers connects the two brain hemispheres. To photograph the half brain shown at left, a surgeon separated the hemispheres by cutting through the corpus callosum and lower brain regions. In the view on the right, brain tissue has been cut back to expose the corpus callosum and bundles of fibers coming out from it.

So the surgeons operated. The result? The seizures all but disappeared. The patients with these **split brains** were surprisingly normal, their personality and intellect hardly affected. Waking from surgery, one even joked that he had a “splitting headache” (Gazzaniga, 1967). By sharing their experiences, these patients have greatly expanded our understanding of interactions between the intact brain's two hemispheres.

To appreciate these findings, we need to focus for a minute on the peculiar nature of our visual wiring, illustrated in **FIGURE 2.27** on the next page. Note that each eye receives sensory information from both the right and left visual fields. In each eye, information from the left half of your field of vision goes to your right hemisphere, and information from the right half of your visual field goes to your left hemisphere, which usually controls speech. Data received by either hemisphere are quickly transmitted to the other across the corpus callosum. In a person with a severed corpus callosum, this information sharing does not take place.

corpus callosum [KOR-pus kah-LOW-sum] the large band of neural fibers connecting the two brain hemispheres and carrying messages between them.

split brain a condition resulting from surgery that isolates the brain's two hemispheres by cutting the fibers (mainly those of the corpus callosum) connecting them.

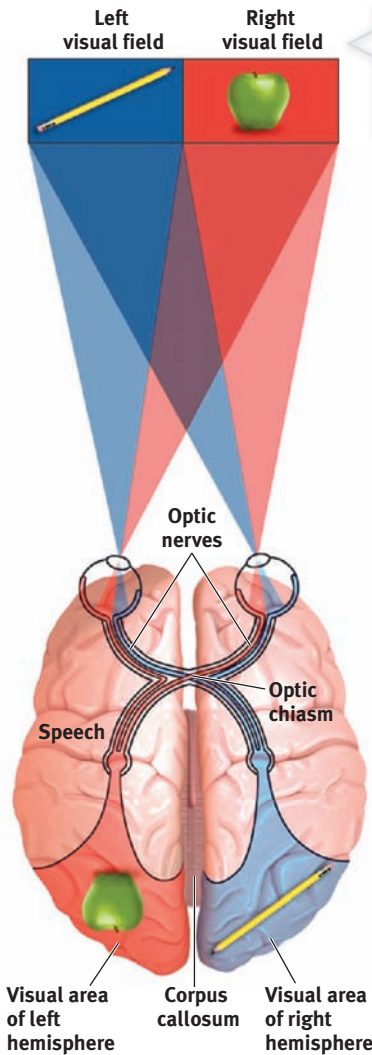


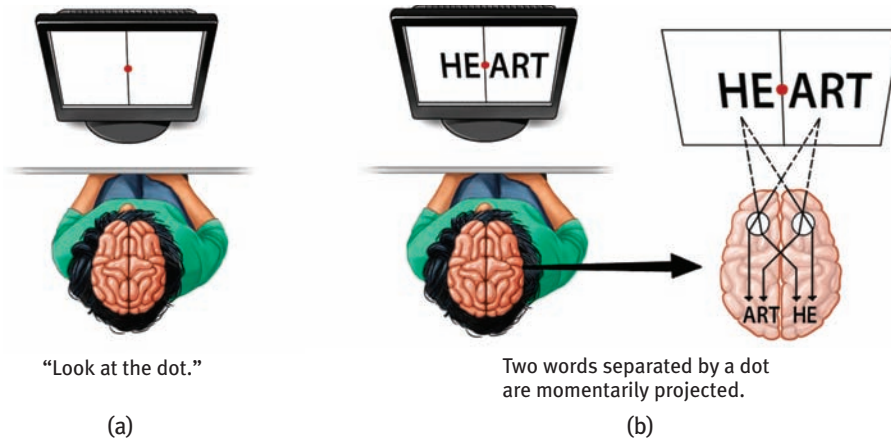
FIGURE 2.27
The information highway from eye to brain

Knowing these facts, Sperry and Gazzaniga could send information to a patient's left or right hemisphere. As the person stared at a spot, they flashed a stimulus to its right or left. They could do this with you, too, but in your intact brain, the hemisphere receiving the information would instantly pass the news to the other side. Because the split-brain surgery had cut the communication lines between the hemispheres, the researchers could, with these patients, quiz each hemisphere separately.

In an early experiment, Gazzaniga (1967) asked these people to stare at a dot as he flashed HE·ART on a screen (FIGURE 2.28). Thus, HE appeared in their left visual field (which transmits to the right hemisphere) and ART in the right field (which transmits to the left hemisphere). When he then asked them to say what they had seen, the patients reported that they had seen ART. But when asked to point to the word they had seen, they were startled when their left hand (controlled by the right hemisphere) pointed to HE. Given an opportunity to express itself, each hemisphere indicated what it had seen. The right hemisphere (controlling the left hand) intuitively knew what it could not verbally report.

When a picture of a spoon was flashed to their right hemisphere, the patients could not say what they had viewed. But when asked to identify what they had viewed by feeling an assortment of hidden objects with their left hand, they readily selected the spoon. If the experimenter said, "Correct!" the patient might reply, "What? Correct? How could I possibly pick out the correct object when I don't know what I saw?" It is, of course, the left hemisphere doing the talking here, bewildered by what the nonverbal right hemisphere knows.

A few people who have had split-brain surgery have been for a time bothered by the unruly independence of their left hand, which might unbutton a shirt while the right hand buttoned it, or put grocery store items back on the shelf after the right hand put

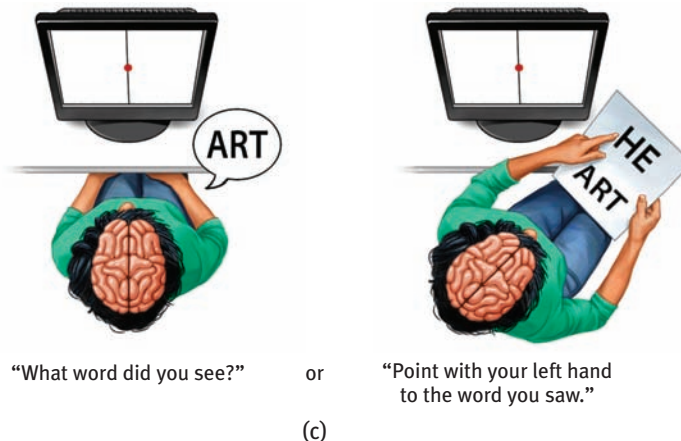


"Do not let your left hand know what your right hand is doing."

Matthew 6:3

FIGURE 2.28

Testing the divided brain When an experimenter flashes the word HEART across the visual field, a woman with a split brain verbally reports seeing the portion of the word transmitted to her left hemisphere. However, if asked to indicate with her left hand what she saw, she points to the portion of the word transmitted to her right hemisphere. (From Gazzaniga, 1983.)



them in the cart. It was as if each hemisphere was thinking “I’ve half a mind to wear my green (blue) shirt today.” Indeed, said Sperry (1964), split-brain surgery leaves people “with two separate minds.” With a split brain, both hemispheres can comprehend and follow an instruction to copy—*simultaneously*—different figures with the left and right hands (Franz et al., 2000; see also **FIGURE 2.29**). (Reading these reports, I fantasize a patient enjoying a solitary game of “rock, paper, scissors”—left versus right hand.)

When the “two minds” are at odds, the left hemisphere does mental gymnastics to rationalize reactions it does not understand. If a patient follows an order (“Walk”) sent to the right hemisphere, a strange thing happens. The left hemisphere, unaware of the order, doesn’t know why the patient begins walking. If asked why, the patient doesn’t reply, “I don’t know.” Instead, the left hemisphere improvises—“I’m going into the house to get a Coke.” Gazzaniga (1988), who considers these patients “the most fascinating people on earth,” concluded that the conscious left hemisphere is an “interpreter” or press agent that instantly constructs theories to explain our behavior.

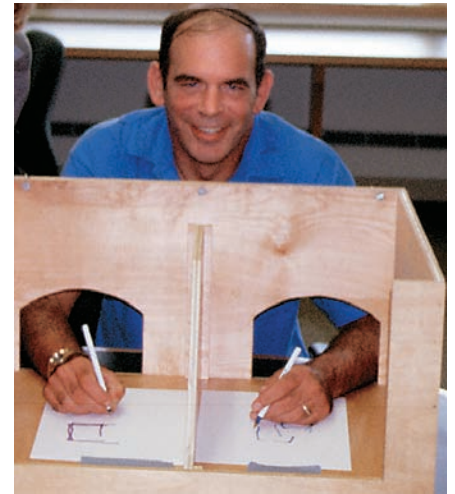
RETRIEVE IT

- (1) If we flash a red light to the right hemisphere of a person with a split brain, and flash a green light to the left hemisphere, will each observe its own color? (2) Will the person be aware that the colors differ? (3) What will the person verbally report seeing?

ANSWERS: 1. yes, 2. no, 3. green

FIGURE 2.29

Try this! Joe, who has had split-brain surgery, can simultaneously draw two different shapes.



BBC

Right-Left Differences in the Intact Brain

So, what about the 99.99+ percent of us with undivided brains? Does each of *our* hemispheres also perform distinct functions? Several different types of studies indicate they do. When a person performs a *perceptual* task, for example, brain waves, bloodflow, and glucose consumption reveal increased activity in the *right* hemisphere. When the person speaks or calculates, activity increases in the *left* hemisphere.

A dramatic demonstration of hemispheric specialization happens before some types of brain surgery. To locate the patient’s language centers, the surgeon injects a sedative into the neck artery feeding blood to the left hemisphere, which usually controls speech. Before the injection, the patient is lying down, arms in the air, chatting with the doctor. Can you predict what probably happens when the drug puts the left hemisphere to sleep? Within seconds, the person’s right arm falls limp. If the left hemisphere is controlling language, the patient will be speechless until the drug wears off. If the drug is injected into the artery to the right hemisphere, the *left* arm will fall limp, but the person will still be able to speak.

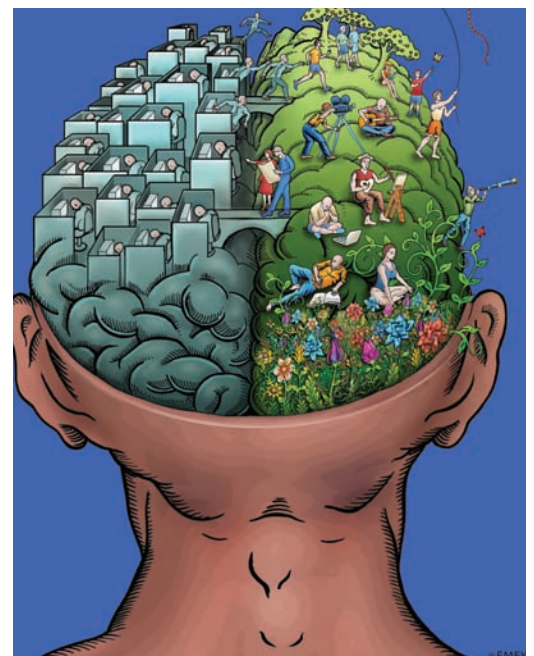
To the brain, language is language, whether spoken or signed. Just as hearing people usually use the left hemisphere to process spoken language, deaf people use the left hemisphere to process sign language (Corina et al., 1992; Hickok et al., 2001). Thus, a left hemisphere stroke disrupts a deaf person’s signing, much as it would disrupt a hearing person’s speaking. The same brain area is involved in both (Corina, 1998). (For more on how the brain enables language, see Chapter 9.)

Although the left hemisphere is adept at making quick, literal interpretations of language, the right hemisphere *helps us modulate our speech* to make meaning clear—as when we ask “What’s that in the road ahead?” instead of “What’s that in the road, a head?” (Heller, 1990). The right hemisphere also *helps orchestrate our self-awareness*. People who suffer partial paralysis will sometimes obstinately deny their impairment—strangely claiming they can move a paralyzed limb—if the damage is to the right hemisphere (Berti et al., 2005).

Simply looking at the two hemispheres, so alike to the naked eye, who would suppose they contribute uniquely to the harmony of the whole? Yet a variety of observations—of people with split brains, of people with normal brains, and even of other species’ brains—converge beautifully, leaving little doubt that we have unified brains with specialized parts (Hopkins & Cantalupo 2008; MacNeilage et al., 2009).

Pop psychology’s idea of hemispheric specialization

Alas, reality is more complex.



© Emek

How does the brain's intricate networking emerge? How does our heredity—the legacy of our ancestral history—conspire with our experiences to organize and “wire” the brain? To that we turn next.

Behavior Genetics: Predicting Individual Differences



2-13: What are genes, and how do behavior geneticists explain our individual differences?

Our shared brain architecture predisposes some common behavioral tendencies. Whether we live in the Arctic or the tropics, we sense the world, develop language, and feel hunger through identical mechanisms. We prefer sweet tastes to sour. We divide the color spectrum into similar colors. And we feel drawn to behaviors that produce and protect offspring.

Our human family shares not only a common biological heritage—cut us and we bleed—but also common social behaviors. Whether named Wong, Nkomo, Smith, or Gonzales, we start fearing strangers at about eight months, and as adults we prefer the company of those with attitudes and attributes similar to our own. As members of one species, we affiliate, conform, return favors, punish offenses, organize hierarchies of status, and grieve a child's death. A visitor from outer space could drop in anywhere and find humans dancing and feasting, singing and worshiping, playing sports and games, laughing and crying, living in families and forming groups. We are the leaves of one tree.

But in important ways, we also are each unique. We look different. We sound different. We have varying personalities, interests, and cultural and family backgrounds. What causes our striking diversity? How much of it is shaped by our differing genes, and how much by our **environment**—by every external influence, from maternal nutrition while in the womb to social support while nearing the tomb? How does our heredity interact with our experiences to create both our universal human nature and our individual and social diversity? Such questions intrigue **behavior geneticists**.

Genes: Our Codes for Life

Barely more than a century ago, few would have guessed that every cell nucleus in your body contains the genetic master code for your entire body. It's as if every room in Dubai's Burj Khalifa (the world's tallest building) contained a book detailing the architect's plans for the entire structure. The plans for your own book of life run to 46 chapters—23 donated by your mother's egg and 23 by your father's sperm. Each of these 46 chapters, called a **chromosome**, is composed of a coiled chain of the molecule **DNA** (*deoxyribonucleic acid*). **Genes**, small segments of the giant DNA molecules, form the words of those chapters (**FIGURE 2.30**). All told, you have 20,000 to 25,000 gene words, which can be either active (*expressed*) or inactive. Environmental events “turn on” genes, rather like hot water enabling a tea bag to express its flavor. When turned on, genes provide the code for creating *protein molecules*, our body's building blocks.

Geneticists and psychologists are interested in the occasional variations found at particular gene sites in human DNA. Slight person-to-person variations from the common pattern give clues to our uniqueness—why one person has a disease that another does not, why one person is short and another tall, why one is outgoing and another shy.

Most of our traits are influenced by many genes. How tall you are, for example, reflects the size of your face, vertebrae, leg bones, and so forth—each of which may be influenced by different genes interacting with your specific environment. Complex traits such as intelligence, happiness, and aggressiveness are similarly influenced by groups of genes. Thus our genetic predispositions—our genetically influenced traits—help explain both our shared human nature and our human diversity.



Courtesy of Kevin Feyen

The nurture of nature Parents everywhere wonder: Will my baby grow up to be peaceful or aggressive? Homely or attractive? Successful or struggling at every step? What comes built in, and what is nurtured—and how? Research reveals that nature and nurture together shape our development—every step of the way.

“Your DNA and mine are 99.9 percent the same. . . . At the DNA level, we are clearly all part of one big worldwide family.”

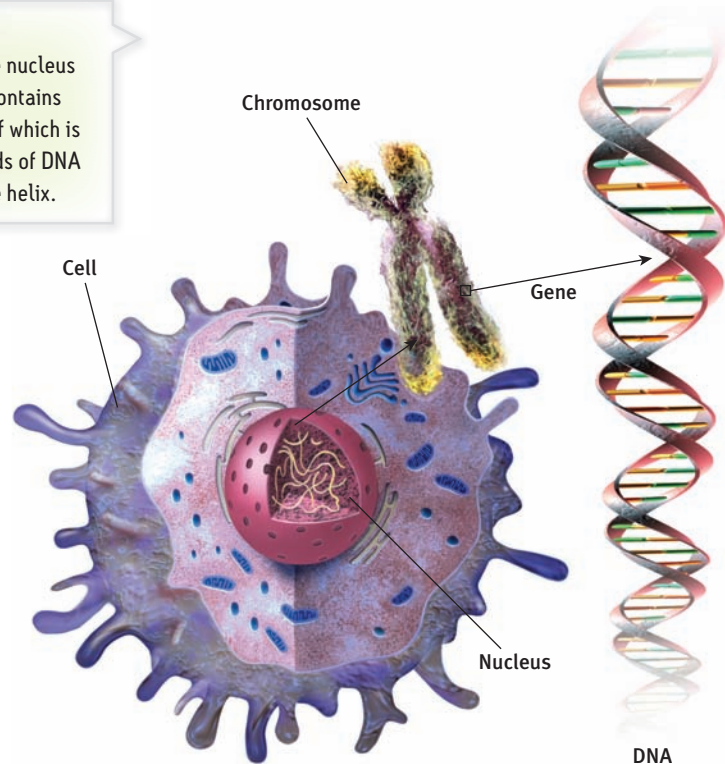
Francis Collins, Human Genome Project director, 2007

“We share half our genes with the banana.”

Evolutionary biologist Robert May, president of Britain's Royal Society, 2001

FIGURE 2.30

The life code The nucleus of every human cell contains chromosomes, each of which is made up of two strands of DNA connected in a double helix.



environment every nongenetic influence, from prenatal nutrition to the people and things around us.

behavior genetics the study of the relative power and limits of genetic and environmental influences on behavior.

chromosomes threadlike structures made of DNA molecules that contain the genes.

DNA (deoxyribonucleic acid) a complex molecule containing the genetic information that makes up the chromosomes.

genes the biochemical units of heredity that make up the chromosomes; segments of DNA capable of synthesizing proteins.

identical twins twins who develop from a single (monozygotic) fertilized egg that splits in two, creating two genetically identical organisms.

fraternal twins twins who develop from separate (dizygotic) fertilized eggs. They are genetically no closer than ordinary brothers and sisters, but they share a fetal environment.

RETRIEVE IT

- Put the following cell structures in order from *smallest to largest*: nucleus, gene, chromosome.

ANSWER: gene, chromosome, nucleus

- When the mother's egg and the father's sperm unite, each contributes 23 _____.

ANSWER: chromosomes

Twin and Adoption Studies

To scientifically tease apart the influences of environment and heredity, behavior geneticists would need to design two types of experiments. The first would control the home environment while varying heredity. The second would control heredity while varying the home environment. Such experiments with human infants would be unethical, but happily for our purposes, nature has done this work for us.

Identical Versus Fraternal Twins

Identical twins develop from a single (*monozygotic*) fertilized egg that splits in two. Thus they are *genetically* identical—nature's own human clones (**FIGURE 2.31** on the next page). Indeed, they are clones who share not only the same genes but the same conception and uterus, and usually the same birth date and cultural history.

Fraternal twins develop from separate (*dizygotic*) fertilized eggs. As womb-mates, they share a fetal environment, but they are genetically no more similar than ordinary brothers and sisters.

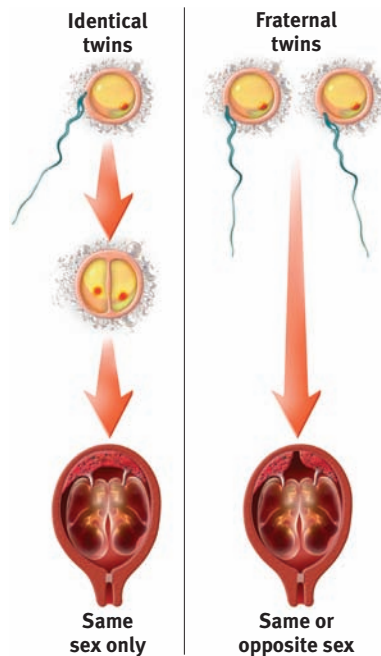
Shared genes can translate into shared experiences. A person whose identical twin has Alzheimer's disease, for example, has a 60 percent risk of getting the disease; if the affected twin is fraternal, the risk is 30 percent (Plomin et al., 1997). To study the effects of genes and



"Thanks for almost everything, Dad."

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FIGURE 2.31
Same fertilized egg, same genes; different eggs, different genes Identical twins develop from a single fertilized egg, fraternal twins from two.



Twins Curiously, twinning rates vary by race. The rate among Caucasians is roughly twice that of Asians and half that of Africans. In Africa and Asia, most twins are identical. In Western countries, most twins are fraternal, and fraternal twins have increased with the use of fertility drugs (Hall, 2003; Steinhauer, 1999).

environments, hundreds of researchers have studied some 800,000 identical and fraternal twin pairs (Johnson et al., 2009).

Are identical twins, being genetic clones of each other, also behaviorally more similar than fraternal twins? Studies of thousands of twin pairs in Sweden, Finland, and Australia have found that on the personality traits of extraversion (outgoingness) and neuroticism (emotional instability), identical twins are much more similar than fraternal twins.

Identical twins, more than fraternal twins, also report being treated alike. So, do their experiences rather than their genes account for their similarity? *No*. Studies have shown that identical twins whose parents treated them alike were not psychologically more alike than identical twins who were treated less similarly (Loehlin & Nichols, 1976). In explaining individual differences, genes matter.



Sweden has the world's largest national twin registry—140,000 living and dead twin pairs—which forms part of a massive registry of 600,000 twins currently being sampled in the world's largest twin study (Wheelwright, 2004; www.genomeutwin.org).

Twins Lorraine and Levinia Christmas, driving to deliver Christmas presents to each other near Flitcham, England, collided (Shepherd, 1997).

Separated Twins

Imagine the following science fiction experiment: A mad scientist decides to separate identical twins at birth, then rear them in differing environments. Better yet, consider a *true* story:

On a chilly February morning in 1979, some time after divorcing his first wife, Linda, Jim Lewis awoke in his modest home next to his second wife, Betty. Determined that this marriage would work, Jim made a habit of leaving love notes to Betty around the house. As he lay in bed he thought about others he had loved, including his son, James Alan, and his faithful dog, Toy.

Jim was looking forward to spending part of the day in his basement woodworking shop, where he had put in many happy hours building furniture, picture frames, and other items, including a white bench now circling a tree in his front yard. Jim also liked to spend free time driving his Chevy, watching stock-car racing, and drinking Miller Lite beer.

Jim was basically healthy, except for occasional half-day migraine headaches and blood pressure that was a little high, perhaps related to his chain-smoking habit. He had become overweight a while back but had shed some of the pounds. Having undergone a vasectomy, he was done having children.

What was extraordinary about Jim Lewis, however, was that at that same moment (I am not making this up) there existed another man—also named Jim—for whom

all these things (right down to the dog's name) were also true.² This other Jim—Jim Springer—just happened, 38 years earlier, to have been his fetal partner. Thirty-seven days after their birth, these genetically identical twins were separated, adopted by blue-collar families, and reared with no contact or knowledge of each other's whereabouts until the day Jim Lewis received a call from his genetic clone (who, having been told he had a twin, set out to find him).

One month later, the brothers became the first twin pair tested by University of Minnesota psychologist Thomas Bouchard and his colleagues, beginning a study of separated twins that extends to the present (Holden, 1980a,b; Wright, 1998). Their voice intonations and inflections were so similar that, hearing a playback of an earlier interview, Jim Springer guessed "That's me." Wrong—it was his brother. Given tests measuring their personality, intelligence, heart rate, and brain waves, the Jim twins—despite 38 years of separation—were virtually as alike as the same person tested twice. Both married women named Dorothy Jane Scheckelburger. Okay, the last item is a joke. But as Judith Rich Harris (2006) has noted, it would hardly be weirder than some other reported similarities.

Aided by publicity in magazine and newspaper stories, Bouchard (2009) and his colleagues located and studied 74 pairs of identical twins reared apart. They continued to find similarities not only of tastes and physical attributes but also of personality (characteristic patterns of thinking, feeling, and acting), abilities, attitudes, interests, and even fears.

In Sweden, Nancy Pedersen and her co-workers (1988) identified 99 separated identical twin pairs and more than 200 separated fraternal twin pairs. Compared with equivalent samples of identical twins reared together, the separated identical twins had somewhat less identical personalities. Still, separated twins were more alike if genetically identical than if fraternal. And separation shortly after birth (rather than, say, at age 8) did not amplify their personality differences.

Stories of startling twin similarities have not impressed Bouchard's critics. "The plural of *anecdote* is not *data*," they have pointed out, noting that if any two strangers were to spend hours comparing their behaviors and life histories, they would probably discover many coincidental similarities. If researchers created a control group of biologically unrelated pairs of the same age, sex, and ethnicity, who had not grown up together but who were as similar to one another in economic and cultural background as are many of the separated twin pairs, wouldn't these pairs also exhibit striking similarities (Joseph, 2001)? Bouchard has replied that separated fraternal twins do not exhibit similarities comparable to those of separated identical twins.

Even the impressive data from personality assessments are clouded by the reunion of many of the separated twins some years before they were tested. Moreover, identical twins share an appearance, and the responses it evokes. Adoption agencies also tend to place separated twins in similar homes. Despite these criticisms, the striking twin-study results helped shift scientific thinking toward a greater appreciation of genetic influences.

If genetic influences help explain individual differences, do they also help explain group differences between men and women, or between people of different races? Not necessarily. Individual differences in height and weight, for example, are highly heritable; yet nutrition (an environmental factor) rather than genetic influences explains why, as a group, today's adults are taller and heavier than those of a century ago. The two groups differ, but not because human genes have changed in a mere century's eyeblink of time. Ditto aggressiveness, a genetically influenced trait. Today's peaceful Scandinavians differ from their more aggressive Viking ancestors, despite carrying many of the same genes.



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Identical twins are people two

Identical twins Jim Lewis and Jim Springer were separated shortly after birth and raised in different homes without awareness of each other. Research has shown remarkable similarities in the life choices of separated identical twins, lending support to the idea that genes influence personality.

"In some domains it looks as though our identical twins reared apart are . . . just as similar as identical twins reared together. Now that's an amazing finding and I can assure you none of us would have expected that degree of similarity."

Thomas Bouchard (1981)

Bouchard's famous twin research was, appropriately enough, conducted in Minneapolis, the "Twin City" (with St. Paul) and home to the Minnesota Twins baseball team.

Coincidences are not unique to twins. Patricia Kern of Colorado was born March 13, 1941, and named Patricia Ann Campbell. Patricia DiBiasi of Oregon also was born March 13, 1941, and named Patricia Ann Campbell. Both had fathers named Robert, worked as bookkeepers, and at the time of this comparison had children ages 21 and 19. Both studied cosmetology, enjoyed oil painting as a hobby, and married military men, within 11 days of each other. They are not genetically related. (From an AP report, May 2, 1983.)

² Actually, this description of the two Jims errs in one respect: Jim Lewis named his son James Alan. Jim Springer named his James Allan.

Biological Versus Adoptive Relatives

For behavior geneticists, nature's second real-life experiment—adoption—creates two groups: *genetic relatives* (biological parents and siblings) and *environmental relatives* (adoptive parents and siblings). For personality or any other given trait, we can therefore ask whether adopted children are more like their biological parents, who contributed their genes, or their adoptive parents, who contribute a home environment. While sharing that home environment, do adopted siblings also come to share traits?

The stunning finding from studies of hundreds of adoptive families is that people who grow up together, whether biologically related or not, do not much resemble one another in personality (McGue & Bouchard, 1998; Plomin, 2011; Rowe, 1990). In personality traits such as extraversion and agreeableness, adoptees are more similar to their biological parents than to their caregiving adoptive parents.

The finding is important enough to bear repeating: *The environment shared by a family's children has virtually no discernible impact on their personalities.* Two adopted children reared in the same home are no more likely to share personality traits with each other than with the child down the block. Heredity shapes other primates' personalities, too. Macaque monkeys raised by foster mothers exhibit social behaviors that resemble their biological, rather than foster, mothers (Maestripieri, 2003). Add all this to the similarity of identical twins, whether they grow up together or apart, and the effect of a shared rearing environment seems shockingly modest.

The genetic leash may limit the family environment's influence on personality, but this does not mean that adoptive parenting is a fruitless venture. Parents do influence their children's attitudes, values, manners, faith, and politics (Reifman & Cleveland, 2007). A pair of adopted children or identical twins *will*, especially during adolescence, have more similar religious beliefs if reared together (Koenig et al., 2005). Parenting matters!

Moreover, in adoptive homes, child neglect and abuse and even parental divorce are rare. (Adoptive parents are carefully screened; natural parents are not.) So it is not surprising that, despite a somewhat greater risk of psychological disorder, most adopted children thrive, especially when adopted as infants (Loehlin et al., 2007; van IJzendoorn & Juffer, 2006; Wierzbicki, 1993). Seven in eight report feeling strongly attached to one or both adoptive parents. As children of self-giving parents, they grow up to be more self-giving and altruistic than average (Sharma et al., 1998). Many score higher than their biological parents on intelligence tests, and most grow into happier and more stable adults. In one Swedish study, children adopted as infants grew up with fewer problems than were experienced by children whose biological mothers initially registered them for adoption but then decided to raise the children themselves (Bohman & Sigvardsson, 1990). Regardless of personality differences between adoptive family members, children benefit from adoption.

"We carry to our graves the essence of the zygote that was first us."

Mary Pipher, *Seeking Peace: Chronicles of the Worst Buddhist in the World, 2009*

The greater uniformity of adoptive homes—mostly healthy, nurturing homes—helps explain the lack of striking differences when comparing child outcomes of different adoptive homes (Stoolmiller, 1999).

Nature or nurture or both? When talent runs in families, as with Wynton Marsalis, Branford Marsalis, and Delfeayo Marsalis, how do heredity and environment together do their work?



AP Photo/Charles Sykes

RETRIEVE IT

- How do researchers use twin and adoption studies to learn about psychological principles?

ANSWER: Researchers compare the traits and behaviors of identical twins (same genes) and fraternal twins (different genes, as in any two siblings). They also compare adopted children with their adoptive and biological parents. Some studies compare twins raised together or separately. These studies help us determine how much variation among individuals is due to genetic makeup and how much to environmental factors.

interaction the interplay that occurs when the effect of one factor (such as environment) depends on another factor (such as heredity).

epigenetics the study of environmental influences on gene expression that occur without a DNA change.

Gene-Environment Interaction



2-14: How do heredity and environment work together?

Among our similarities, the most important—the behavioral hallmark of our species—is our enormous adaptive capacity. Some human traits, such as having two eyes, develop the same in virtually every environment. But other traits are expressed only in particular environments. Go barefoot for a summer and you will develop toughened, callused feet—a biological adaptation to friction. Meanwhile, your shod neighbor will remain a tenderfoot. The difference between the two of you is, of course, an effect of environment. But it is also the product of a biological mechanism—adaptation.

Genes and environment—nature and nurture—work together, like two hands clapping. Genes are self-regulating. Rather than acting as blueprints that lead to the same result no matter the context, genes react. An African butterfly that is green in summer turns brown in fall, thanks to a temperature-controlled genetic switch. The genes that produce brown in one situation produce green in another.

To say that genes and experience are *both* important is true. But more precisely, they **interact**. Imagine two babies, one genetically predisposed to be attractive, sociable, and easygoing, the other less so. Assume further that the first baby attracts more affectionate and stimulating care and so develops into a warmer and more outgoing person. As the two children grow older, the more naturally outgoing child more often seeks activities and friends that encourage further social confidence.

What has caused their resulting personality differences? Neither heredity nor experience acts alone. Environments trigger gene activity. And our genetically influenced traits *evoke* significant responses in others. Thus, a child's impulsivity and aggression may evoke an angry response from a parent or teacher who reacts warmly to model children in the family or classroom. In such cases, the child's nature and the adult's nurture interact. Gene and scene dance together.

Evocative interactions may help explain why identical twins reared in different families recall their parents' warmth as remarkably similar—almost as similar as if they had had the same parents (Plomin et al., 1988, 1991, 1994). Fraternal twins have more differing recollections of their early family life—even if reared in the same family! “Children experience us as different parents, depending on their own qualities,” noted Sandra Scarr (1990).

Recall that genes can be either active (expressed, as the hot water activates the tea bag) or inactive. A new field, **epigenetics** (meaning “in addition to” or “above and beyond” genetics), is studying the molecular mechanisms by which environments trigger genetic expression. Although genes have the potential to influence development, environmental triggers can switch them on or off, much as your computer's software switches your printer on and off. One such *epigenetic mark* is an organic methyl molecule attached to part of a DNA strand (FIGURE 2.32). It instructs the cell to ignore any gene present in that DNA stretch, thereby preventing the DNA from producing the proteins coded by that gene.

“Men's natures are alike; it is their habits that carry them far apart.”

Confucius, Analects, 500 B.C.E.



“Heredity deals the cards; environment plays the hand.”

Psychologist Charles L. Brewer (1990)

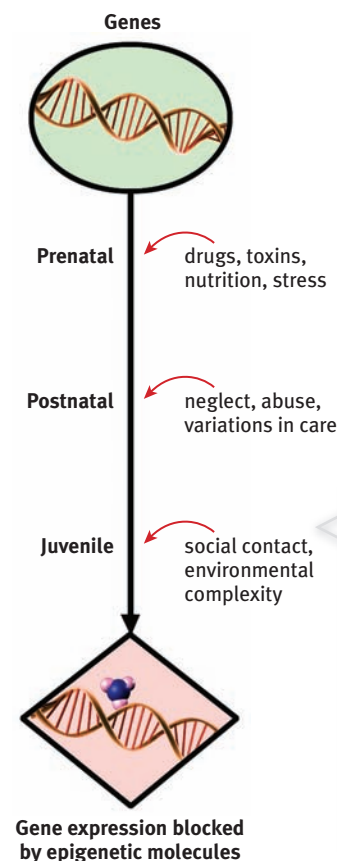


FIGURE 2.32
Epigenetics influences gene expression Life experiences beginning in the womb lay down *epigenetic marks*—often organic methyl molecules—that can block the expression of any gene in that DNA segment. (From Frances Champagne, 2010.)

Gene-environment interaction

Biological appearances have social consequences. People respond differently to a Channing Tatum (shown here in the movie *Dear John*), than to his fellow actor Mike Myers (shown here playing the character Austin Powers).



The Kobal Collection/Relativity Media



New Line/Photofest

Environmental factors such as diet, drugs, toxins, and stress can affect the epigenetic molecules that regulate gene expression. In one experiment, infant rats deprived of their mothers' normal licking had more molecules that blocked access to the "on" switch for developing the brain's stress-hormone receptors. When stressed, the animals had above-average levels of free-floating stress hormones and were more stressed out (Champagne et al., 2003; Champagne & Mashoodh, 2009). Child abuse may similarly affect its victims. Suicide victims with a history of child abuse exhibit the epigenetic effect (McGowan et al., 2009). Researchers now wonder if epigenetics might help solve some scientific mysteries, such as why only one member of an identical twin pair may develop a genetically influenced mental disorder, and how experience leaves its fingerprints in our brains.

So, if Jaden Agassi, son of tennis stars Andre Agassi and Stefanie Graf, grows up to be a tennis star, should we attribute his superior talent to his Grand Slam genes? To his growing up in a tennis-rich environment? To high expectations? The best answer seems to be "All of the above." From conception onward, we are the product of a cascade of interactions between our genetic predispositions and our surrounding environments (McGue, 2010). Our genes affect how people react to and influence us. Forget nature *versus* nurture; think nature *via* nurture.

RETRIEVE IT

- Match the following terms to the correct explanation.

- | | |
|----------------------|--|
| 1. Epigenetics | a. Study of the relative effects of our genes and our environment on our behavior. |
| 2. Behavior genetics | b. Study of environmental factors that affect how our genes are expressed. |

ANSWERS: 1. b, 2. a

evolutionary psychology the study of the evolution of behavior and the mind, using principles of natural selection.

natural selection the principle that, among the range of inherited trait variations, those contributing to reproduction and survival will most likely be passed on to succeeding generations.

Evolutionary Psychology: Understanding Human Nature



2-15: How do evolutionary psychologists use natural selection to explain behavior tendencies?

Behavior geneticists explore the genetic and environmental roots of human differences. **Evolutionary psychologists** instead focus mostly on what makes us so much alike as humans. They use Charles Darwin's principle of **natural selection** to

understand the roots of behavior and mental processes. Richard Dawkins (2007) calls natural selection “arguably the most momentous idea ever to occur to a human mind.” The idea, simplified, is this:

- Organisms’ varied offspring compete for survival.
- Certain biological and behavioral variations increase organisms’ reproductive and survival chances in their particular environment.
- Offspring that survive are more likely to pass their genes to ensuing generations.
- Thus, over time, population characteristics may change.

To see these principles at work, let’s consider a straightforward example in foxes.

Natural Selection and Adaptation

A fox is a wild and wary animal. If you capture a fox and try to befriend it, be careful. Stick your hand in the cage and, if the timid fox cannot flee, it may snack on your fingers. Russian scientist Dmitry Belyaev wondered how our human ancestors had domesticated dogs from their equally wild wolf forebears. Might he, within a comparatively short stretch of time, accomplish a similar feat by transforming the fearful fox into a friendly fox?

To find out, Belyaev set to work with 30 male and 100 female foxes. From their offspring he selected and mated the tamest 5 percent of males and 20 percent of females. (He measured tameness by the foxes’ responses to attempts to feed, handle, and stroke them.) Over more than 30 generations of foxes, Belyaev and his successor, Lyudmila Trut, repeated that simple procedure. Forty years and 45,000 foxes later, they had a new breed of foxes that, in Trut’s (1999) words, are “docile, eager to please, and unmistakably domesticated. . . . Before our eyes, ‘the Beast’ has turned into ‘beauty,’ as the aggressive behavior of our herd’s wild [ancestors] entirely disappeared.” So friendly and eager for human contact are they, so inclined to whimper to attract attention and to lick people like affectionate dogs, that the cash-strapped institute seized on a way to raise funds—marketing its foxes to people as house pets.

Over time, traits that confer a reproductive advantage on an individual or a species are *selected* and will prevail. Animal breeding experiments exploit genetic selection. Dog breeders have given us sheepdogs that herd, retrievers that retrieve, trackers that track, and pointers that point (Plomin et al., 1997). Psychologists, too, have bred animals to be serene or reactive, quick learners or slow ones.

Does the same process work with naturally occurring selection? Does natural selection explain our human tendencies? Nature has indeed selected advantageous variations from the new gene combinations produced at each human conception and the **mutations** (random errors in gene replication) that sometimes result. But the tight genetic leash that predisposes a dog’s retrieving, a cat’s pouncing, or an ant’s nest building is looser on humans. The genes selected during our ancestral history endow us with a great capacity to learn and therefore to *adapt* to life in varied environments, from the tundra to the jungle. Genes and experience together wire the brain. Our adaptive flexibility in responding to different environments contributes to our *fitness*—our ability to survive and reproduce.

mutation a random error in gene replication that leads to a change.



Eric Isselée/Shutterstock

RETRIEVE IT

- How are Belyaev and Trut’s breeding practices similar to, and how do they differ from, the way natural selection normally occurs?

ANSWER: Over multiple generations, Belyaev and Trut have been selecting and breeding foxes that exhibited a trait they desired: tameness. This process is similar to naturally occurring selection, but it differs in that natural selection normally favors traits (including those arising from mutations) that contribute to reproduction and survival.

Evolutionary Success Helps Explain Similarities

Our behavioral and biological similarities arise from our shared human *genome*, our common genetic profile. How did we develop our genetic kinship?

Our Genetic Legacy

At the dawn of human history, our ancestors faced certain questions: Who is my ally, who is my foe? With whom should I mate? What food should I eat? Some individuals answered those questions more successfully than others. For example, women who experienced nausea in the critical first three months of pregnancy were predisposed to avoid certain bitter, strongly flavored, and novel foods. Avoiding such foods has survival value, since they are the very foods most often toxic to prenatal development (Schmitt & Pilcher, 2004). Early humans disposed to eat nourishing rather than poisonous foods survived to contribute their genes to later generations. Those who deemed leopards “nice to pet” often did not.

Similarly successful were those whose mating helped them produce and nurture offspring. Over generations, the genes of individuals not so disposed tended to be lost from the human gene pool. As success-enhancing genes continued to be selected, behavioral tendencies and thinking and learning capacities emerged that prepared our Stone Age ancestors to survive, reproduce, and send their genes into the future, and into you.

As inheritors of this prehistoric genetic legacy, we are predisposed to behave in ways that promoted our ancestors’ surviving and reproducing. But in some ways, we are biologically prepared for a world that no longer exists. We love the taste of sweets and fats, which prepared our ancestors to survive famines, and we heed their call from store shelves, fast-food outlets, and vending machines. With famine now rare in Western cultures, obesity is truly a growing problem. Our natural dispositions, rooted deep in history, are mismatched with today’s junk-food environment and tomorrow’s threats, such as climate change (Colarelli & Dettman, 2003).

Evolutionary Psychology Today

Darwin’s theory of evolution has been an organizing principle for biology for a long time. As Jared Diamond (2001) has noted, “Virtually no contemporary scientists believe that Darwin was basically wrong.” Today, Darwin’s theory lives on in the *second Darwinian revolution*: the application of evolutionary principles to psychology. In concluding *On the Origin of Species*, Darwin (1859, p. 346) anticipated this, foreseeing “open fields for far more important researches. Psychology will be based on a new foundation.”

In chapters to come, we’ll address some questions that intrigue evolutionary psychologists: Why do infants start to fear strangers about the time they become mobile? Why are biological fathers so much less likely than unrelated boyfriends to abuse and murder the children with whom they share a home? Why do so many more people have phobias about spiders, snakes, and heights than about more dangerous threats, such as guns and electricity? And why do we fear air travel so much more than driving?

I know from my mail and from public opinion surveys that some readers feel troubled by the naturalism and evolutionism of contemporary science. Readers from other nations bear with me, but in the United States there is a wide gulf between scientific and lay thinking about evolution. “The idea that human minds are the product of evolution is . . . unassailable fact,” declared a 2007 editorial in *Nature*, a leading science magazine. That sentiment concurs with a 2006 statement of “evidence-based facts” about evolution jointly issued by the national science academies of 66 nations (IAP, 2006). In *The Language of God*, Human Genome Project director Francis Collins (2006, pp. 141, 146), a self-described evangelical Christian, compiles the “utterly

Despite high infant mortality and rampant disease in past millennia, not one of your countless ancestors died childless.



Jacob Hamblin/Shutterstock

compelling” evidence that leads him to conclude that Darwin’s big idea is “unquestionably correct.” Yet Gallup reports that half of U.S. adults do not believe in evolution’s role in “how human beings came to exist on Earth” (Newport, 2007). Many of those who dispute the scientific story worry that a science of behavior (and evolutionary science in particular) will destroy our sense of the beauty, mystery, and spiritual significance of the human creature. For those concerned, I offer some reassuring thoughts.

When Isaac Newton explained the rainbow in terms of light of differing wavelengths, the poet Keats feared that Newton had destroyed the rainbow’s mysterious beauty. Yet, as Richard Dawkins (1998) noted in *Unweaving the Rainbow*, Newton’s analysis led to an even deeper mystery—Einstein’s theory of special relativity. Moreover, nothing about Newton’s optics need diminish our appreciation for the dramatic elegance of a rainbow arching across a brightening sky.

When Galileo assembled evidence that the Earth revolved around the Sun, not vice versa, he did not offer irrefutable proof for his theory. Rather, he offered a coherent explanation for a variety of observations, such as the changing shadows cast by the Moon’s mountains. His explanation eventually won the day because it described and explained things in a way that made sense, that hung together. Darwin’s theory of evolution likewise is a coherent view of natural history. It offers an organizing principle that unifies various observations.

Collins is not the only person of faith to find the scientific idea of human origins congenial with his spirituality. In the fifth century, St. Augustine (quoted by Wilford, 1999) wrote, “The universe was brought into being in a less than fully formed state, but was gifted with the capacity to transform itself from unformed matter into a truly marvelous array of structures and life forms.” Some 1600 years later, Pope John Paul II in 1996 welcomed a science–religion dialogue, finding it noteworthy that evolutionary theory “has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge.”

Meanwhile, many people of science are awestruck at the emerging understanding of the universe and the human creature. It boggles the mind—the entire universe popping out of a point some 14 billion years ago, and instantly inflating to cosmological size. Had the energy of this Big Bang been the tiniest bit less, the universe would have collapsed back on itself. Had it been the tiniest bit more, the result would have been a soup too thin to support life. Astronomer Sir Martin Rees has described *Just Six Numbers* (1999), any one of which, if changed ever so slightly, would produce a cosmos in which life could not exist. Had gravity been a tad stronger or weaker, or had the weight of a carbon proton been a wee bit different, our universe just wouldn’t have worked.

What caused this almost-too-good-to-be-true, finely tuned universe? Why is there something rather than nothing? How did it come to be, in the words of Harvard-Smithsonian astrophysicist Owen Gingerich (1999), “so extraordinarily right, that it seemed the universe had been expressly designed to produce intelligent, sentient beings”? Is there a benevolent superintelligence behind it all? Have there instead been an infinite number of universes born and we just happen to be the lucky inhabitants of one that, by chance, was exquisitely fine-tuned to give birth to us? Or does that idea violate *Occam’s razor*, the principle that we should prefer the simplest of competing explanations? On such matters, a humble, awed, scientific silence is appropriate, suggested philosopher Ludwig Wittgenstein: “Whereof one cannot speak, thereof one must be silent.”

Rather than fearing science, we can welcome its enlarging our understanding and awakening our sense of awe. In *The Fragile Species*, Lewis Thomas (1992) described his utter amazement that the Earth in time gave rise to bacteria and eventually to Bach’s *Mass in B Minor*. In a short 4 billion years, life on Earth has come from nothing to structures as complex as a 6-billion-unit strand of DNA and the incomprehensible intricacy of the human brain. Atoms no different from those in a rock somehow formed

Those who are troubled by an apparent conflict between scientific and religious accounts of human origins may find it helpful to recall (Chapter 1) that different perspectives of life can be complementary. For example, the scientific account attempts to tell us *when* and *how*; religious creation stories usually aim to tell about an ultimate *who* and *why*. As Galileo explained to the Grand Duchess Christina, “The Bible teaches how to go to heaven, not how the heavens go.”

dynamic entities that became conscious. Nature, says cosmologist Paul Davies (2007), seems cunningly and ingeniously devised to produce extraordinary, self-replicating, information-processing systems—us. Although we appear to have been created from dust, over eons of time, the end result is a priceless creature, one rich with potential beyond our imagining.

RETRIEVE IT

- Behavior geneticists are most interested in exploring _____ (commonalities; differences) in our traits and behaviors, and evolutionary psychologists are most interested in exploring _____ (commonalities; differences).

ANSWERS: differences; commonalities

CHAPTER REVIEW

The Biology of Behavior

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Biology and Behavior

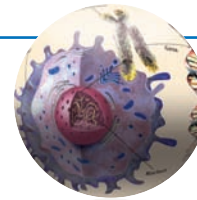
- 2-1:** Why are psychologists concerned with human biology?

Neural Communication

- 2-2:** What are neurons, and how do they transmit information?
- 2-3:** How do nerve cells communicate with other nerve cells?
- 2-4:** How do neurotransmitters influence behavior?

The Nervous System

- 2-5:** What are the functions of the nervous system's main divisions, and what are the three main types of neurons?



The Endocrine System

- 2-6:** How does the endocrine system transmit information and interact with the nervous system?

The Brain

- 2-7:** How do neuroscientists study the brain's connections to behavior and mind?
- 2-8:** What structures make up the brainstem, and what are the functions of the brainstem, thalamus, and cerebellum?
- 2-9:** What are the limbic system's structures and functions?
- 2-10:** What are the functions of the various cerebral cortex regions?
- 2-11:** To what extent can a damaged brain reorganize itself, and what is neurogenesis?
- 2-12:** What do split brains reveal about the functions of our two brain hemispheres?

Behavior Genetics: Predicting Individual Differences

2-13: What are genes, and how do behavior geneticists explain our individual differences?

2-14: How do heredity and environment work together?

Evolutionary Psychology: Understanding Human Nature

2-15: How do evolutionary psychologists use natural selection to explain behavior tendencies?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

biological psychology, p. 36

neuron, p. 36

dendrites, p. 36

axon, p. 36

myelin [MY-uh-lin] sheath, p. 37

glial cells (glia), p. 37

action potential, p. 37

threshold, p. 37

synapse [SIN-aps], p. 39

neurotransmitters, p. 39

endorphins [en-DOR-fins], p. 40

nervous system, p. 41

central nervous system (CNS), p. 41

peripheral nervous system (PNS), p. 41

nerves, p. 41

sensory (afferent) neurons, p. 41

motor (efferent) neurons, p. 41

interneurons, p. 41

somatic nervous system, p. 42

autonomic [aw-tuh-NAHM-ik] nervous system (ANS), p. 42

sympathetic nervous system, p. 42

parasympathetic nervous system, p. 42

reflex, p. 44

endocrine [EN-duh-krin] system, p. 45

hormones, p. 45

adrenal [ah-DREEN-el] glands, p. 45

pituitary gland, p. 45

lesion [LEE-zhuhn], p. 46

brainstem, p. 47

medulla [muh-DUL-uh], p. 47

electroencephalogram (EEG), p. 48

PET (positron emission tomography) scan, p. 48

MRI (magnetic resonance imaging), p. 48

fMRI (functional MRI), p. 48

thalamus [THAL-uh-muss], p. 48

reticular formation, p. 49

cerebellum [sehr-uh-BELL-um], p. 50

limbic system, p. 50

amygdala [uh-MIG-duh-la], p. 50

hypothalamus [hi-po-THAL-uh-muss], p. 51

cerebral [seh-REE-bruhl] cortex, p. 53

frontal lobes, p. 53

parietal [puh-RYE-uh-tuhl] lobes, p. 53

occipital [ahk-SIP-uh-tuhl] lobes, p. 53

temporal lobes, p. 53

motor cortex, p. 54

sensory cortex, p. 55

association areas, p. 56

plasticity, p. 57

neurogenesis, p. 58

corpus callosum [KOR-pus kah-LOW-sum], p. 59

split brain, p. 59

environment, p. 62

behavior genetics, p. 62

chromosomes, p. 62

DNA (*deoxyribonucleic acid*), p. 62

genes, p. 62

identical twins, p. 63

fraternal twins, p. 63

interaction, p. 67

epigenetics, p. 67

evolutionary psychology, p. 68

natural selection, p. 68

mutation, p. 69

EXPERIENCE THE TESTING EFFECT

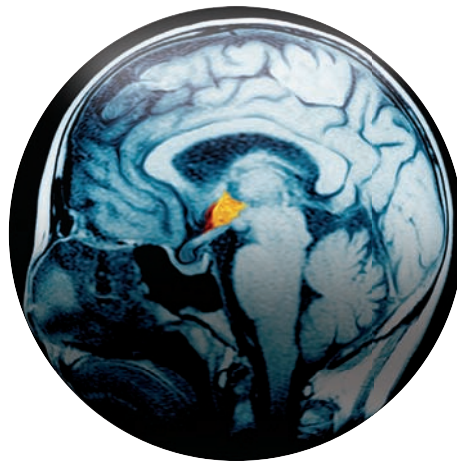
Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- The neuron fiber that passes messages through its branches to other neurons or to muscles and glands is the _____.
- The tiny space between the axon of one neuron and the dendrite or cell body of another is called the
 - axon terminal.
 - branching fiber.
 - synaptic gap.
 - threshold.
- Regarding a neuron's response to stimulation, the intensity of the stimulus determines
 - whether or not an impulse is generated.
 - how fast an impulse is transmitted.
 - how intense an impulse will be.
 - whether reuptake will occur.
- In a sending neuron, when an action potential reaches an axon terminal, the impulse triggers the release of chemical messengers called _____.

5. Endorphins are released in the brain in response to
 - a. morphine or heroin.
 - b. pain or vigorous exercise.
 - c. the all-or-none response.
 - d. All these answers are correct.
6. The autonomic nervous system controls internal functions, such as heart rate and glandular activity. The word *autonomic* means
 - a. calming.
 - b. voluntary.
 - c. self-regulating.
 - d. arousing.
7. The sympathetic nervous system arouses us for action and the parasympathetic nervous system calms us down. Together, the two systems make up the _____ nervous system.
8. The neurons of the spinal cord are part of the _____ nervous system.
9. The most influential endocrine gland, known as the master gland, is the
 - a. pituitary.
 - b. hypothalamus.
 - c. thyroid.
 - d. pancreas.
10. The _____ _____ secrete(s) epinephrine and norepinephrine, helping to arouse the body during times of stress.
11. The part of the brainstem that controls heartbeat and breathing is the
 - a. cerebellum.
 - b. medulla.
 - c. cortex.
 - d. thalamus.
12. The thalamus functions like a(n)
 - a. memory bank.
 - b. balance center.
 - c. breathing regulator.
 - d. Internet router.
13. The lower brain structure that governs arousal is the
 - a. spinal cord.
 - b. cerebellum.
 - c. reticular formation.
 - d. medulla.
14. The part of the brain that coordinates voluntary movement and enables nonverbal learning and memory is the _____.
15. Two parts of the limbic system are the amygdala and the
 - a. cerebral hemispheres.
 - b. hippocampus.
 - c. thalamus.
 - d. pituitary.
16. A cat's ferocious response to electrical brain stimulation would lead you to suppose the electrode had touched the _____.
17. The neural structure that most directly regulates eating, drinking, and body temperature is the
 - a. endocrine system.
 - b. hypothalamus.
 - c. hippocampus.
 - d. amygdala.
18. The initial reward center discovered by Olds and Milner was located in the _____.
19. If a neurosurgeon stimulated your right motor cortex, you would most likely
 - a. see light.
 - b. hear a sound.
 - c. feel a touch on the right arm.
 - d. move your left leg.
20. How do different neural networks communicate with one another to let you respond when a friend greets you at a party?
21. Which of the following body regions has the greatest representation in the sensory cortex?
 - a. Upper arm
 - b. Toes
 - c. Lips
 - d. All regions are equally represented.
22. The "uncommitted" areas that make up about three-fourths of the cerebral cortex are called _____.
23. Judging and planning are enabled by the _____ lobes.
24. What would it be like to talk on the phone if you didn't have temporal lobe association areas? What would you hear? What would you understand?
25. Plasticity is especially evident in the brains of
 - a. split-brain patients.
 - b. young adults.
 - c. young children.
 - d. right-handed people.
26. An experimenter flashes the word HERON across the visual field of a man whose corpus callosum has been sev-

- ered. HER is transmitted to his right hemisphere and ON to his left hemisphere. When asked to indicate what he saw, the man says he saw _____ but points to _____.
27. Studies of people with split brains and brain scans of those with undivided brains indicate that the left hemisphere excels in
 - a. processing language.
 - b. visual perceptions.
 - c. making inferences.
 - d. neurogenesis.
 28. Damage to the brain's right hemisphere is most likely to reduce a person's ability to
 - a. recite the alphabet rapidly.
 - b. make inferences.
 - c. understand verbal instructions.
 - d. solve arithmetic problems.
 29. What do behavior geneticists study?
 30. The threadlike structures made largely of DNA molecules are called _____.
 31. A small segment of DNA that codes for particular proteins is referred to as a _____.
 32. When the mother's egg and the father's sperm unite, each contributes
 - a. one chromosome pair.
 - b. 23 chromosomes.
 - c. 23 chromosome pairs.
 - d. 25,000 chromosomes.
 33. Fraternal twins result when
 - a. a single egg is fertilized by a single sperm and then splits.
 - b. a single egg is fertilized by two sperm and then splits.
 - c. two eggs are fertilized by two sperm.
 - d. two eggs are fertilized by a single sperm.
 34. _____ twins share the same DNA.
 35. Adoption studies seek to understand genetic influences on personality. They do this mainly by
 - a. comparing adopted children with nonadopted children.
 - b. evaluating whether adopted children's personalities more closely resemble those of their adoptive parents or their biological parents.
 - c. studying the effect of prior neglect on adopted children.
 - d. studying the effect of children's age at adoption.

Find answers to these questions in Appendix E, in the back of the book.



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THE BRAIN AND CONSCIOUSNESS

Dual Processing: The Two-Track Mind
Selective Attention

SLEEP AND DREAMS

Biological Rhythms and Sleep
Sleep Theories
Sleep Deprivation and Sleep Disorders
Dreams

HYPNOSIS

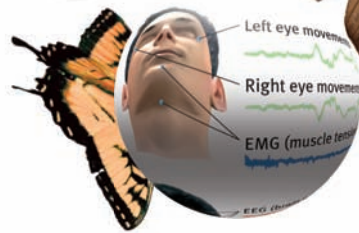
Frequently Asked Questions About Hypnosis
Explaining the Hypnotized State

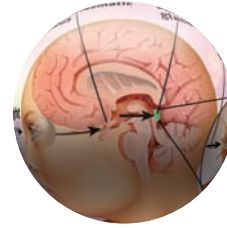
DRUGS AND CONSCIOUSNESS

Tolerance, Dependence, and Addiction

THINKING CRITICALLY ABOUT: Addiction

Types of Psychoactive Drugs
Influences on Drug Use





CHAPTER 3

Consciousness and the Two-Track Mind



Consciousness can be a funny thing. It offers us weird experiences, as when entering sleep or leaving a dream, and sometimes it leaves us wondering who is really in control. After zoning me out with nitrous oxide, my dentist tells me to turn my head to the left. My conscious mind resists:

“No way,” I silently say. “You can’t boss me around!”

Whereupon my robotic head, ignoring my conscious mind, turns obligingly under the dentist’s control.

Then there are those times when consciousness seems to split. Reading *Green Eggs and Ham* to one of my preschoolers for the umpteenth time, my obliging mouth could say the words while my mind wandered elsewhere. And if someone were to drop by my office while I’m typing this sentence, it would not be a problem. My fingers could complete it as I strike up a conversation.

What do such experiences reveal? Was my drug-induced dental experience akin to people’s experiences with other *psychoactive drugs* (mood- and perception-altering substances)? Was my automatic obedience to my dentist like people’s responses to a hypnotist? Does a split in consciousness, as when our mind goes elsewhere while reading or typing, explain people’s behavior while under hypnosis? And during sleep, when do those weird dream experiences occur, and why? Before considering these questions and more, let’s ask a fundamental question: What is *consciousness*?



consciousness our awareness of ourselves and our environment.

cognitive neuroscience the interdisciplinary study of the brain activity linked with cognition (including perception, thinking, memory, and language).

“Psychology must discard all reference to consciousness.”

Behaviorist John B. Watson (1913)

The Brain and Consciousness



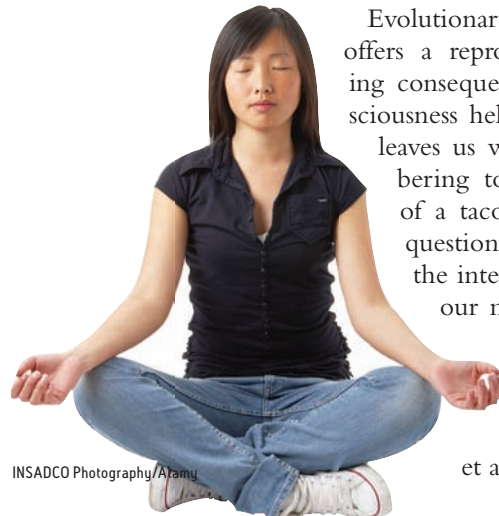
3-1: What is the place of consciousness in psychology's history?

Every science has concepts so fundamental they are nearly impossible to define. Biologists agree on what is alive but not on precisely what life is. In physics, *matter* and *energy* elude simple definition. To psychologists, consciousness is similarly a fundamental yet slippery concept. At its beginning, *psychology* was “the description and explanation of states of consciousness” (Ladd, 1887). But during the first half of the twentieth century, the difficulty of scientifically studying consciousness led many psychologists—including those in the emerging school of *behaviorism* (Chapter 7)—to turn to direct observations of behavior. By the 1960s, psychology had nearly lost consciousness and was defining itself as “the science of behavior.” Consciousness was likened to a car’s speedometer: “It doesn’t make the car go, it just reflects what’s happening” (Seligman, 1991, p. 24).

After 1960, mental concepts reemerged. Neuroscience advances linked brain activity to sleeping, dreaming, and other mental states. Researchers began studying consciousness altered by hypnosis and drugs. Psychologists of all persuasions were affirming the importance of *cognition*, or mental processes. Psychology was regaining consciousness.

Most psychologists now define **consciousness** as our awareness of ourselves and our environment. This awareness allows us to assemble information from many sources as we reflect on our past and plan for our future. And it focuses our attention when we learn a complex concept or behavior. When learning to drive, we focus on the car and the traffic. With practice, driving becomes semi-automatic, freeing us to focus our attention on other things. Over time, we flit between various *states of consciousness*, including normal waking awareness and various altered states (**FIGURE 3.1**).

Today’s science explores the biology of consciousness. Scientists now assume, in the words of neuroscientist Marvin Minsky (1986, p. 287), that “the mind is what the brain does.”



INSADCO Photography/Aramu

Evolutionary psychologists speculate that consciousness offers a reproductive advantage (Barash, 2006). By considering consequences and helping us read others’ intentions, consciousness helps us act in our long-term interests. Even so, that leaves us with the “hard problem”: How do brain cells jabbering to one another create our awareness of the taste of a taco, the idea of infinity, the feeling of fright? Such questions are at the heart of **cognitive neuroscience**—the interdisciplinary study of the brain activity linked with our mental processes. Based on your cortical activation patterns, neuroscientists can now, in limited ways, read your mind (Bor, 2010). They could tell, for example, which of 10 similar objects (hammer, drill, and so forth) you were viewing (Shinkareva et al., 2008).

FIGURE 3.1

Altered states of consciousness

In addition to normal, waking awareness, consciousness comes to us in altered states, including daydreaming, sleeping, meditating, and drug-induced hallucinating.

Some states occur spontaneously

Daydreaming

Drowsiness

Dreaming

Some are physiologically induced

Hallucinations

Orgasm

Food or oxygen starvation

Some are psychologically induced

Sensory deprivation

Hypnosis

Meditation

Discovering which brain region becomes active with a particular conscious experience strikes many people as interesting but not mind blowing. (If everything psychological is simultaneously biological, then our ideas, emotions, and spirituality must all, somehow, be embodied.) What *is* mind blowing to many of us is the growing evidence that we have, so to speak, two minds, each supported by its own neural equipment.

RETRIEVE IT

- Those working in the interdisciplinary field called _____ study the brain activity associated with perception, thinking, memory, and language.

ANSWER: cognitive neuroscience

Dual Processing: The Two-Track Mind



3-2: What is the “dual-processing” being revealed by today’s cognitive neuroscience?

At any moment, you and I are aware of little more than what’s on the screen of our consciousness. But beneath the surface, unconscious information processing occurs simultaneously on many parallel tracks. When we look at a bird flying, we are consciously aware of the result of our cognitive processing (“It’s a hummingbird!”) but not of our subprocessing of the bird’s color, form, movement, and distance. One of the grand ideas of recent cognitive neuroscience is that much of our brain work occurs off stage, out of sight. Perception, memory, thinking, language, and attitudes all operate on two levels—a conscious, deliberate “high road,” and an unconscious, automatic “low road.” Today’s researchers call this **dual processing**. We know more than we know we know.

If you are a driver, consider how you move into a right lane. Drivers know this unconsciously, yet they cannot accurately explain it (Eagelman, 2011). Can you? Most say they would bank the steering wheel to the right, then straighten it out—a procedure that would actually steer them off the road. In reality, an experienced driver, after moving right, automatically reverses the wheel just as far to the left of center, and only then returns to the center position. The lesson: The human brain is a device for converting conscious into unconscious knowledge.

Or consider this story, which illustrates how science can be stranger than science fiction. During my sojourns at Scotland’s University of St. Andrews, I came to know cognitive neuroscientists David Milner and Melvyn Goodale (2008). A local woman, whom they called D. F., had suffered brain damage when overcome by carbon monoxide, leaving her unable to recognize and discriminate objects visually. Consciously, D. F. could see nothing. Yet she exhibited **blindsight**—she acted *as though* she could see. Asked to slip a postcard into a vertical or horizontal mail slot, she could do so without error. Asked the width of a block in front of her, she was at a loss, but she could grasp it with just the right finger-thumb distance.

How could this be? Don’t we have one visual system? Goodale and Milner knew from animal research that the eye sends information simultaneously to different brain areas, which support different tasks (Weiskrantz, 2009, 2010). Sure enough, a scan of D.F.’s brain activity revealed normal activity in the area concerned with reaching for, grasping, and navigating objects, but damage in the area concerned with consciously recognizing objects. (See another example in **FIGURE 3.2**.)

How strangely intricate is this thing we call vision, conclude Goodale and Milner in their aptly titled book, *Sight Unseen*. We may think of our vision as one system controlling our visually guided actions, but it is actually a dual-processing system. A *visual perception track* enables us “to think about the world”—to recognize things and to plan future actions. A *visual action track* guides our moment-to-moment movements.

dual processing the principle that information is often simultaneously processed on separate conscious and unconscious tracks.

blindsight a condition in which a person can respond to a visual stimulus without consciously experiencing it.



FIGURE 3.2

When the blind can “see” In this compelling demonstration of blindsight and the two-track mind, researcher Lawrence Weiskrantz trailed a blindsight patient down a cluttered hallway. Although told the hallway was empty, the patient meandered around all the obstacles without any awareness of them.

selective attention the focusing of conscious awareness on a particular stimulus.

The dual-track mind can also be seen in a patient who lost all his left visual cortex, leaving him blind to objects presented on the right side of his field of vision. He is nevertheless able to sense the emotion expressed in faces, presented to his right, he does not consciously perceive (De Gelder, 2010). The same is true of normally sighted people whose visual cortex has been disabled with magnetic stimulation. Such findings suggest that brain areas below the cortex are processing emotion-related information.

People often have trouble accepting that much of our everyday thinking, feeling, and acting operates outside our conscious awareness (Bargh & Chartrand, 1999). We are understandably biased to believe that our intentions and deliberate choices rule our lives. But consciousness, though enabling us to exert voluntary control and to communicate our mental states to others, is but the tip of the information-processing iceberg. Being intensely focused on an activity (such as reading this chapter, I'd love to think) increases your total brain activity no more than 5 percent above its baseline rate. And even when you rest, "hubs of dark energy" are whirling inside your head (Raichle, 2010).

Unconscious *parallel processing* is faster than conscious *sequential processing*, but both are essential. Parallel processing enables your mind to take care of routine business. Sequential processing is skilled at solving new problems, which requires your focused attention. Try this: If you are right-handed, you can move your right foot in a smooth counterclockwise circle, and you can write the number 3 repeatedly with your right hand—but probably not at the same time. (If you are musically inclined, try something equally difficult: Tap a steady beat three times with your left hand while tapping four times with your right hand.) Both tasks require conscious attention, which can be in only one place at a time. If time is nature's way of keeping everything from happening at once, then consciousness is nature's way of keeping us from thinking and doing everything at once.

RETRIEVE IT

- What are the mind's two tracks, and what is "dual processing"?

ANSWER: Our mind has separate conscious and unconscious tracks that perform dual processing and interpreting information simultaneously.

Selective Attention



3-3: How much information do we consciously attend to at once?

Through **selective attention**, your awareness focuses, like a flashlight beam, on a minute aspect of all that you experience. By one estimate, your five senses take in 11,000,000 bits of information per second, of which you consciously process about 40 (Wilson, 2002). Yet your mind's unconscious track intuitively makes great use of the other 10,999,960 bits. Until reading this sentence, for example, you have been unaware that your shoes are pressing against your feet or that your nose is in your line of vision. Now, suddenly, your attentional spotlight shifts. Your feet feel encased, your nose stubbornly intrudes on the words before you. While focusing on these words, you've also been blocking other parts of your environment from awareness, though your peripheral vision would let you see them easily. You can change that. As you stare at the X below, notice what surrounds these sentences (the edges of the page, the desktop, the floor).

X

A classic example of selective attention is the *cocktail party effect*—your ability to attend to only one voice among many. Let another voice speak your name and your cognitive radar, operating on your mind's other track, will instantly bring that voice into consciousness. This effect might have prevented an embarrassing and dangerous situation in 2009, when two Northwest Airlines pilots "lost track of time." Focused on their laptops and conversation, they ignored alarmed air traffic controllers' attempts to reach them as they overflew their Minneapolis destination by 150 miles. If only the controllers had known and spoken the pilots' names.

"Has a generation of texters, surfers, and twitterers evolved the enviable ability to process multiple streams of novel information in parallel? Most cognitive psychologists doubt it."

Steven Pinker, "Not at All," 2010

Selective Attention and Accidents

Talk on the phone or attend to a music player or GPS while driving and your selective attention will shift back and forth between the road and its electronic competition. But when a demanding situation requires it, you'll probably give the road your full attention. You'll probably also blink less. When focused on a task, such as reading, people blink less than when their mind is wandering (Smilek et al., 2010). If you want to know whether your dinner companion is focused on what you're saying, watch for eyeblinks and hope there won't be too many.

We pay a toll for switching attentional gears, especially when we shift to complex tasks, like noticing and avoiding cars around us. The toll is a slight and sometimes fatal delay in coping (Rubenstein et al., 2001). About 28 percent of traffic accidents occur when people are chatting on cell phones or texting (National Safety Council, 2010). One study tracked long-haul truck drivers for 18 months. The video cameras mounted in their cabs showed they were at 23 times greater risk of a collision while texting (VTTI, 2009). Mindful of such findings, the United States in 2010 banned truckers and bus drivers from texting while driving (Halsey, 2010).

It's not just truck drivers who are at risk. One in four teen drivers with cell phones admit to texting while driving (Pew, 2009). Multitasking comes at a cost: fMRI scans offer a biological account of how multitasking distracts from brain resources allocated to driving. In areas vital to driving, brain activity decreases an average 37 percent when a driver is attending to conversation (Just et al., 2008).

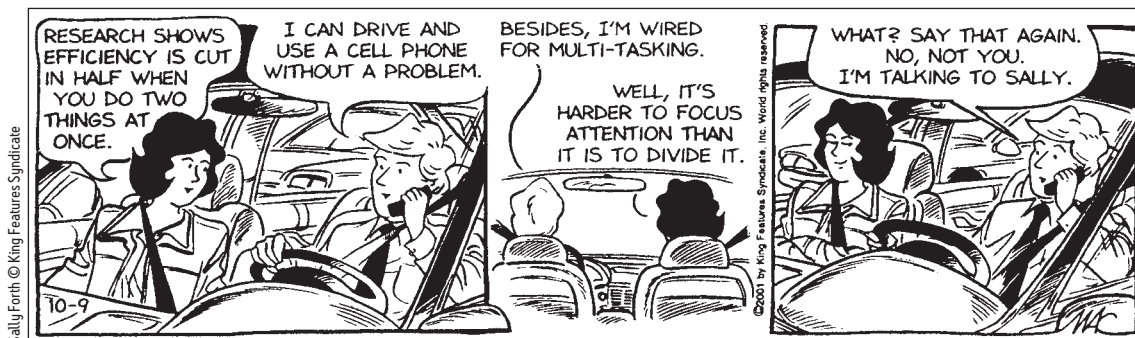
Even hands-free cell-phone talking is more distracting than chatting with passengers, who can see the driving demands and pause the conversation. When University of Sydney researchers analyzed phone records for the moments before a car crash, they found that cell-phone users (even those with hands-free sets) were four times more at risk (McEvoy et al., 2005, 2007). Having a passenger increased risk only 1.6 times. This risk difference also appeared in an experiment that asked drivers to pull off at a freeway rest stop 8 miles ahead. Of drivers conversing with a passenger, 88 percent did so. Of those talking on a cell phone, 50 percent drove on by (Strayer & Drews, 2007).



"I wasn't texting. I was building this ship in a bottle."

The New Yorker Collection, 2009. Robert Leighton, from cartoonbank.com. All Rights Reserved.

Sally Forth



Driven to distraction In driving-simulation experiments, people whose attention is diverted by cell-phone conversation make more driving errors.

Selective Inattention

At the level of conscious awareness, we are “blind” to all but a tiny sliver of visual stimuli. Ulric Neisser (1979), Robert Becklen and Daniel Cervone (1983) demonstrated this **inattention blindness** dramatically. They showed people a one-minute video in which images of three black-shirted men tossing a basketball were superimposed over the images of three white-shirted players. The viewers' supposed task was to press a key every time a black-shirted player passed the ball. Most focused their attention so completely on the game that they failed to notice a young woman carrying an umbrella saunter across the screen midway through the video. Seeing a replay of the video, viewers were astonished to see her (Mack & Rock, 2000). This inattention blindness is a by-product of what we are really good at: focusing attention on some part of our environment.

inattention blindness failing to see visible objects when our attention is directed elsewhere.

FIGURE 3.3

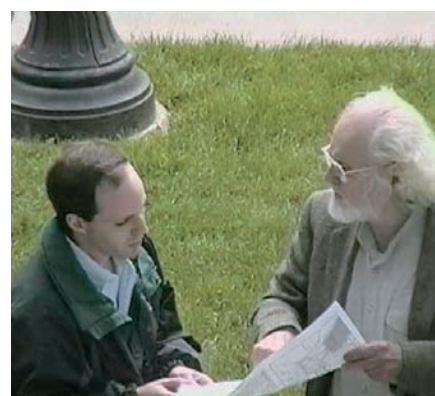
Gorilla in our midst When attending to one task (counting basketball passes by one of the three-person teams), about half the viewers displayed inattention blindness by failing to notice a clearly visible gorilla passing through.



Daniel Simons, University of Illinois

FIGURE 3.4

Change blindness While a man (white hair) provides directions to a construction worker, two experimenters rudely pass between them carrying a door. During this interruption, the original worker switches places with another person wearing different-colored clothing. Most people, focused on their direction giving, do not notice the switch. (From Simons & Levin, 1998.)



© 1998 Psychonomic Society, Inc. Image provided courtesy of Daniel J. Simons.

Magicians also exploit our **change blindness**. By selectively riveting our attention on their left hand's dramatic act, they entice us to overlook changes made with their other hand. Participants in laboratory experiments on change blindness have failed to notice that, after a brief visual interruption, a big Coke bottle had disappeared, a railing had risen, or clothing color had changed (Chabris & Simons, 2010; Resnick et al., 1997). Two-thirds of those who were focused on giving directions to a construction worker failed to notice when he was replaced by another worker during a staged interruption (**FIGURE 3.4**). Out of sight, out of mind.

Some stimuli, however, are so powerful, so strikingly distinct, that we experience *popout*, as with the only smiling face in **FIGURE 3.5**. We don't choose to attend to these stimuli; they draw our eye and demand our attention.

The dual-track mind is active even during sleep, as we see next.



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FIGURE 3.5

The pop-out phenomenon

Sleep and Dreams

Sleep—the irresistible tempter to whom we inevitably succumb. Sleep—the equalizer of presidents and peasants. Sleep—sweet, renewing, mysterious sleep. While sleeping, you may feel “dead to the world,” but you are not. Even when you are deeply asleep, your perceptual window is open a crack. You move around on your bed, but you manage not to fall out. The occasional roar of passing vehicles may leave your deep sleep undisturbed, but a cry from a baby’s nursery quickly interrupts it. So does the sound of your name. EEG recordings confirm that the brain’s auditory cortex responds to sound stimuli even during sleep (Kutas, 1990). And when you are asleep, as when you are awake, you process most information outside your conscious awareness.

Many of sleep’s mysteries are now being solved as some people sleep, attached to recording devices, while others observe. By recording brain waves and muscle movements, and by observing and occasionally waking sleepers, researchers are glimpsing things that a thousand years of common sense never told us. Perhaps you can anticipate some of their discoveries. Are the following statements true or false?

1. When people dream of performing some activity, their limbs often move in concert with the dream.
2. Older adults sleep more than young adults.
3. Sleepwalkers are acting out their dreams.
4. Sleep experts recommend treating insomnia with an occasional sleeping pill.
5. Some people dream every night; others seldom dream.

All these statements (adapted from Palladino & Carducci, 1983) are *false*. To see why, read on.

Biological Rhythms and Sleep

Like the ocean, life has its rhythmic tides. Over varying time periods, our bodies fluctuate, and with them, our minds. Let’s look more closely at two of those biological rhythms—our 24-hour biological clock and our 90-minute sleep cycle.

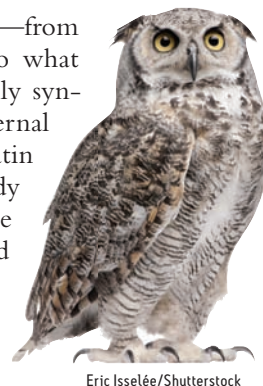
Circadian Rhythm



3-4: How do our biological rhythms influence our daily functioning?

The rhythm of the day parallels the rhythm of life—from our waking at a new day’s birth to our nightly return to what Shakespeare called “death’s counterfeit.” Our bodies roughly synchronize with the 24-hour cycle of day and night by an internal biological clock called the **circadian rhythm** (from the Latin *circa*, “about,” and *diem*, “day”). As morning approaches, body temperature rises, then peaks during the day, dips for a time in early afternoon (when many people take siestas), and begins to drop again in the evening. Thinking is sharpest and memory most accurate when we are at our daily peak in circadian arousal. Try pulling an all-nighter or working an occasional night shift. You’ll feel groggiest in the middle of the night but may gain new energy when your normal wake-up time arrives.

Age and experience can alter our circadian rhythm. Most 20-year-olds are evening-energized “owls,” with performance improving across the day (May & Hasher, 1998).



Eric Isselée/Shutterstock

change blindness failing to notice changes in the environment.

circadian [ser-KAY-dee-an] **rhythm** the biological clock; regular bodily rhythms (for example, of temperature and wakefulness) that occur on a 24-hour cycle.

“I love to sleep. Do you? Isn’t it great? It really is the best of both worlds. You get to be alive and unconscious.”

Comedian Rita Rudner, 1993

Dolphins, porpoises, and whales sleep with one side of their brain at a time (Miller et al., 2008).

REM sleep rapid eye movement sleep; a recurring sleep stage during which vivid dreams commonly occur. Also known as *paradoxical sleep*, because the muscles are relaxed (except for minor twitches) but other body systems are active.

alpha waves the relatively slow brain waves of a relaxed, awake state.

sleep periodic, natural loss of consciousness—as distinct from unconsciousness resulting from a coma, general anesthesia, or hibernation. (Adapted from Dement, 1999.)

hallucinations false sensory experiences, such as seeing something in the absence of an external visual stimulus.

delta waves the large, slow brain waves associated with deep sleep.

Most older adults are morning-loving “larks,” with performance declining as the day wears on. By mid-evening, when the night has hardly begun for many young adults, retirement homes are typically quiet. After about age 20 (slightly earlier for women), we begin to shift from being owls to being larks (Roenneberg et al., 2004). Women become more morning oriented as they have children and also as they transition to menopause (Leonhard & Randler, 2009; Randler & Bausback, 2010). Morning types tend to do better in school, to take more initiative, and to be less vulnerable to depression (Randler, 2008, 2009; Randler & Frech, 2009).



Peter Chadwick/Photo Researchers, Inc.

Sleep Stages



3-5: What is the biological rhythm of our sleeping and dreaming stages?

Sooner or later, sleep overtakes us and consciousness fades as different parts of our brain’s cortex stop communicating (Massimini et al., 2005). But rather than emitting a constant dial tone, the sleeping brain has its own biological rhythm.

About every 90 minutes, you cycle through four distinct sleep stages. This simple fact apparently was unknown until 8-year-old Armond Aserinsky went to bed one night in 1952. His father, Eugene, a University of Chicago graduate student, needed to test an electroencephalograph he had repaired that day (Aserinsky, 1988; Seligman & Yellen, 1987). Placing electrodes near Armond’s eyes to record the rolling eye movements then believed to occur during sleep, Aserinsky watched the machine go wild, tracing deep zigzags on the graph paper. Could the machine still be broken? As the night proceeded and the activity recurred, Aserinsky realized that the periods of fast, jerky eye movements were accompanied by energetic brain activity. Awakened during one such episode, Armond reported having a dream. Aserinsky had discovered what we now know as **REM sleep** (*rapid eye movement sleep*).

Similar procedures used with thousands of volunteers showed the cycles were a normal part of sleep (Kleitman, 1960). To appreciate these studies, imagine yourself as a participant. As the hour grows late, you feel sleepy and yawn in response to reduced brain metabolism. (Yawning, which can be socially contagious, stretches your neck muscles and increases your heart rate, which increases your alertness [Moorcroft, 2003].) When you are ready for bed, a researcher comes in and tapes electrodes to your scalp (to detect your brain waves), on your chin (to detect muscle tension), and just outside the corners of your eyes (to detect eye movements) (**FIGURE 3.6**). Other devices will record your heart rate, respiration rate, and genital arousal.

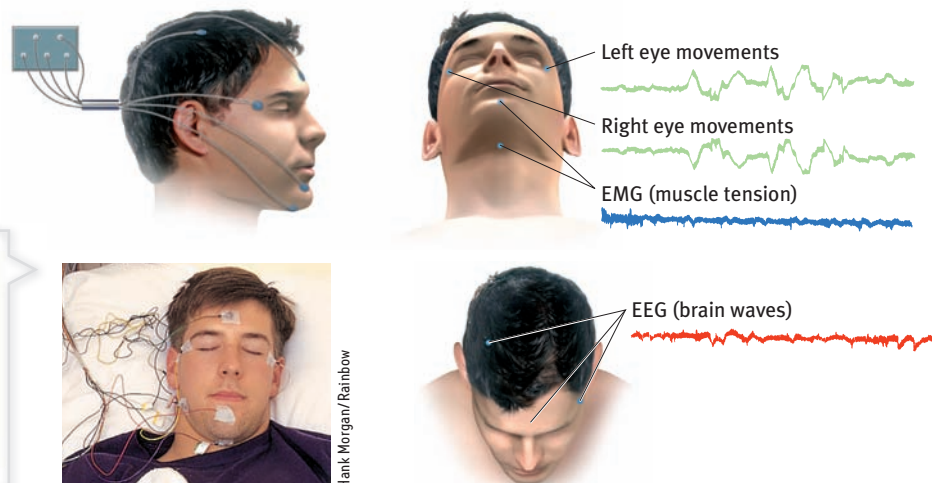


FIGURE 3.6

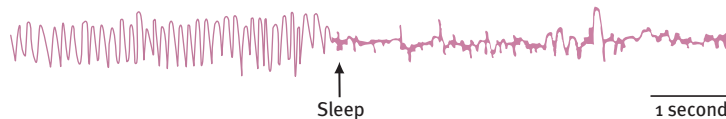
Measuring sleep activity Sleep researchers measure brain-wave activity, eye movements, and muscle tension by electrodes that pick up weak electrical signals from the brain, eyes, and facial muscles. (From Dement, 1978.)

When you are in bed with your eyes closed, the researcher in the next room sees on the EEG the relatively slow **alpha waves** of your awake but relaxed state (FIGURE 3.7). As you adapt to all this equipment, you grow tired and, in an unremembered moment, slip into **sleep** (FIGURE 3.8). The transition is marked by the slowed breathing and the irregular brain waves of non-REM stage 1 sleep. Using the new American Academy of Sleep Medicine classification of sleep stages, this is called NREM-1 sleep (Silber et al., 2008).

In one of his 15,000 research participants, William Dement (1999) observed the moment the brain's perceptual window to the outside world slammed shut. Dement asked this sleep-deprived young man, lying on his back with eyelids taped open, to press a button every time a strobe light flashed in his eyes (about every 6 seconds). After a few minutes the young man missed one. Asked why, he said, "Because there was no flash." But there was a flash. He missed it because (as his brain activity revealed) he had fallen asleep for 2 seconds, missing not only the flash 6 inches from his nose but also the awareness of the abrupt moment of entry into sleep.

During this brief NREM-1 sleep you may experience fantastic images resembling **hallucinations**—sensory experiences that occur without a sensory stimulus. You may have a sensation of falling (at which moment your body may suddenly jerk) or of floating weightlessly. These *hypnagogic* sensations may later be incorporated into your memories. People who claim to have been abducted by aliens—often shortly after getting into bed—commonly recall being floated off (or pinned down on) their beds (Clancy, 2005).

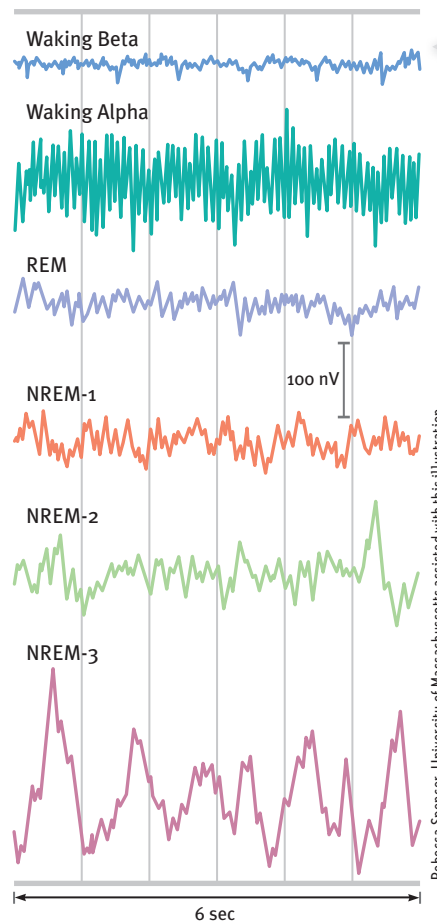
You then relax more deeply and begin about 20 minutes of NREM-2 sleep, with its periodic *sleep spindles*—bursts of rapid, rhythmic brain-wave activity (see Figure 3.7). Although you could still be awakened without too much difficulty, you are now clearly asleep.



Then you transition to the deep sleep of NREM-3. During this slow-wave sleep, which lasts for about 30 minutes, your brain emits large, slow **delta waves** and you are hard to awaken. (It is at the end of the deep, slow-wave NREM-3 sleep that children may wet the bed.)

REM Sleep

About an hour after you first fall asleep, a strange thing happens. Rather than continuing in deep slumber, you ascend from your initial sleep dive. Returning through NREM-2 (where you spend about half your night), you enter the most intriguing sleep phase—REM sleep (FIGURE 3.9 on the next page). For about 10 minutes, your brain waves become rapid and saw-toothed, more like those of the nearly awake NREM-1 sleep. But unlike NREM-1, during REM sleep your heart rate rises, your



Rebecca Spencer, University of Massachusetts assisted with this illustration.

FIGURE 3.7

Brain waves and sleep stages The beta waves of an alert, waking state and the regular alpha waves of an awake, relaxed state differ from the slower, larger delta waves of deep NREM-3 sleep. Although the rapid REM sleep waves resemble the near-waking NREM-1 sleep waves, the body is more aroused during REM sleep than during NREM sleep.

To catch your own hypnagogic experiences, you might use your alarm's snooze function.

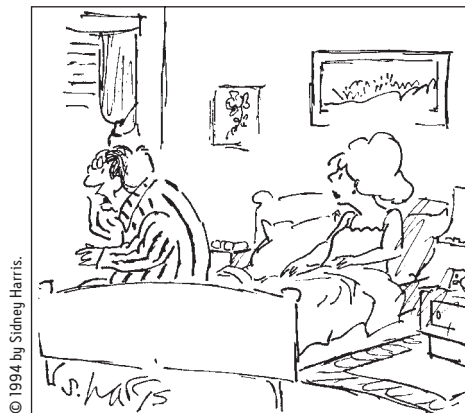
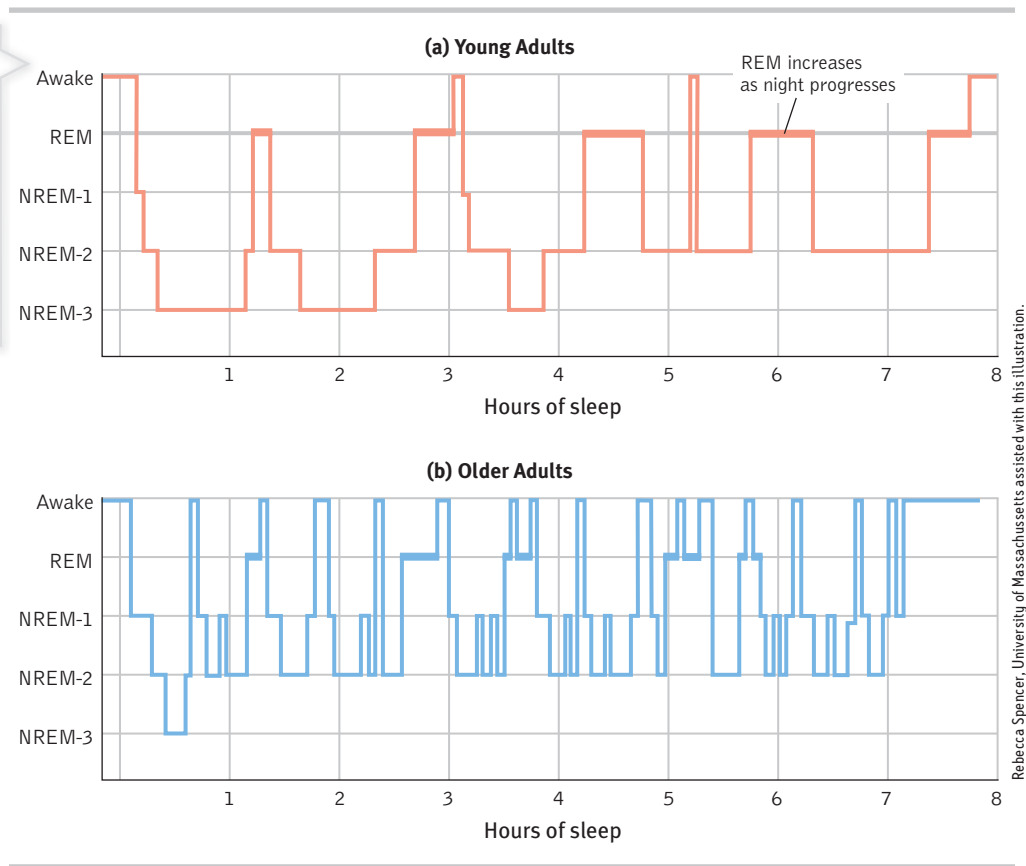
FIGURE 3.8

The moment of sleep We seem unaware of the moment we fall into sleep, but someone watching our brain waves could tell. (From Dement, 1999.)

People rarely snore during dreams. When REM starts, snoring stops.

FIGURE 3.9**The stages in a typical night's sleep**

People pass through a multistage sleep cycle several times each night, with the periods of deep sleep diminishing and REM sleep periods increasing in duration. As people age, sleep becomes more fragile, with awakenings common among older adults (Kamel et al., 2006; Neubauer, 1999).



“Boy are my eyes tired!
I had REM sleep all night long.”

breathing becomes rapid and irregular, and every half-minute or so your eyes dart around in momentary bursts of activity behind closed lids. These eye movements announce the beginning of a dream—often emotional, usually story-like, and richly hallucinatory. Because anyone watching a sleeper’s eyes can notice these REM bursts, it is amazing that science was ignorant of REM sleep until 1952.

Except during very scary dreams, your genitals become aroused during REM sleep. You have an erection or increased vaginal lubrication and clitoral engorgement, regardless of whether the dream’s content is sexual (Karacan et al., 1966). Men’s common “morning erection” stems from the night’s last REM period, often just before waking. In young men, sleep-related erections outlast REM periods,

lasting 30 to 45 minutes on average (Karacan et al., 1983; Schiavi & Schreiner-Engel, 1988). A typical 25-year-old man therefore has an erection during nearly half his night’s sleep, a 65-year-old man for one-quarter. Many men troubled by *erectile dysfunction* (impotence) have sleep-related erections, suggesting the problem is not between their legs.

Your brain’s motor cortex is active during REM sleep, but your brainstem blocks its messages. This leaves your muscles relaxed, so much so that, except for an occasional finger, toe, or facial twitch, you are essentially paralyzed. Moreover, you cannot easily be awakened. REM sleep is thus sometimes called *paradoxical* sleep: The body is internally aroused, with waking-like brain activity, yet asleep and externally calm.

Horses, which spend 92 percent of each day standing and can sleep standing, must lie down for REM sleep (Morrison, 2003).

RETRIEVE IT

- Why would communal sleeping provide added protection for those whose safety depends upon vigilance, such as these soldiers?

ANSWER: With each soldier cycling through the sleep stages independently, it is very likely that at any given time at least one of them will be awake or easily awakened in the event of a threat.

The sleep cycle repeats itself about every 90 minutes for younger adults (somewhat more frequently for older adults). As the night wears on, deep NREM-3 sleep grows shorter and disappears. The REM and NREM-2 sleep periods get longer (see Figure 3.9). By morning, we have spent 20 to 25 percent of an average night’s sleep—some 100 minutes—in REM sleep. Thirty-seven percent of people report rarely or never having dreams “that you can remember the next morning” (Moore, 2004). Yet even they will, more than 80 percent of the time, recall a dream after being awakened during REM sleep. We spend about 600 hours a year experiencing some 1500 dreams, or more than 100,000 dreams over a typical lifetime—dreams swallowed by the night but not acted out, thanks to REM’s protective paralysis.



Uriel Sinai/Getty Images

Safety in numbers?

RETRIEVE IT

- What are the four sleep stages, and in what order do we normally travel through those stages?
- Can you match the cognitive experience with the sleep stage?

1. NREM-1	a. story-like dreams
2. NREM-3	b. fleeting images
3. REM	c. minimal awareness

ANSWER: REM, NREM-1, NREM-2, NREM-3; normally we move through NREM-1, then NREM-2, then NREM-3, then back up through NREM-2 before we experience REM sleep.
ANSWERS: 1. b, 2. c, 3. a

suprachiasmatic nucleus a pair of cell clusters in the hypothalamus that responds to light-sensitive retinal proteins; causes pineal gland to increase or decrease production of melatonin, thus modifying our feelings of sleepiness.

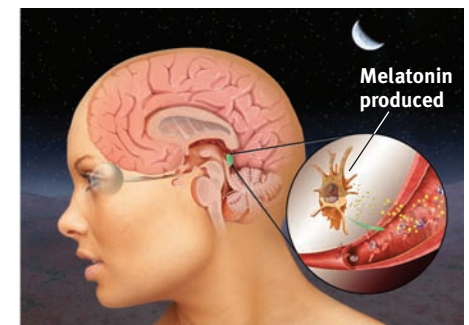
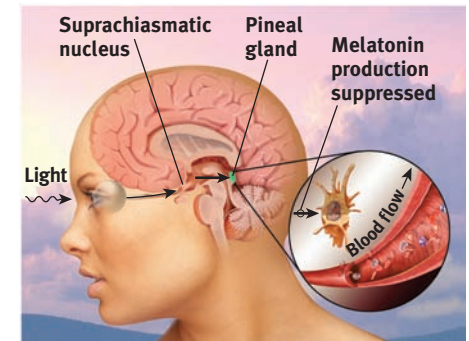


FIGURE 3.10
The biological clock Light striking the retina signals the suprachiasmatic nucleus (SCN) to suppress the pineal gland’s production of the sleep hormone melatonin. At night, the SCN quiets down, allowing the pineal gland to release melatonin into the bloodstream.

What Affects Our Sleep Patterns?



3-6: How do biology and environment interact in our sleep patterns?

The idea that “everyone needs 8 hours of sleep” is untrue. Newborns sleep nearly two-thirds of their day, most adults no more than one-third. Still, there is more to our sleep differences than age. Some of us thrive with fewer than 6 hours per night; others regularly rack up 9 hours or more. Such sleep patterns are genetically influenced (Hor & Tafti, 2009). In studies of fraternal and identical twins, only the identical twins had strikingly similar sleep patterns and durations (Webb & Campbell, 1983). Today’s researchers are discovering the genes that regulate sleep in humans and animals (Donlea et al., 2009; He et al., 2009).

In the United States and Canada, adults average 7 to 8 hours of sleep per night (Hurst, 2008; National Sleep Foundation, 2010; Robinson & Martin, 2009). North Americans are nevertheless sleeping less than their counterparts a century ago. Thanks to modern light bulbs, shift work, and social diversions, those who would have gone to bed at 9:00 P.M. are now up until 11:00 P.M. or later. With sleep, as with waking behavior, biology and environment interact.

Being bathed in light disrupts our 24-hour biological clock (Czeisler et al., 1999; Dement, 1999). Bright light affects our sleepiness by activating light-sensitive retinal proteins. This signals the brain’s **suprachiasmatic nucleus** to decrease production of *melatonin*, a sleep-inducing hormone (**FIGURE 3.10**). Our ancestors’ body clocks were

A circadian disadvantage: One study of a decade's 24,121 Major League Baseball games found that teams who had crossed three time zones before playing a multiday series had nearly a 60 percent chance of losing their first game (Winter et al., 2009).

attuned to the rising and setting Sun of the 24-hour day. Many of today's young adults adopt something closer to a 25-hour day, by staying up too late to get 8 hours of sleep. Most animals, too, when placed under unnatural constant illumination will exceed a 24-hour day.

Sleep often eludes those who stay up late and sleep in on weekends, and then go to bed earlier on Sunday to prepare for the new week ahead (Oren & Terman, 1998). For North Americans who fly to Europe and need to be up when their circadian rhythm cries “*SLEEP*,” bright light (spending the next day outdoors) helps reset the biological clock (Czeisler et al., 1986, 1989; Eastman et al., 1995).

RETRIEVE IT

- The _____ nucleus helps monitor the brain's release of melatonin, which affects our _____ rhythm.

ANSWERS: suprachiasmatic nucleus; circadian

Sleep Theories



3-7: What are sleep's functions?

So, our sleep patterns differ from person to person and from culture to culture. But why do we have this need for sleep? Psychologists offer five possible reasons why sleep evolved.

- 1. Sleep protects.** When darkness shut down the day's hunting, food gathering, and travel, our distant ancestors were better off asleep in a cave, out of harm's way. Those who didn't try to navigate around rocks and cliffs at night were more likely to leave descendants. This fits a broader principle: A species' sleep pattern tends to suit its ecological niche (Siegel, 2009). Animals with the greatest need to graze and the least ability to hide tend to sleep less. (For a sampling of animal sleep times, see **FIGURE 3.11**.)
- 2. Sleep helps us recuperate.** It helps restore and repair brain tissue. Bats and other animals with high waking metabolism burn a lot of calories, producing a lot of *free radicals*, molecules that are toxic to neurons. Sleeping a lot gives resting neurons time to repair themselves, while pruning or weakening unused connections (Gilestro et al., 2009; Siegel, 2003; Vyazovskiy et al., 2008). Think of it this way: When consciousness leaves your house, brain construction workers come in for a makeover.
- 3. Sleep helps restore and rebuild our fading memories of the day's experiences.** Sleep consolidates our memories—it strengthens and stabilizes neural memory traces (Racsmány et al., 2010; Rasch & Born, 2008). People trained to perform tasks therefore recall them better after a night's sleep, or even after a short nap, than after several hours awake (Stickgold & Ellenbogen, 2008). After sleeping well, older people remember more. And in both humans and rats, neural activity during slow-wave sleep re-enacts and promotes recall of prior novel experiences (Peigneux et al., 2004; Ribeiro et al., 2004). Sleep, it seems, strengthens memories in a way that being awake does not.
- 4. Sleep feeds creative thinking.** On occasion, dreams have inspired noteworthy literary, artistic, and scientific achievements, such as the dream that clued chemist August Kekulé to the structure of benzene (Ross, 2006). More commonplace is the boost that a complete night's sleep gives to our thinking and learning. After working on a task, then sleeping on it, people solve problems more insightfully than do those who

“Sleep faster, we need the pillows.”

Yiddish proverb

“Corduroy pillows make headlines.”

Anonymous

FIGURE 3.11

Animal sleep times Would you rather be a brown bat and sleep 20 hours a day or a giraffe and sleep 2 hours (data from NIH, 2010)?

Kruglov_Orda/Shutterstock; Courtesy of Andrew D. Myers; © Anna63/Dreamstime.com; Steffen Foerster Photography/Shutterstock; The Agency Collection/Punchstock; Eric Isselée/Shutterstock; pandapaw/Shutterstock



stay awake (Wagner et al., 2004). They also are better at spotting connections among novel pieces of information (Ellenbogen et al., 2007). To think smart and see connections, it often pays to sleep on it.

5. **Sleep supports growth.** During deep sleep, the pituitary gland releases a growth hormone necessary for muscle development. A regular full night's sleep can also “*dramatically* improve your athletic ability,” report James Maas and Rebecca Robbins (2010). Well-rested athletes have faster reaction times, more energy, and greater endurance. Teams that build 8 to 10 hours of daily sleep into their training show improved performance. As we age, we release less of this hormone and spend less time in deep sleep (Pekkanen, 1982).

Given all the benefits of sleep, it's no wonder that sleep loss hits us so hard.

RETRIEVE IT

- What five theories explain our need for sleep?

ANSWER: (1) Sleep has survival value. (2) Sleep helps restore and repair brain tissue. (3) During sleep we strengthen memory traces. (4) Sleep fuels creativity. (5) Sleep plays a role in the growth process.

Sleep Deprivation and Sleep Disorders



3-8: How does sleep loss affect us, and what are the major sleep disorders?

When our body yearns for sleep but does not get it, we begin to feel terrible. Trying to stay awake, we will eventually lose. In the tiredness battle, sleep always wins.

Effects of Sleep Loss

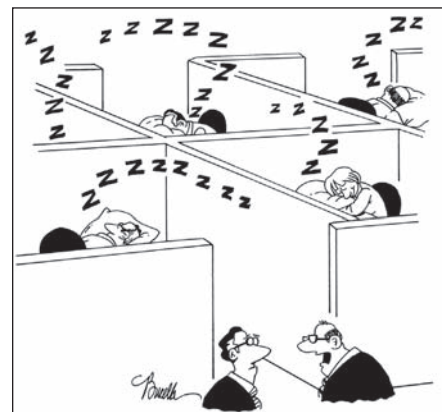
Today, more than ever, our sleep patterns leave us not only sleepy but drained of energy and feelings of well-being. After a succession of 5-hour nights, we accumulate a sleep debt that need not be entirely repaid but cannot be satisfied by one long sleep. “The brain keeps an accurate count of sleep debt for at least two weeks,” reported sleep researcher William Dement (1999, p. 64).

Obviously, then, we need sleep. Sleep commands roughly one-third of our lives—some 25 years, on average. Allowed to sleep unhindered, most adults will sleep at least 9 hours a night (Coren, 1996). With that much sleep, we awake refreshed, sustain better moods, and perform more efficient and accurate work. The U.S. Navy and the National Institutes of Health have demonstrated the benefits of unrestricted sleep in experiments in which volunteers spent 14 hours daily in bed for at least a week. For the first few days, the volunteers averaged 12 hours of sleep a day or more, apparently paying off a sleep debt that averaged 25 to 30 hours. That accomplished, they then settled back to 7.5 to 9 hours nightly and felt energized and happier (Dement, 1999). In one Gallup survey (Mason, 2005), 63 percent of adults who reported getting the sleep they needed also reported being “very satisfied” with their personal life (as did only 36 percent of those needing more sleep).

College and university students are especially sleep deprived; 69 percent in one national survey reported “feeling tired” or “having little energy” on several or more days in the last two weeks (AP, 2009). In another survey, 28 percent of high school students acknowledged falling asleep in class at least once a week (Sleep Foundation, 2006). When the going gets boring, the students start snoring.

Sleep loss is a predictor of depression. Researchers who studied 15,500 young people, 12 to 18 years old, found that those who slept 5 or fewer hours a night had a 71 percent higher risk of depression than their peers who slept 8 hours or more (Gangwisch et al., 2010). This link does not appear to reflect sleep difficulties *caused* by depression.

In 1989, Michael Doucette was named America's Safest Driving Teen. In 1990, while driving home from college, he fell asleep at the wheel and collided with an oncoming car, killing both himself and the other driver. Michael's driving instructor later acknowledged never having mentioned sleep deprivation and drowsy driving (Dement, 1999).



“Maybe ‘Bring Your Pillow To Work Day’ wasn’t such a good idea.”

When children and youth are followed through time, sleep loss predicts depression rather than vice versa (Gregory et al., 2009). Moreover, REM sleep's processing of emotional experiences helps protect against depression (Walker & van der Helm, 2009). After a good night's sleep, we often do feel better the next day. And that may help to explain why parentally enforced bedtimes predict less depression, and why pushing back school start time leads to improved adolescent sleep, alertness, and mood (Gregory et al., 2009; Owens et al., 2010).

Sleep-deprived students often function below their peak. And they know it: Four in five teens and three in five 18- to 29-year-olds wish they could get more sleep on weekdays (Mason, 2003, 2005). Yet that teen who staggers glumly out of bed in response to an unwelcome alarm, yawns through morning classes, and feels half-depressed much of the day may be energized at 11:00 P.M. and mindless of the next day's looming sleepiness (Carskadon, 2002). "Sleep deprivation has consequences—difficulty studying, diminished productivity, tendency to make mistakes, irritability, fatigue," noted Dement (1999, p. 231). A large sleep debt "makes you stupid."

"Remember to sleep because you have to sleep to remember."

James B. Maas and Rebecca S. Robbins, *Sleep for Success*, 2010

It can also make you gain weight. Sleep deprivation increases *ghrelin*, a hunger-arousing hormone, and decreases its hunger-suppressing partner, *leptin* (more on these in Chapter 10). It also increases *cortisol*, a stress hormone that stimulates the body to make fat. Sure enough, children and adults who sleep less than normal are fatter than those who sleep more (Chen et al., 2008; Knutson et al., 2007; Schoenborn & Adams, 2008). And experimental sleep deprivation of adults increases appetite and eating (Nixon et al., 2008; Patel et al., 2006; Spiegel et al., 2004; Van Cauter et al., 2007). This may help explain the common weight gain among sleep-deprived students (although a review of 11 studies reveals that the mythical "freshman 15" is, on average, closer to a "first-year 4" [Hull et al., 2007]).

Sleep affects our immune system. When infections set in, we typically sleep more, boosting our immune cells. Sleep deprivation can suppress the immune cells that battle viral infections and cancer (Motivala & Irwin, 2007). In one experiment, when researchers exposed volunteers to a cold virus, those who had been averaging less than 7 hours sleep a night were three times more likely to develop the cold than were those sleeping 8 or more hours a night (Cohen et al., 2009). Sleep's protective effect may help explain why people who sleep 7 to 8 hours a night tend to outlive those who are chronically sleep deprived, and why older adults who have no difficulty falling or staying asleep tend to live longer than their sleep-deprived agemates (Dement, 1999; Dew et al., 2003).

Sleep deprivation slows reactions and increases errors on visual attention tasks similar to those involved in screening airport baggage, performing surgery, and reading X-rays (Lim & Dinges, 2010). When sleepy frontal lobes confront an unexpected situation, misfortune often results. Consider the timing of the 1989 *Exxon Valdez* oil spill; Union Carbide's 1984 Bhopal, India, disaster; and the 1979 Three Mile Island and 1986 Chernobyl nuclear accidents: All occurred after midnight, when operators in charge were likely to be drowsiest and unresponsive to signals requiring an alert response. Slow responses can also spell disaster for those operating equipment, piloting, or driving. Driver fatigue has contributed to an estimated 20 percent of American traffic accidents (Brody, 2002) and to some 30 percent of Australian highway deaths (Maas, 1999).

Stanley Coren capitalized on what is, for many North Americans, a semi-annual sleep-manipulation experiment—the "spring forward" to "daylight savings" time and "fall backward" to "standard" time. Searching millions of records, Coren found that in both Canada and the United States, accidents increased immediately after the time change that shortens sleep (FIGURE 3.12).

FIGURE 3.13 summarizes the effects of sleep deprivation. But there is good news! Psychologists have discovered a treatment that strengthens memory, increases concentration, boosts mood, moderates hunger and obesity, fortifies the disease-fighting immune system, and lessens the risk of fatal accidents. Even better news: The treatment feels

insomnia recurring problems in falling or staying asleep.

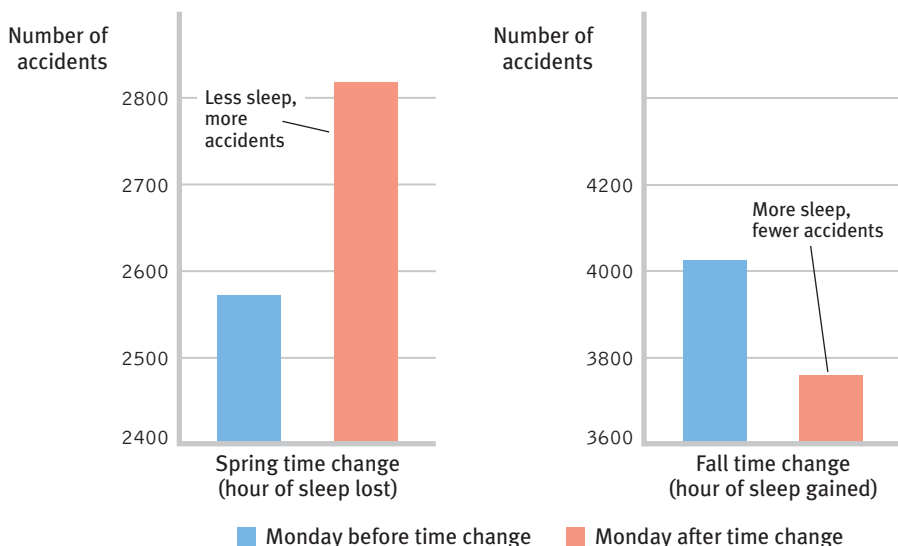


FIGURE 3.12

Canadian traffic accidents On the Monday after the spring time change, when people lose one hour of sleep, accidents increased, as compared with the Monday before. In the fall, traffic accidents normally increase because of greater snow, ice, and darkness, but they diminished after the time change. (Adapted from Coren, 1996.)

good, it can be self-administered, the supplies are limitless, and it's free! If you are a typical university-age student, often going to bed near 2:00 A.M. and dragged out of bed 6 hours later by the dreaded alarm, the treatment is simple: Each night just add an hour to your sleep.

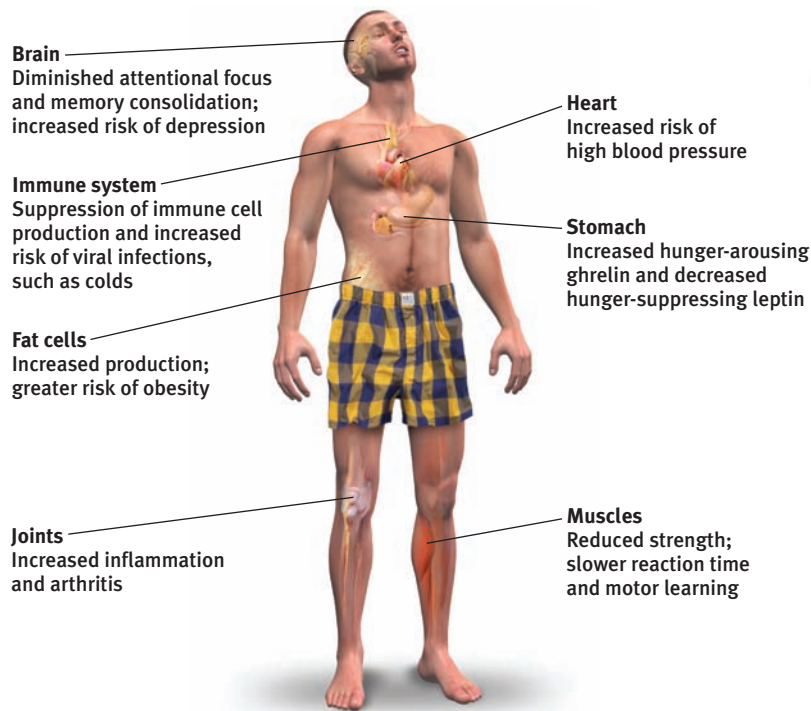


FIGURE 3.13

How sleep deprivation affects us

Major Sleep Disorders

No matter what their normal need for sleep, 1 in 10 adults, and 1 in 4 older adults, complain of **insomnia**—not an occasional inability to sleep when anxious or excited, but persistent problems in falling or staying asleep (Irwin et al., 2006).



Mark Parisi/offthemark.com



AP Photo/Paul Sakuma, File

Economic recession and stress can rob sleep A National Sleep Foundation (2009) survey found 27 percent of people reporting sleeplessness related to the economy, their personal finances, and employment, as seems evident in this man looking for work.

“The lion and the lamb shall lie down together, but the lamb will not be very sleepy.”

Woody Allen, in the movie *Love and Death*, 1975

“Sleep is like love or happiness. If you pursue it too ardently it will elude you.”

Wilde Webb, *Sleep: The Gentle Tyrant*, 1992



Did Brahms need his own lullabies? Cranky, overweight, and nap-prone, classical composer Johannes Brahms exhibited common symptoms of sleep apnea (Margolis, 2000).

The Granger Collection, New York

From middle age on, awakening occasionally during the night becomes the norm, not something to fret over or treat with medication (Vitiello, 2009). Ironically, insomnia is worsened by fretting about one’s insomnia. In laboratory studies, insomnia complainers do sleep less than others, but they typically overestimate—by about double—how long it takes them to fall asleep. They also underestimate by nearly half how long they actually have slept. Even if we have been awake only an hour or two, we may *think* we have had very little sleep because it’s the waking part we remember.

The most common quick fixes for true insomnia—sleeping pills and alcohol—can aggravate the problem, reducing REM sleep and leaving the person with next-day blahs. Such aids can also lead to *tolerance*—a state in which increasing doses are needed to produce an effect. An ideal sleep aid would mimic the natural chemicals abundant during sleep, reliably producing sound sleep without side effects. Until scientists can supply this magic pill, sleep experts have offered some tips for getting better quality sleep (**TABLE 3.1**).

Falling asleep is not the problem for people with **narcolepsy** (from *narco*, “numbness,” and *lepsy*, “seizure”), who have sudden attacks of overwhelming sleepiness, usually lasting less than 5 minutes. Narcolepsy attacks can occur at the most inopportune times, perhaps just after taking a terrific swing at a softball or when laughing loudly, shouting angrily, or having sex (Dement, 1978, 1999). In severe cases, the person collapses directly into a brief period of REM sleep, with loss of muscular tension. People with narcolepsy—1 in 2000 of us, estimated the Stanford University Center for Narcolepsy (2002)—must therefore live with extra caution. As a traffic menace, “snoozing is second only to boozing,” says the American Sleep Disorders Association, and those with narcolepsy are especially at risk (Aldrich, 1989).

Although 1 in 20 of us have **sleep apnea**, it was unknown before modern sleep research. *Apnea* means “with no breath,” and people with this condition intermittently stop breathing during sleep. After an airless minute or so, decreased blood oxygen arouses them and they wake up enough to snort in air for a few seconds, in a process that repeats hundreds of times each night, depriving them of slow-wave sleep. Apnea sufferers don’t recall these episodes the next day. So, despite feeling fatigued and depressed—and hearing their mate’s complaints about their loud “snoring”—many are unaware of their disorder (Peppard et al., 2006).

Sleep apnea is associated with obesity, and as the number of obese Americans has increased, so has sleep apnea, particularly among overweight men, including some football players (Keller, 2007). In addition to loud snoring, other warning signs are daytime sleepiness, irritability, and (possibly) high blood pressure, which increases the risk of a stroke or heart attack (Dement, 1999). If one doesn’t mind looking a little goofy in the

Table 3.1
Some Natural Sleep Aids

- Exercise regularly but not in the late evening. (Late afternoon is best.)
- Avoid caffeine after early afternoon, and avoid food and drink near bedtime. The exception would be a glass of milk, which provides raw materials for the manufacture of serotonin, a neurotransmitter that facilitates sleep.
- Relax before bedtime, using dimmer light.
- Sleep on a regular schedule (rise at the same time even after a restless night) and avoid naps.
- Hide the clock face so you aren’t tempted to check it repeatedly.
- Reassure yourself that temporary sleep loss causes no great harm.
- Realize that for any stressed organism, being vigilant is natural and adaptive. A personal conflict during the day often means a fitful sleep that night (Åkerstedt et al., 2007; Brissette & Cohen, 2002). Managing your stress levels will enable more restful sleeping. (See Chapter 11 for more on stress.)
- If all else fails, settle for less sleep, either going to bed later or getting up earlier.

dark, the treatment—a masklike device with an air pump that keeps the sleeper’s airway open (imagine a snorkeler at a slumber party)—can effectively relieve apnea symptoms.

Unlike sleep apnea, **night terrors** target mostly children, who may sit up or walk around, talk incoherently, experience doubled heart and breathing rates, and appear terrified (Hartmann, 1981). They seldom wake up fully during an episode and recall little or nothing the next morning—at most, a fleeting, frightening image. Night terrors are not nightmares (which, like other dreams, typically occur during early morning REM sleep); night terrors usually occur during the first few hours of NREM-3.

Sleepwalking—another NREM-3 sleep disorder—and **sleeptalking** are usually childhood disorders and, like narcolepsy, they run in families. (Sleeptalking—usually garbled or nonsensical—can occur during any sleep stage [Mahowald & Ettinger, 1990].) Occasional childhood sleepwalking occurs for about one-third of those with a sleepwalking fraternal twin and half of those with a sleepwalking identical twin. The same is true for sleeptalking (Hublin et al., 1997, 1998). Sleepwalking is usually harmless. After returning to bed on their own or with the help of a family member, few sleepwalkers recall their trip the next morning. About 20 percent of 3- to 12-year-olds have at least one episode of sleepwalking, usually lasting 2 to 10 minutes; some 5 percent have repeated episodes (Giles et al., 1994). Young children, who have the deepest and lengthiest NREM-3 sleep, are the most likely to experience both night terrors and sleepwalking. As we grow older and deep NREM-3 sleep diminishes, so do night terrors and sleepwalking. After being sleep deprived, we sleep more deeply, which increases any tendency to sleepwalk (Zadra et al., 2008).

Dreams

Now playing at an inner theater near you: the premiere showing of a sleeping person’s vivid dream. This never-before-seen mental movie features captivating characters wrapped in a plot so original and unlikely, yet so intricate and so seemingly real, that the viewer later marvels at its creativity.

Waking from a troubling dream, wrenched by its emotions, who among us has not wondered about this weird state of consciousness? How can our brain so creatively, colorfully, and completely construct this alternative world? In the shadowland between our dreaming and waking consciousness, we may even wonder for a moment which is real.

Discovering the link between REM sleep and dreaming opened a new era in dream research. Instead of relying on someone’s hazy recall hours or days after having a dream, researchers could catch dreams as they happened. They could awaken people during or within 3 minutes after a REM sleep period and hear a vivid account.

What We Dream



3-9: What do we dream?

Daydreams tend to involve the familiar details of our life—perhaps picturing ourselves explaining to an instructor why a paper will be late, or replaying in our minds personal encounters we relish or regret. **REM dreams**—“hallucinations of the sleeping mind” (Loftus & Ketcham, 1994, p. 67)—are vivid, emotional, and bizarre—so vivid we may confuse them with reality. Awakening from a nightmare, a 4-year-old may be sure there is a bear in the house.

We spend 6 years of our life in dreams, many of which are anything but sweet. For both women and men, 8 in 10 dreams are marked by at least one negative event or emotion (Domhoff, 2007). Common themes are repeatedly failing in an attempt to do something; being attacked, pursued, or rejected; or experiencing misfortune (Hall et al., 1982). Dreams with sexual imagery occur less often than you might think. In one study, only 1 in 10 dreams among young men and 1 in 30 among young women had sexual content (Domhoff, 1996). More commonly, a dream’s story line incorporates traces of previous days’ nonsexual experiences and preoccupations (De Koninck, 2000):

narcolepsy a sleep disorder characterized by uncontrollable sleep attacks. The sufferer may lapse directly into REM sleep, often at inopportune times.

sleep apnea a sleep disorder characterized by temporary cessations of breathing during sleep and repeated momentary awakenings.

night terrors a sleep disorder characterized by high arousal and an appearance of being terrified; unlike nightmares, night terrors occur during NREM-3 sleep, within two or three hours of falling asleep, and are seldom remembered.

dream a sequence of images, emotions, and thoughts passing through a sleeping person’s mind. Dreams are notable for their hallucinatory imagery, discontinuities, and incongruities, and for the dreamer’s delusional acceptance of the content and later difficulties remembering it.



Photofest/Warner Bros. Pictures

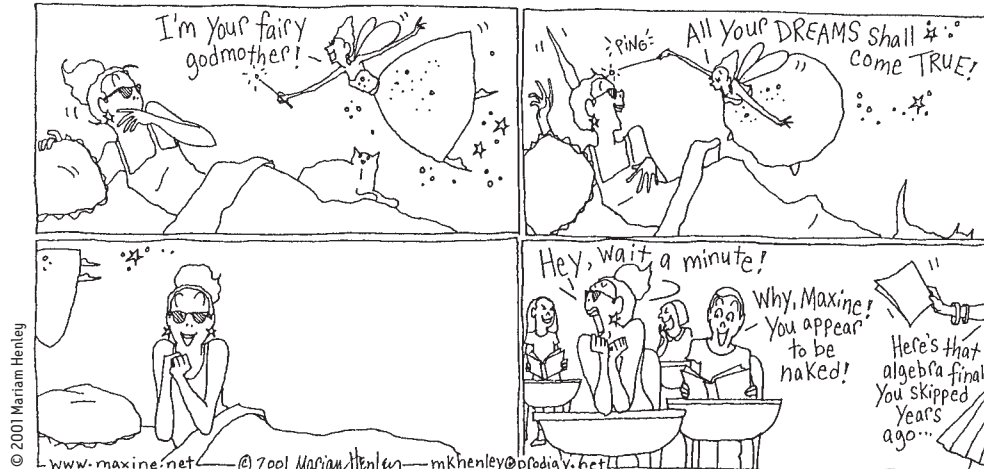
A dreamy take on dreamland The 2010 movie *Inception* creatively plays off our interest in finding meaning in our dreams and in understanding the layers of our consciousness. It further explores the idea of creating false memories through the power of suggestion—an idea we will explore in Chapter 8.

“I do not believe that I am now dreaming, but I cannot prove that I am not.”

*Philosopher Bertrand Russell
(1872–1970)*

Would you suppose that people dream if blind from birth? Studies in France, Hungary, Egypt, and the United States all found blind people dreaming of using their nonvisual senses—hearing, touching, smelling, tasting (Buquet, 1988; Taha, 1972; Vekassy, 1977).

MAXINE



“For what one has dwelt on by day, these things are seen in visions of the night.”

*Menander of Athens (342–292 B.C.E.),
Fragments*

A popular sleep myth: If you dream you are falling and hit the ground (or if you dream of dying), you die. (Unfortunately, those who could confirm these ideas are not around to do so. Some people, however, have had such dreams and are alive to report them.)

“Follow your dreams, except for that one where you’re naked at work.”

Attributed to Henny Youngman

- After suffering a trauma, people commonly report nightmares, which help extinguish daytime fears (Levin & Nielsen, 2007, 2009). One sample of Americans recording their dreams during September 2001 reported an increase in threatening dreams following the 9/11 attacks (Propper et al., 2007).
- After playing the computer game *Tetris* for 7 hours and then being awakened repeatedly during their first hour of sleep, 3 in 4 people reported experiencing images of the game’s falling blocks (Stickgold et al., 2000).
- Compared with city dwellers, people in hunter-gatherer societies more often dream of animals (Mestel, 1997). Compared with nonmusicians, musicians report twice as many dreams of music (Uga et al., 2006).

Our two-track mind continues to monitor our environment while we sleep. Sensory stimuli—a particular odor or a phone’s ringing—may be instantly and ingeniously woven into the dream story. In a classic experiment, researchers lightly sprayed cold water on dreamers’ faces (Dement & Wolpert, 1958). Compared with sleepers who did not get the cold-water treatment, these people were more likely to dream about a waterfall, a leaky roof, or even about being sprayed by someone.

So, could we learn a foreign language by hearing it played while we sleep? If only it were so easy. While sleeping, we can learn to associate a sound with a mild electric shock (and to react to the sound accordingly). But we do not remember recorded information played while we are soundly asleep (Eich, 1990; Wyatt & Bootzin, 1994). In fact, anything that happens during the 5 minutes just before we fall asleep is typically lost from memory (Roth et al., 1988). This explains why sleep apnea patients, who repeatedly awaken with a gasp and then immediately fall back to sleep, do not recall the episodes. It also explains why dreams that momentarily awaken us are mostly forgotten by morning. To remember a dream, get up and stay awake for a few minutes.

Why We Dream



3-10: What are the functions of dreams?

Dream theorists have proposed several explanations of why we dream, including these five:

To satisfy our own wishes. In 1900, in his landmark book *The Interpretation of Dreams*, Sigmund Freud offered what he thought was “the most valuable of all the discoveries it has been my good fortune to make.” He proposed that dreams provide a psychic safety valve that discharges otherwise unacceptable feelings. He viewed a dream’s **manifest**

content (the apparent and remembered story line) as a censored, symbolic version of its **latent content**, the unconscious drives and wishes that would be threatening if expressed directly. Although most dreams have no overt sexual imagery, Freud nevertheless believed that most adult dreams could be “traced back by analysis to erotic wishes.” Thus, a gun might be a disguised representation of a penis.

Freud considered dreams the key to understanding our inner conflicts. However, his critics say it is time to wake up from Freud’s dream theory, which is a scientific nightmare. Based on the accumulated science, “there is no reason to believe any of Freud’s specific claims about dreams and their purposes,” observed dream researcher William Domhoff (2003). Some contend that even if dreams are symbolic, they could be interpreted any way one wished. Others maintain that dreams hide nothing. A dream about a gun is a dream about a gun. Legend has it that even Freud, who loved to smoke cigars, acknowledged that “sometimes, a cigar is just a cigar.” Freud’s wish-fulfillment theory of dreams has in large part given way to other theories.

To file away memories. The *information-processing* perspective proposes that dreams may help sift, sort, and fix the day’s experiences in our memory. Some studies support this view. When tested the day after learning a task, those who had been deprived of both slow-wave and REM sleep did not do as well as those who had slept undisturbed on their new learning (Stickgold et al., 2000, 2001). In other studies, people who heard unusual phrases or learned to find hidden visual images before bedtime remembered less the next morning if they had been awakened every time they began REM sleep than if awakened during other sleep stages (Empson & Clarke, 1970; Karni & Sagi, 1994).

Brain scans confirm the link between REM sleep and memory. The brain regions that buzzed as rats learned to navigate a maze, or as people learned to perform a visual-discrimination task, buzzed again during later REM sleep (Louie & Wilson, 2001; Maquet, 2001). So precise were these activity patterns that scientists could tell where in the maze the rat would be if awake. Some, however, are unpersuaded by these studies, noting that memory consolidation may also occur during non-REM sleep (Siegel, 2001; Vertes & Siegel, 2005). This much seems true: A night of solid sleep (and dreaming) has an important place in our lives. To sleep, perchance to remember.

This is important news for students, many of whom, observed researcher Robert Stickgold (2000), suffer from a kind of sleep bulimia—binge sleeping on the weekend. “If you don’t get good sleep and enough sleep after you learn new stuff, you won’t integrate it effectively into your memories,” he warned. That helps explain why secondary students with high grades have averaged 25 minutes more sleep a night than their lower-achieving classmates (Wolfson & Carskadon, 1998).

To develop and preserve neural pathways. Perhaps dreams, or the brain activity associated with REM sleep, serve a *physiological* function, providing the sleeping brain with periodic stimulation. This theory makes developmental sense. As you will see in Chapter 4, stimulating experiences preserve and expand the brain’s neural pathways.

To make sense of neural static. Other theories propose that dreams erupt from *neural activation* spreading upward from the brainstem (Antrobus, 1991; Hobson, 2003, 2004, 2009). According to one version, dreams are the brain’s attempt to make sense of random neural activity. Much as a neurosurgeon can produce hallucinations by stimulating different parts of a patient’s cortex, so can stimulation originating within the brain. These internal stimuli activate brain areas that process visual images, but not the visual cortex area, which receives raw input from the eyes. As Freud might have expected, PET scans of sleeping people also reveal increased activity in the emotion-related limbic system (in the amygdala) during REM sleep. In contrast, frontal lobe regions responsible for inhibition and logical thinking seem to idle, which may explain why our dreams are less inhibited than we are when awake (Maquet et al., 1996). Add the limbic system’s emotional tone to the brain’s visual bursts and—Voilà!—we dream. Damage either the limbic system or the visual centers active during dreaming, and dreaming itself may be impaired (Domhoff, 2003).

manifest content according to Freud, the remembered story line of a dream (as distinct from its latent, or hidden, content).

latent content according to Freud, the underlying meaning of a dream (as distinct from its manifest content).

“When people interpret [a dream] as if it were meaningful and then sell those interpretations, it’s quackery.”

*Sleep researcher
J. Allan Hobson (1995)*

Rapid eye movements also stir the liquid behind the cornea; this delivers fresh oxygen to corneal cells, preventing their suffocation.

Question: Does eating spicy foods cause one to dream more?

Answer: Any food that causes you to awaken more increases your chance of recalling a dream (Moorcroft, 2003).

Table 3.2
Dream Theories

Theory	Explanation	Critical Considerations
<i>Freud's wish-fulfillment</i>	Dreams provide a “psychic safety valve”—expressing otherwise unacceptable feelings; contain manifest (remembered) content and a deeper layer of latent content (a hidden meaning).	Lacks any scientific support; dreams may be interpreted in many different ways.
<i>Information-processing</i>	Dreams help us sort out the day's events and consolidate our memories.	But why do we sometimes dream about things we have not experienced?
<i>Physiological function</i>	Regular brain stimulation from REM sleep may help develop and preserve neural pathways.	This does not explain why we experience <i>meaningful</i> dreams.
<i>Neural activation</i>	REM sleep triggers neural activity that evokes random visual memories, which our sleeping brain weaves into stories.	The individual's brain is weaving the stories, which still tells us something about the dreamer.
<i>Cognitive development</i>	Dream content reflects dreamers' cognitive development—their knowledge and understanding.	Does not address the neuroscience of dreams.

To reflect cognitive development. Some dream researchers dispute both the Freudian and neural activation theories, preferring instead to see dreams as part of brain maturation and cognitive development (Domhoff, 2010, 2011; Foulkes, 1999). For example, prior to age 9, children's dreams seem more like a slide show and less like an active story in which the dreamer is an actor. Dreams overlap with waking cognition and feature coherent speech. They simulate reality by drawing on our concepts and knowledge. They engage brain networks that also are active during daydreaming. Unlike the idea that dreams arise from bottom-up brain activation, the cognitive perspective emphasizes our mind's top-down control of our dream content (Nir & Tononi, 2010).

TABLE 3.2 compares these major dream theories. Although sleep researchers debate dreams' functions—and some are skeptical that dreams serve any function—there is one thing they agree on: We need REM sleep. Deprived of it by repeatedly being awakened, people return more and more quickly to the REM stage after falling back to sleep. When finally allowed to sleep undisturbed, they literally sleep like babies—with increased REM sleep, a phenomenon called **REM rebound**. Withdrawing REM-suppressing sleeping medications also increases REM sleep, but with accompanying nightmares.

Most other mammals also experience REM rebound, suggesting that the causes and functions of REM sleep are deeply biological. That REM sleep occurs in mammals—and not in animals such as fish, whose behavior is less influenced by learning—also fits the information-processing theory of dreams.

So does this mean that because dreams serve physiological functions and extend normal cognition, they are psychologically meaningless? Not necessarily. Every psychologically meaningful experience involves an active brain. We are once again reminded of a basic principle: *Biological and psychological explanations of behavior are partners, not competitors.*

Dreams are a fascinating altered state of consciousness. But they are not the only altered states. Hypnosis and drugs also alter conscious awareness.

RETRIEVE IT

- What five theories explain why we dream?

ANSWER: (1) Freud's wish-fulfillment (dreams as a psychic safety valve), (2) information-processing (dreams sort the day's events and form memories), (3) physiological function (dreams pave neural pathways), (4) neural activation (REM sleep triggers random neural activity that the mind weaves into stories), (5) cognitive development (dreams reflect the dreamer's developmental stage)

Hypnosis



3-11: What is hypnosis, and what powers does a hypnotist have over a hypnotized subject?

Imagine you are about to be hypnotized. The hypnotist invites you to sit back, fix your gaze on a spot high on the wall, and relax. In a quiet voice the hypnotist suggests, “Your eyes are growing tired. . . . Your eyelids are becoming heavy . . . now heavier and heavier. . . . They are beginning to close. . . . You are becoming more deeply relaxed. . . . Your breathing is now deep and regular. . . . Your muscles are becoming more and more relaxed. Your whole body is beginning to feel like lead.”

After a few minutes of this *hypnotic induction*, you may experience **hypnosis**. When the hypnotist suggests, “Your eyelids are shutting so tight that you cannot open them even if you try,” it may indeed seem beyond your control to open your eyelids. Told to forget the number 6, you may be puzzled when you count 11 fingers on your hands. Invited to smell a sensuous perfume that is actually ammonia, you may linger delightedly over its pungent odor. Told that you cannot see a certain object, such as a chair, you may indeed report that it is not there, although you manage to avoid the chair when walking around (illustrating the *dual processing* talents of that mind of yours).

But is hypnosis really an *altered* state of consciousness? Let’s start with some frequently asked questions.

Frequently Asked Questions About Hypnosis

Hypnotists have no magical mind-control power. Their power resides in the subjects’ openness to suggestion and ability to focus (Bowers, 1984). But how open to suggestions are we?

- **Can anyone experience hypnosis?** To some extent, we are all open to suggestion.

When people stand upright with their eyes closed and are told that they are swaying back and forth, most will indeed sway a little. In fact, *postural sway* is one of the items assessed on the Stanford Hypnotic Susceptibility Scale. People who respond to such suggestions without hypnosis are the same people who respond with hypnosis (Kirsch & Braffman, 2001).

Highly hypnotizable people—say, the 20 percent who can carry out a suggestion not to smell or react to a bottle of ammonia held under their nose—typically become deeply absorbed in imaginative activities (Barnier & McConkey, 2004; Silva & Kirsch, 1992). Many researchers refer to this as hypnotic *ability*—the ability to focus attention totally on a task, to become imaginatively absorbed in it, to entertain fanciful possibilities.

- **Can hypnosis enhance recall of forgotten events?** Most people believe (wrongly, as Chapter 8 will explain) that our experiences are all “in there,” recorded in our brain and available for recall if only we can break through our own defenses (Loftus, 1980). But 60 years of memory research disputes such beliefs. We do not encode everything that occurs around us. We permanently store only some of our experiences, and we may be unable to retrieve some memories we have stored.

“Hypnotically refreshed” memories combine fact with fiction. Since 1980, thousands of people have reported being abducted by UFOs, but most such reports have come from people who are predisposed to believe in aliens, are highly hypnotizable, and have undergone hypnosis (Newman & Baumeister, 1996; Nickell, 1996). Without either person being aware of what is going on, a hypnotist’s hints—“Did you hear loud noises?”—can plant ideas that become the subject’s pseudomemory.

So should testimony obtained under hypnosis be admissible in court? American, Australian, and British courts have agreed it should not. They generally ban testimony from witnesses who have been hypnotized (Druckman & Bjork, 1994; Gibson, 1995; McConkey, 1995).

REM rebound the tendency for REM sleep to increase following REM sleep deprivation (created by repeated awakenings during REM sleep).

hypnosis a social interaction in which one person (the hypnotist) suggests to another (the subject) that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur.

“Hypnosis is not a psychological truth serum and to regard it as such has been a source of considerable mischief.”

Researcher Kenneth Bowers (1987)

See Chapter 8 for a more detailed discussion of how people may construct false memories.

“It wasn’t what I expected. But facts are facts, and if one is proved to be wrong, one must just be humble about it and start again.”

Agatha Christie’s Miss Marple



044/ZUMA Press/Newscom

Stage hypnotist

- **Can hypnosis force people to act against their will?** Researchers have induced hypnotized people to perform an apparently dangerous act: plunging one hand briefly into fuming “acid,” then throwing the “acid” in a researcher’s face (Orne & Evans, 1965). Interviewed a day later, these people emphatically denied their acts and said they would never follow such orders.

Had hypnosis given the hypnotist a special power to control others against their will? To find out, researchers Martin Orne and Frederick Evans unleashed that enemy of so many illusory beliefs—the control group. Orne asked other individuals to *pretend* they were hypnotized. Laboratory assistants, unaware that those in the experiment’s control group had not been hypnotized, treated both groups the same. The result? All the *unhypnotized* participants (perhaps believing that the laboratory context assured safety) performed the same acts as those who were hypnotized.

- **Can hypnosis help people heal or relieve their pain?** *Hypnotherapists* try to help patients harness their own healing powers (Baker, 1987). **Posthypnotic suggestions** have helped alleviate headaches, asthma, and stress-related skin disorders.

In one statistical digest of 18 studies, the average client whose therapy was supplemented with hypnosis showed greater improvement than 70 percent of other therapy patients (Kirsch et al., 1995, 1996). Hypnosis seemed especially helpful for the treatment of obesity. However, drug, alcohol, and smoking addictions have not responded well to hypnosis (Nash, 2001). In controlled studies, hypnosis did speed the disappearance of warts, but so did the same positive suggestions given without hypnosis (Spanos, 1991, 1996).

Hypnosis *can* relieve pain (Druckman & Bjork, 1994; Jensen, 2008). When un hypnotized people put their arm in an ice bath, they felt intense pain within 25 seconds. When hypnotized people did the same after being given suggestions to feel no pain, they indeed reported feeling little pain. As some dentists know, light hypnosis can reduce fear, thus reducing hypersensitivity to pain.

Hypnosis inhibits pain-related brain activity. In surgical experiments, hypnotized patients have required less medication, recovered sooner, and left the hospital earlier than un hypnotized control patients (Askay & Patterson, 2007; Hammond, 2008; Spiegel, 2007). Nearly 10 percent of us can become so deeply hypnotized that even major surgery can be performed without anesthesia. Half of us can gain at least some pain relief from hypnosis. The surgical use

of hypnosis has flourished in Europe, where one Belgian medical team has performed more than 5000 surgeries with a combination of hypnosis, local anesthesia, and a mild sedative (Song, 2006).

RETRIEVE IT

- When is the use of hypnosis potentially harmful, and when can hypnosis be used to help?

ANSWER: Hypnosis can be harmful if used to “hypnotically refresh” memories, which may plant false memories. But posthypnotic suggestions have helped alleviate some ailments, and hypnosis can also help control pain.

Explaining the Hypnotized State



3-12: Is hypnosis an extension of normal consciousness or an altered state?

posthypnotic suggestion a suggestion, made during a hypnosis session, to be carried out after the subject is no longer hypnotized; used by some clinicians to help control undesired symptoms and behaviors.

We have seen that hypnosis involves heightened suggestibility. We have also seen that hypnotic procedures do not endow a person with special powers but can sometimes help people overcome stress-related ailments and cope with pain. So, just what is hypnosis? Psychologists have proposed two explanations.

Hypnosis as a Social Phenomenon

Our attentional spotlight and interpretations powerfully influence our ordinary perceptions. Might hypnotic phenomena reflect such workings of normal consciousness, as well as the power of social influence (Lynn et al., 1990; Spanos & Coe, 1992)? Advocates of the *social influence theory of hypnosis* believe they do.

Does this mean that subjects consciously fake hypnosis? No—like actors caught up in their roles, they begin to feel and behave in ways appropriate for “good hypnotic subjects.” The more they like and trust the hypnotist, the more they allow that person to direct their attention and fantasies (Gfeller et al., 1987). “The hypnotist’s ideas become the subject’s thoughts,” explained Theodore Barber (2000), “and the subject’s thoughts produce the hypnotic experiences and behaviors.” Told to scratch their ear later when they hear the word *psychology*, subjects will likely do so—but only if they think the experiment is still under way. If an experimenter eliminates their motivation for acting hypnotized—by stating that hypnosis reveals their “gullibility”—subjects become unresponsive. Such findings support the idea that hypnotic phenomena are an extension of normal social and cognitive processes.

These views illustrate a principle that Chapter 13 emphasizes: *An authoritative person in a legitimate context can induce people—hypnotized or not—to perform some unlikely acts.* Or as hypnosis researcher Nicholas Spanos (1982) put it, “The overt behaviors of hypnotic subjects are well within normal limits.”

Hypnosis as Divided Consciousness

Other hypnosis researchers believe hypnosis is more than inducing someone to play the role of “good subject.” How, they ask, can we explain why hypnotized subjects sometimes carry out suggested behaviors on cue, even when they believe no one is watching (Perugini et al., 1998)? And why does distinctive brain activity accompany hypnosis (Oakley & Halligan, 2009)? In one experiment, deeply hypnotized people were asked to imagine a color, and areas of their brain activated as if they were really seeing the color. To the hypnotized person’s brain, mere imagination had become a compelling hallucination (Kosslyn et al., 2000).

These results would not have surprised famed researcher Ernest Hilgard (1986, 1992), who believed hypnosis involves not only social influence but also a special dual-processing state of **dissociation**—a split between different levels of consciousness. Hilgard viewed hypnotic dissociation as a vivid form of everyday mind splits—similar to doodling while listening to a lecture or typing the end of a sentence while starting a conversation. For example, Hilgard felt that when hypnotized people lower their arm into an ice bath, as in **FIGURE 3.14**, the hypnosis dissociates the sensation of the pain stimulus (of which the subjects are still aware) from the emotional suffering that defines their experience of pain. The ice water therefore feels cold—very cold—but not painful.

dissociation a split in consciousness, which allows some thoughts and behaviors to occur simultaneously with others.

“The total possible consciousness may be split into parts which co-exist but mutually ignore each other.”

William James,
Principles of Psychology, 1890

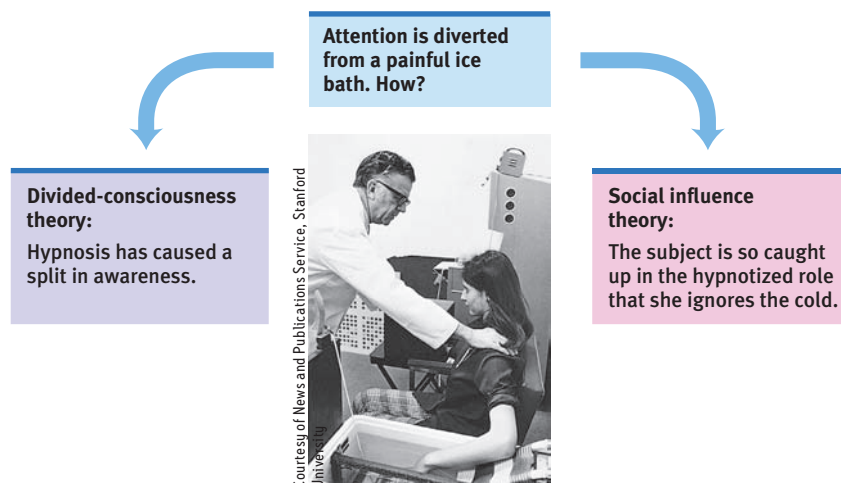
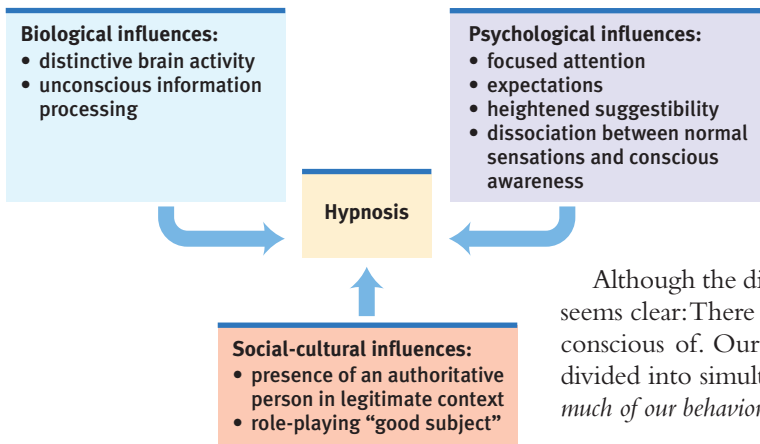


FIGURE 3.14

Dissociation or role-playing? This hypnotized woman tested by Ernest Hilgard exhibited no pain when her arm was placed in an ice bath. But asked to press a key if some part of her felt the pain, she did so. To Hilgard, this was evidence of dissociation, or divided consciousness. Proponents of social influence theory, however, maintain that people responding this way are caught up in playing the role of “good subject.”

**FIGURE 3.15****Levels of analysis for hypnosis**

Using a biopsychosocial approach, researchers explore hypnosis from complementary perspectives.

Another form of dual processing—*selective attention*—may also play a role in hypnotic pain relief. PET scans show that hypnosis reduces brain activity in a region that processes painful stimuli, but not in the sensory cortex, which receives the raw sensory input (Rainville et al., 1997). Hypnosis does not block sensory input, but it may block our attention to those stimuli. This helps explain why an injured athlete, caught up in the competition, may feel little or no pain until the game ends.

Although the divided-consciousness theory of hypnosis is controversial, this much seems clear: There is, without doubt, much more to thinking and acting than we are conscious of. Our information processing, which starts with selective attention, is divided into simultaneous conscious and nonconscious realms. In hypnosis as in life, *much of our behavior occurs on autopilot*. We have two-track minds (**FIGURE 3.15**).

There is controversy about whether hypnosis uniquely alters consciousness, but there is little dispute that some drugs do.

RETRIEVE IT

- Hilgard believed that hypnosis involves a state of divided consciousness called _____. His beliefs have been challenged by researchers who suggest _____ influence is involved.

ANSWERS: dissociation; social

Drugs and Consciousness

Let's imagine a day in the life of a legal-drug user. It begins with a wake-up latte. By midday, several cigarettes have calmed frazzled nerves before an appointment at the plastic surgeon's office for wrinkle-smoothing Botox injections. A diet pill before dinner helps stem the appetite, and its stimulating effects can later be partially offset with a glass of wine and two Tylenol PMs. And if performance needs enhancing, there are beta blockers for onstage performers, Viagra for middle-aged men, hormone-delivering “libido patches” for middle-aged women, and Adderall for students hoping to focus their concentration. Before drifting off into REM-depressed sleep, our hypothetical drug user is dismayed by news reports of pill-sharing, pill-popping college students.

Most of us manage to use some nonprescription drugs in moderation and without disrupting our lives. But some of us develop self-harming *substance-related disorders*. In such cases, the substances being used are **psychoactive drugs**, chemicals that change perceptions and moods. A drug's overall effect depends not only on its biological effects but also on the psychology of the user's expectations, which vary with social and cultural contexts (Ward, 1994). If one culture assumes that a particular drug produces euphoria (or aggression or sexual arousal) and another does not, each culture may find its expectations fulfilled. In the pages that follow, we'll take a closer look at these interacting forces in the use and potential abuse of particular psychoactive drugs. But first, let's see how our bodies react to the ongoing use of psychoactive drugs.

Tolerance, Dependence, and Addiction



3-13: What are tolerance, dependence, and addiction, and what are some common misconceptions about addiction?

Why might a person who rarely drinks alcohol get buzzed on one can of beer while a long-term drinker shows few effects until the second six-pack? The answer is **tolerance**. With continued use of alcohol and some other drugs (marijuana is an exception), the user's brain chemistry adapts to offset the drug effect (a process called *neuroadaptation*). To experience the same effect, the user requires larger

psychoactive drug a chemical substance that alters perceptions and moods.

tolerance with repeated use, achieving the desired effect requires larger doses.

addiction compulsive drug craving and use, despite adverse consequences.

THINKING CRITICALLY ABOUT:

Addiction

In recent pop psychology, the supposedly irresistible seduction of addiction has been extended to cover many behaviors formerly considered bad habits or even sins. Has the concept been stretched too far? Are addictions as irresistible as commonly believed? Let's consider three big questions.

- 1. Do addictive drugs quickly corrupt?** For example, does morphine taken to control pain often lead to heroin abuse? Generally not. People given morphine for pain control rarely develop the cravings of the addict who uses morphine as a mood-altering drug (Melzack, 1990). Some—perhaps 10 percent—do indeed have a hard time using a psychoactive drug in moderation or stopping altogether. But controlled, occasional users of drugs such as alcohol and marijuana far outnumber those who become addicted to these substances (Gazzaniga, 1988; Siegel, 1990). “Even for a very addictive drug like cocaine, only 15 to 16 percent of people become addicted within 10 years of first use,” observed Terry Robinson and Kent Berridge (2003).
- 2. Does overcoming an addiction require therapy?** Addictions can be powerful, and some addicts do benefit from therapy or group support. Alcoholics Anonymous has supported many people in overcoming their alcohol dependence. But the recovery rates of treated and untreated groups differ less than one might suppose. Moreover, viewing addiction as an uncontrollable disease can

undermine people's self-confidence and their belief that they can change. And that, critics say, would be unfortunate, for many people do voluntarily stop using addictive drugs, without any treatment. Most of America's 41 million ex-smokers kicked the habit on their own, usually after prior failed efforts or treatments.

- 3. Can we extend the concept of addiction to cover not just drug dependencies, but a whole spectrum of repetitive, pleasure-seeking behaviors?** We can, and we have, but should we? The addiction-as-disease-needing-treatment idea has been suggested for a host of driven, excessive behaviors—eating, shopping, gambling, work, and sex. Used not as a metaphor (“I'm a science fiction addict”) but as reality, “addiction” can become an all-purpose excuse. Moreover, labeling a behavior doesn't explain it. Attributing serial adultery, as in the case of Tiger Woods, to a “sex addiction” does not explain the sexual impulsiveness, say critics (Radford, 2010).

Sometimes, though, behaviors such as gambling, video gaming, or online surfing do become compulsive and dysfunctional, much like abusive drug taking (Gentile, 2009; Griffiths, 2001;



A social networking addiction?

Hoelt et al., 2008). Some Internet users, for example, do display an apparent inability to resist logging on, and staying on, even when this excessive use impairs their work and relationships (Ko et al., 2005). Are we justified in stretching the addiction concept to cover such social behaviors? Stay tuned. Debates over the addiction-as-disease model continue.

The odds of getting hooked after using various drugs:

Tobacco	32%
Heroin	23%
Alcohol	15%
Marijuana	9%

Source: National Academy of Science, Institute of Medicine (Brody, 2003).

and larger doses (FIGURE 3.16). In chronic alcohol abuse, for example, the person's brain, heart, and liver suffer damage from the excessive amounts of alcohol being “tolerated.” Ever-increasing doses of most psychoactive drugs can pose a serious threat to health and may lead to **addiction**: The person craves and uses the substance despite its adverse consequences. (See Thinking Critically About: Addiction.) The World Health Organization (2008) has reported that, worldwide, 90 million people suffer from such problems related to alcohol and other drugs.

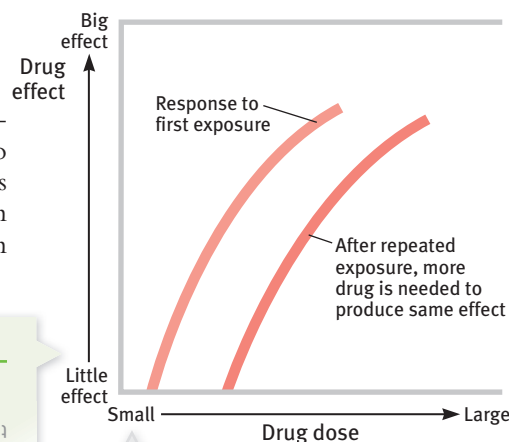


FIGURE 3.16 Drug tolerance

RETRIEVE IT

- What is the process that leads to drug tolerance?

ANSWER: With repeated exposure to a psychoactive drug, the drug's effect lessens. Thus, it takes bigger doses to get the desired effect.

David Horsey/Seattlepi.com

withdrawal the discomfort and distress that follow discontinuing the use of an addictive drug.

physical dependence a physiological need for a drug, marked by unpleasant withdrawal symptoms when the drug is discontinued.

psychological dependence a psychological need to use a drug, such as to relieve negative emotions.

depressants drugs (such as alcohol, barbiturates, and opiates) that reduce neural activity and slow body functions.

alcohol dependence (popularly known as alcoholism). Alcohol use marked by tolerance, withdrawal if suspended, and a drive to continue use.

Regular users often try to fight their addiction, but abruptly stopping the drug may lead to the undesirable side effects of **withdrawal**. As the body responds to the drug's absence, the user may feel physical pain and intense cravings, indicating **physical dependence**. People can also develop **psychological dependence**, particularly for stress-relieving drugs, such as alcohol. Although not always physically addictive, such drugs may nevertheless become an important part of the user's life, often as a way of relieving negative emotions. For someone who is either physically or psychologically dependent, obtaining and using the drug can become the day's focus.

Types of Psychoactive Drugs

The three major categories of psychoactive drugs are *depressants*, *stimulants*, and *hallucinogens*. All do their work at the brain's synapses, stimulating, inhibiting, or mimicking the activity of the brain's own chemical messengers, the neurotransmitters.

Depressants



3-14: What are depressants, and what are their effects?

Depressants are drugs such as alcohol, barbiturates (tranquilizers), and opiates that calm neural activity and slow body functions.

Alcohol True or false? In small amounts, alcohol is a stimulant. *False*. Low doses of alcohol may, indeed, enliven a drinker, but they do so by acting as a *disinhibitor*—they slow brain activity that controls judgment and inhibitions. Alcohol is an equal-opportunity drug: It increases (disinhibits) helpful tendencies, as when tipsy restaurant patrons leave extravagant tips (Lynn, 1988). And it increases harmful tendencies, as when sexually aroused men become more disposed to sexual aggression.

Alcohol + sex = the perfect storm. When drinking, both men and women are more disposed to casual sex (Cooper, 2006; Ebel-Lam et al., 2009). *The urges you would feel if sober are the ones you will more likely act upon when intoxicated.*

SLOWED NEURAL PROCESSING Low doses of alcohol relax the drinker by slowing sympathetic nervous system activity. Larger doses cause reactions to slow, speech to slur, and skilled performance to deteriorate. Paired with sleep deprivation, alcohol is a potent sedative. Add these physical effects to lowered inhibitions, and the result can be deadly. Worldwide, several hundred thousand lives are lost each year in alcohol-related accidents and violent crime. As blood-alcohol levels rise and judgment falters, people's qualms about drinking and driving lessen. In experiments, virtually all drinkers who had insisted when sober that they would not drive under the influence later decided to drive home from a bar, even when given a breathalyzer test and told they were intoxicated (Denton & Krebs, 1990; MacDonald et al., 1995). Alcohol can also be life threatening when heavy drinking follows an earlier period of moderate drinking, which depresses the vomiting response. People may poison themselves with an overdose that their bodies would normally throw up.

MEMORY DISRUPTION Alcohol can disrupt memory formation, and heavy drinking can have long-term effects on the brain and cognition. In rats, at a developmental period corresponding to human adolescence, binge drinking contributes to nerve cell death and reduces the birth of new nerve cells. It also impairs the growth of synaptic connections (Crews et al., 2006, 2007). In humans, heavy drinking may lead to blackouts, in which drinkers are unable to recall people they met the night before or what they said or did while intoxicated. These blackouts result partly from the way alcohol suppresses REM sleep, which helps fix the day's experiences into permanent memories.

The prolonged and excessive drinking that characterizes **alcohol dependence** can shrink the brain (**FIGURE 3.17**). Girls and young women (who have less of a stomach



"That is not one of the seven habits of highly effective people."

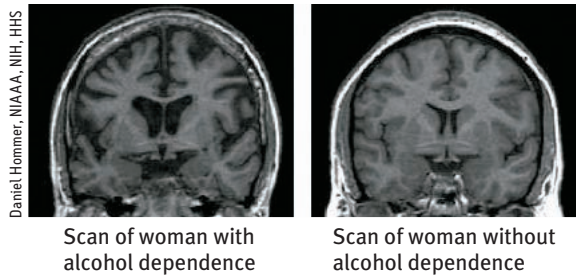


FIGURE 3.17

Alcohol dependence shrinks the brain
 MRI scans show brain shrinkage in women with alcohol dependence (left) compared with women in a control group (right).

enzyme that digests alcohol) can become addicted to alcohol more quickly than boys and young men do, and they are at risk for lung, brain, and liver damage at lower consumption levels (CASA, 2003; Wuethrich, 2001).

REDUCED SELF-AWARENESS AND SELF-CONTROL In one experiment, those who consumed alcohol (rather than a placebo beverage) were doubly likely to be caught mind-wandering during a reading task, yet were *less* likely to notice that they zoned out (Sayette et al., 2009). Alcohol not only reduces self-awareness, it also produces a sort of “myopia” by focusing attention on an arousing situation (such as a provocation) and distracting attention from normal inhibitions and future consequences (Giancola et al., 2010; Hull et al., 1986; Steele & Josephs, 1990).

Reduced self-awareness may help explain why people who want to suppress their awareness of failures or shortcomings are more likely to drink than are those who feel good about themselves. Losing a business deal, a game, or a romantic partner sometimes elicits a drinking binge.

EXPECTANCY EFFECTS As with other drugs, expectations influence behavior. When people *believe* that alcohol affects social behavior in certain ways, and *believe*, rightly or wrongly, that they have been drinking alcohol, they will behave accordingly (Moss & Albery, 2009). In a classic experiment, researchers gave Rutgers University men (who had volunteered for a study on “alcohol and sexual stimulation”) either an alcoholic or a nonalcoholic drink (Abrams & Wilson, 1983). (Both had strong tastes that masked any alcohol.) In each group, half the participants thought they were drinking alcohol and half thought they were not. After watching an erotic movie clip, the men who *thought* they had consumed alcohol were more likely to report having strong sexual fantasies and feeling guilt free. Being able to *attribute* their sexual responses to alcohol released their inhibitions—whether or not they had actually consumed any alcohol. Alcohol’s effect lies partly in that powerful sex organ, the mind.

Barbiturates Like alcohol, the **barbiturate** drugs, or *tranquilizers*, depress nervous system activity. Barbiturates such as Nembutal, Seconal, and Amytal are sometimes prescribed to induce sleep or reduce anxiety. In larger doses, they can impair memory and judgment. If combined with alcohol—as sometimes happens when people take a sleeping pill after an evening of heavy drinking—the total depressive effect on body functions can be lethal.

Opiates The **opiates**—opium and its derivatives, morphine and heroin—also depress neural functioning. Pupils constrict, breathing slows, and lethargy sets in as blissful pleasure replaces pain and anxiety. For this short-term pleasure, opiate users may pay a long-term price: a gnawing craving for another fix, a need for progressively larger doses (as tolerance develops), and the extreme discomfort of withdrawal. When repeatedly flooded with an artificial opiate, the brain eventually stops producing *endorphins*, its own opiates. If the artificial opiate is then withdrawn, the brain lacks the normal level of these painkilling neurotransmitters. Those who cannot or choose not to tolerate this state may pay an ultimate price—death by overdose.

barbiturates drugs that depress central nervous system activity, reducing anxiety but impairing memory and judgment.

opiates opium and its derivatives, such as morphine and heroin; they depress neural activity, temporarily lessening pain and anxiety.

stimulants drugs (such as caffeine, nicotine, and the more powerful amphetamines, cocaine, Ecstasy, and methamphetamine) that excite neural activity and speed up body functions.

amphetamines drugs that stimulate neural activity, causing speeded-up body functions and associated energy and mood changes.

nicotine a stimulating and highly addictive psychoactive drug in tobacco.

RETRIEVE IT

- Alcohol, barbiturates, and opiates are all in a class of drugs called _____.

ANSWER: depressants

Stimulants



3-15: What are stimulants, and what are their effects?

A **stimulant** excites neural activity and speeds up body functions. Pupils dilate, heart and breathing rates increase, and blood sugar levels rise, causing a drop in appetite. Energy and self-confidence also rise.

Stimulants include caffeine, nicotine, the **amphetamines**, cocaine, methamphetamine (“speed”), and Ecstasy. People use stimulants to feel alert, lose weight, or boost mood or athletic performance. Unfortunately, stimulants can be addictive, as you may know if you are one of the many who use caffeine daily in your coffee, tea, soda, or energy drinks. Cut off from your usual dose, you may crash into fatigue, headaches, irritability, and depression (Silverman et al., 1992). A mild dose of caffeine typically lasts three or four hours, which—if taken in the evening—may be long enough to impair sleep.



Vasca/Shutterstock

Nicotine One of the most addictive stimulants is **nicotine**, found in cigarettes and other tobacco products. Imagine that cigarettes were harmless—except, once in every 25,000 packs, an occasional innocent-looking one is filled with dynamite instead of tobacco. Not such a bad risk of having your head blown off. But with 250 million packs a day consumed worldwide, we could expect more than 10,000 gruesome daily deaths (more than three times the 9/11 fatalities each and every day)—surely enough to have cigarettes banned everywhere.¹

The lost lives from these dynamite-loaded cigarettes approximate those from today’s actual cigarettes. A teen-to-the-grave smoker has a 50 percent chance of dying from the habit, and each year, tobacco kills nearly 5.4 million of its 1.3 billion customers worldwide. (Imagine the outrage if terrorists took down an equivalent of 25 loaded jumbo jets today, let alone tomorrow and every day thereafter.) By 2030, annual deaths are expected to increase to 8 million. That means that *1 billion* twenty-first-century people may be killed by tobacco (WHO, 2008). Eliminating smoking would increase life expectancy more than any other preventive measure.

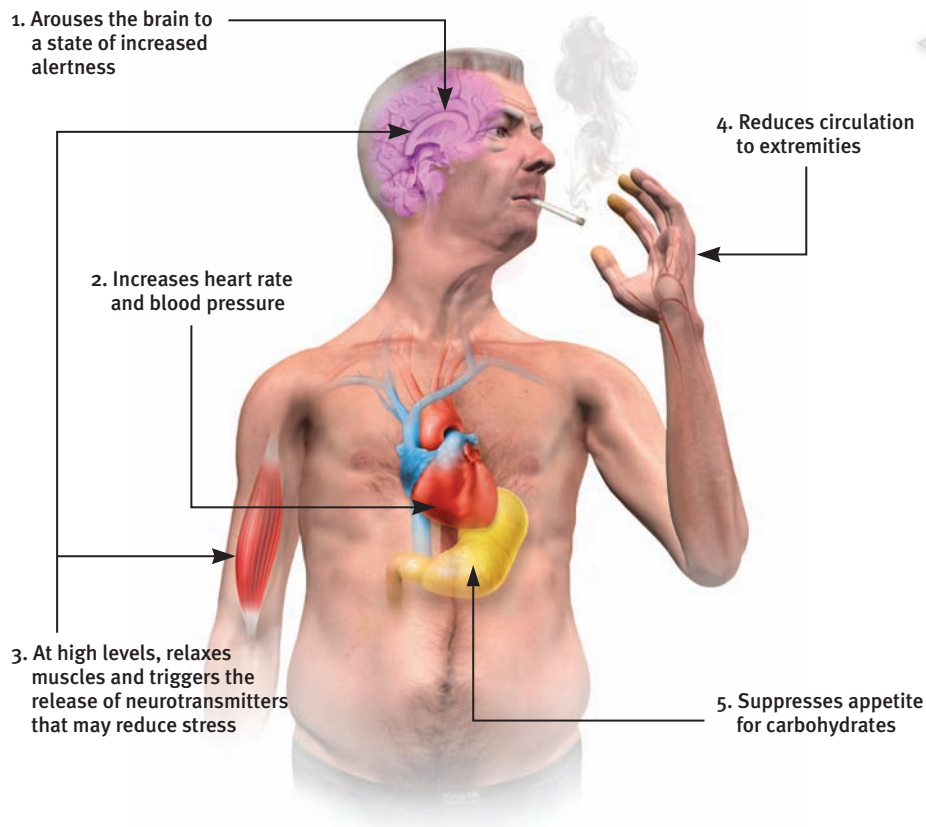
Those addicted to nicotine find it very hard to quit because tobacco products are as powerfully and quickly addictive as heroin and cocaine. Attempts to quit even within the first weeks of smoking often fail (DiFranza, 2008). As with other addictions, smokers become *dependent*, and they develop *tolerance*. Quitting causes nicotine-withdrawal symptoms, including craving, insomnia, anxiety, irritability, and distractibility. Nicotine-deprived smokers trying to focus on a task experience a tripled rate of mind wandering (Sayette et al., 2010). When not craving a cigarette, they tend to underestimate the power of such cravings (Sayette et al., 2008).

All it takes to relieve this aversive state is a cigarette—a portable nicotine dispenser. Within 7 seconds, a rush of nicotine signals the central nervous system to release a flood of neurotransmitters (**FIGURE 3.18**). Epinephrine and norepinephrine diminish appetite and boost alertness and mental efficiency. Dopamine and opioids calm anxiety and reduce sensitivity to pain (Nowak, 1994; Scott et al., 2004).

Smoke a cigarette and nature will charge you 12 minutes—ironically, just about the length of time you spend smoking it (*Discover*, 1996).

Humorist Dave Barry (1995) recalling why he smoked his first cigarette the summer he turned 15: “Arguments against smoking: ‘It’s a repulsive addiction that slowly but surely turns you into a gasping, gray-skinned, tumor-ridden invalid, hacking up brownish gobs of toxic waste from your one remaining lung.’ Arguments for smoking: ‘Other teenagers are doing it.’ Case closed! Let’s light up!”

¹ This analogy, adapted here with world-based numbers, was suggested by mathematician Sam Saunders, as reported by K. C. Cole (1998).

**FIGURE 3.18**

Where there's smoke . . . : The physiological effects of nicotine
Nicotine reaches the brain within 7 seconds, twice as fast as intravenous heroin. Within minutes, the amount in the blood soars.

These rewards keep people smoking, even among the 8 in 10 smokers who wish they could stop (Jones, 2007). Each year, fewer than 1 in 7 smokers who want to quit will be able to resist. Even those who know they are committing slow-motion suicide may be unable to stop (Saad, 2002). Asked “If you had to do it all over again, would you start smoking?” more than 85 percent of adult smokers have answered *No* (Slovic et al., 2002).

Nevertheless, repeated attempts seem to pay off. Half of all Americans who have ever smoked have quit, sometimes aided by a nicotine replacement drug and with encouragement from a telephone counselor or a support group. Success is equally likely whether smokers quit abruptly or gradually (Fiore et al., 2008; Lichtenstein et al., 2010; Lindson et al., 2010). For those who endure, the acute craving and withdrawal symptoms gradually dissipate over the ensuing 6 months (Ward et al., 1997). After a year's abstinence, only 10 percent will relapse in the next year (Hughes et al., 2010). These nonsmokers may live not only healthier but also happier lives. Smoking correlates with higher rates of depression, chronic disabilities, and divorce (Doherty & Doherty, 1998; Vita et al., 1998). Healthy living seems to add both years to life and life to years.

RETRIEVE IT

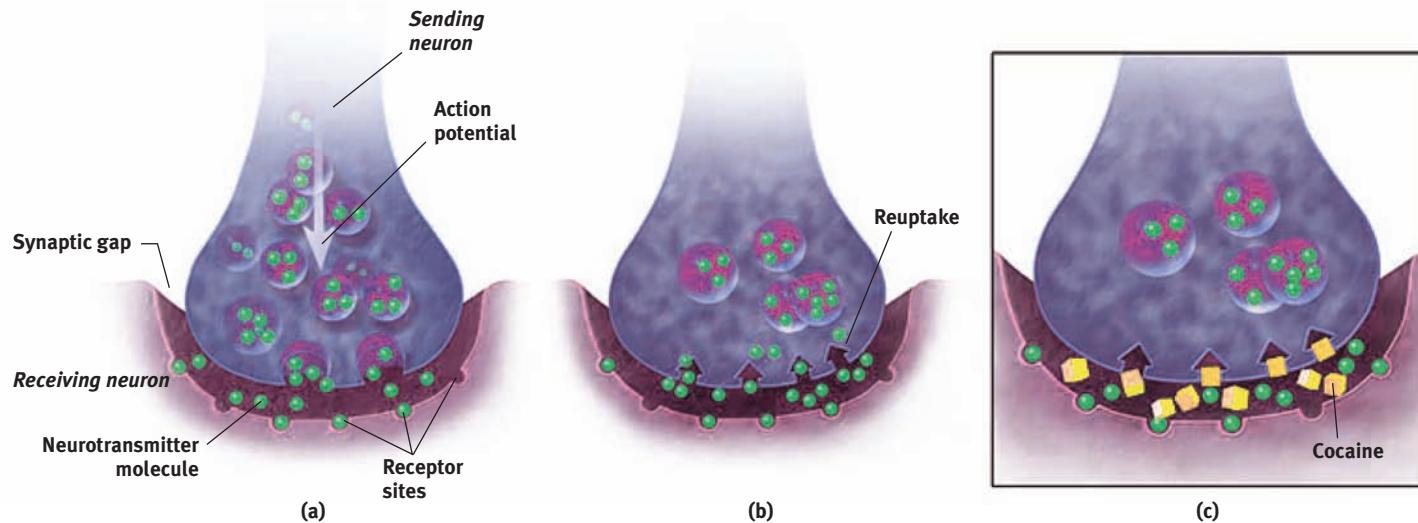
- Why do tobacco companies try so hard to get customers hooked as teens?

ANSWER: Nicotine is powerfully addictive, expensive, and deadly. Those who start paving the neural pathways when young may find it very hard to stop using nicotine. As a result, tobacco companies may have lifelong customers.

Cocaine The recipe for Coca-Cola originally included an extract of the coca plant, creating a cocaine tonic for tired elderly people. Between 1896 and 1905, Coke was indeed “the real thing.” But no longer. Cocaine is now snorted, injected, or smoked. It enters the bloodstream quickly, producing a rush of euphoria that depletes the brain's supply of the neurotransmitters dopamine, serotonin, and norepinephrine (**FIGURE**

“Cocaine makes you a new man. And the first thing that new man wants is more cocaine.”

Comedian George Carlin (1937–2008)



(a) Neurotransmitters carry a message from a sending neuron across a synapse to receptor sites on a receiving neuron.

(b) The sending neuron normally reabsorbs excess neurotransmitter molecules, a process called *reuptake*.

(c) By binding to the sites that normally reabsorb neurotransmitter molecules, cocaine blocks reuptake of dopamine, norepinephrine, and serotonin (Ray & Ksir, 1990). The extra neurotransmitter molecules therefore remain in the synapse, intensifying their normal mood-altering effects and producing a euphoric rush. When the cocaine level drops, the absence of these neurotransmitters produces a crash.

FIGURE 3.19
Cocaine euphoria and crash

3.19). Within the hour, a crash of agitated depression follows as the drug's effect wears off. Many regular cocaine users chasing this high become addicted. In the lab, cocaine-addicted monkeys have pressed levers more than 12,000 times to gain one cocaine injection (Siegel, 1990).

In situations that trigger aggression, ingesting cocaine may heighten reactions. Caged rats fight when given foot shocks, and they fight even more when given cocaine *and* foot shocks. Likewise, humans ingesting high doses of cocaine in laboratory experiments impose higher shock levels on a presumed opponent than do those receiving a placebo (Licata et al., 1993). Cocaine use may also lead to emotional disturbances, suspiciousness, convulsions, cardiac arrest, or respiratory failure.

In national surveys, 3 percent of U.S. high school seniors and 6 percent of British 18- to 24-year-olds reported having tried cocaine during the past year (ACMD, 2009; Johnston et al., 2011). Nearly half had smoked *crack*, a faster-working crystallized form of cocaine that produces a briefer but more intense high, followed by a more intense crash. After several hours, the craving for more wanes, only to return several days later (Gawin, 1991).

Cocaine's psychological effects depend in part on the dosage and form consumed, but the situation and the user's expectations and personality also play a role. Given a placebo, cocaine users who *thought* they were taking cocaine often had a cocaine-like experience (Van Dyke & Byck, 1982).

Dramatic drug-induced decline This woman's methamphetamine addiction led to obvious physical changes. Her decline is evident in these two photos, taken at age 36 (left) and, after four years of addiction, at age 40 (right).



National Pictures/Topham/The Image Works

Methamphetamine Methamphetamine is chemically related to its parent drug, *amphetamine* (NIDA, 2002, 2005) but has even greater effects. Methamphetamine triggers the release of the neurotransmitter dopamine, which stimulates brain cells that enhance energy and mood, leading to eight hours or so of heightened energy and euphoria. Its aftereffects may include irritability, insomnia, hypertension, seizures, social isolation, depression, and occasional violent outbursts (Homer et al., 2008). Over time, methamphetamine may reduce baseline dopamine levels, leaving the user with depressed functioning.

Ecstasy *Ecstasy*, a street name for **MDMA** (methylenedioxymethamphetamine), is both a stimulant and a mild hallucinogen. As an amphetamine derivative, Ecstasy triggers dopamine release, but its major effect is releasing stored serotonin and blocking its reuptake, thus prolonging serotonin's feel-good flood (Braun, 2001). Users feel the effect about a half-hour after taking an Ecstasy pill. For three or four hours, they experience high energy, emotional elevation, and (given a social context) connectedness with those around them ("I love everyone").

During the 1990s, Ecstasy's popularity soared as a "club drug" taken at nightclubs and all-night raves (Landry, 2002). The drug's popularity crosses national borders, with an estimated 60 million tablets consumed annually in Britain (ACMD, 2009). There are, however, reasons not to be ecstatic about Ecstasy. One is its dehydrating effect, which—when combined with prolonged dancing—can lead to severe overheating, increased blood pressure, and death. Another is that long-term, repeated leaching of brain serotonin can damage serotonin-producing neurons, leading to decreased output and increased risk of permanently depressed mood (Croft et al., 2001; McCann et al., 2001; Roiser et al., 2005). Ecstasy also suppresses the disease-fighting immune system, impairs memory, slows thought, and disrupts sleep by interfering with serotonin's control of the circadian clock (Laws & Kokkalis, 2007; Pacifici et al., 2001; Schilt et al., 2007). Ecstasy delights for the night but dispirits the morrow.



AP Photo/Dale Sparks

The hug drug MDMA, known as Ecstasy, produces a euphoric high and feelings of intimacy. But repeated use can destroy serotonin-producing neurons and deflate mood and impair memory.

Hallucinogens



3-16: What are hallucinogens, and what are their effects?

Hallucinogens distort perceptions and evoke sensory images in the absence of sensory input (which is why these drugs are also called *psychedelics*, meaning "mind-manifesting"). Some, such as LSD and MDMA (Ecstasy), are synthetic. Others, including the mild hallucinogen marijuana, are natural substances.

LSD Chemist Albert Hofmann created—and on one Friday afternoon in April 1943 accidentally ingested—**LSD** (lysergic acid diethylamide). The result—"an uninterrupted stream of fantastic pictures, extraordinary shapes with intense, kaleidoscopic play of colors"—reminded him of a childhood mystical experience that had left him longing for another glimpse of "a miraculous, powerful, unfathomable reality" (Siegel, 1984; Smith, 2006).

The emotions of an LSD trip vary from euphoria to detachment to panic. The user's current mood and expectations color the emotional experience, but the perceptual distortions and hallucinations have some commonalities. Whether provoked to hallucinate by drugs, loss of oxygen, or extreme sensory deprivation, the brain hallucinates in basically the same way (Siegel, 1982). The experience typically begins with simple geometric forms, such as a lattice, cobweb, or spiral. The next phase consists of more meaningful images; some may be superimposed on a tunnel or funnel, others may be replays of past emotional experiences. As the hallucination peaks, people frequently feel separated from their body and experience dreamlike scenes so real that they may become panic-stricken or harm themselves.

These sensations are strikingly similar to the **near-death experience**, an altered state of consciousness reported by about 15 percent of patients revived from cardiac arrest (Agrillo, 2011; Greyson, 2010). Many describe visions of tunnels (**FIGURE 3.20** on the next page), bright lights or beings of light, a replay of old memories, and out-of-body sensations (Siegel, 1980). Given that oxygen deprivation and other insults to the brain are known to produce hallucinations, it is difficult to resist wondering whether a brain under stress manufactures the near-death experience. Following temporal lobe seizures, patients have reported similarly profound mystical experiences. So have solitary sailors and polar explorers while enduring monotony, isolation, and cold (Suedfeld & Mocellin, 1987).

methamphetamine a powerfully addictive drug that stimulates the central nervous system, with speeded-up body functions and associated energy and mood changes; over time, appears to reduce baseline dopamine levels.

Ecstasy (MDMA) a synthetic stimulant and mild hallucinogen. Produces euphoria and social intimacy, but with short-term health risks and longer-term harm to serotonin-producing neurons and to mood and cognition.

hallucinogens psychedelic ("mind-manifesting") drugs, such as LSD, that distort perceptions and evoke sensory images in the absence of sensory input.

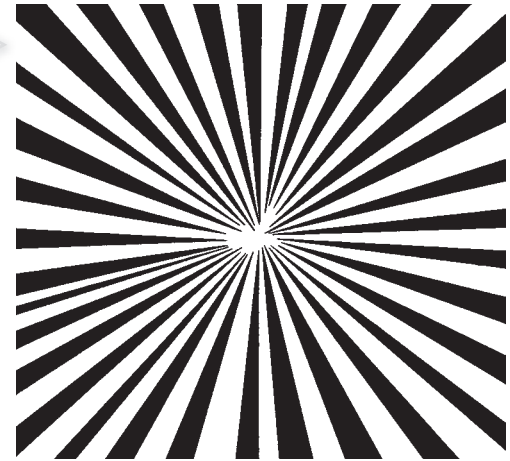
LSD a powerful hallucinogenic drug; also known as acid (*lysergic acid diethylamide*).

near-death experience an altered state of consciousness reported after a close brush with death (such as through cardiac arrest); often similar to drug-induced hallucinations.

FIGURE 3.20

Hallucination or near-death vision?

Psychologist Ronald Siegel (1977) reported that people under the influence of hallucinogenic drugs often see “a bright light in the center of the field of vision. . . . The location of this point of light create[s] a tunnel-like perspective.” This is very similar to others’ near-death experiences.



Marijuana For 5000 years, hemp has been cultivated for its fiber. The leaves and flowers of this plant, which are sold as marijuana, contain **THC** (delta-9-tetrahydrocannabinol). Whether smoked (getting to the brain in about 7 seconds) or eaten (causing its peak concentration to be reached at a slower, unpredictable rate), THC produces a mix of effects.

Marijuana is a difficult drug to classify. It is a mild hallucinogen, amplifying sensitivity to colors, sounds, tastes, and smells. But like alcohol, marijuana relaxes, disinhibits, and may produce a euphoric high. Both alcohol and marijuana impair the motor coordination, perceptual skills, and reaction time necessary for safely operating an automobile or other machine. “THC causes animals to misjudge events,” reported Ronald Siegel (1990, p. 163). “Pigeons wait too long to respond to buzzers or lights that tell them food is available for brief periods; and rats turn the wrong way in mazes.”

Marijuana and alcohol also differ. The body eliminates alcohol within hours. THC and its by-products linger in the body for a week or more, which means that regular users may achieve a high with smaller amounts of the drug than would be needed by occasional users. This is contrary to the usual path of tolerance, in which repeat users need to take larger doses to feel the same effect.

A user’s experience can vary with the situation. If the person feels anxious or depressed, using marijuana may intensify these feelings. The more often the person uses marijuana, especially during adolescence, the greater the risk of anxiety or depression (Bambico et al., 2010; Hall, 2006; Murray et al., 2007). Daily use bodes a worse outcome than infrequent use.

Marijuana also disrupts memory formation and interferes with immediate recall of information learned only a few minutes before. Such cognitive effects outlast the period of smoking (Messinis et al., 2006). Heavy adult use for over 20 years is associated with a shrinkage of brain areas that process memories and emotions (Yücel et al., 2008). Prenatal exposure through maternal marijuana use impairs brain development (Berghuis et al., 2007; Huizink & Mulder, 2006).

Some states and countries have passed laws allowing marijuana to be used for medical purposes to relieve the pain and nausea associated with diseases such as AIDS and cancer (Munsey, 2010; Watson et al., 2000). In such cases, the Institute of Medicine recommends delivering the THC with medical inhalers. Marijuana smoke, like cigarette smoke, is toxic and can cause cancer, lung damage, and pregnancy complications.

Despite their differences, the psychoactive drugs summarized in **TABLE 3.3** share a common feature: They trigger negative aftereffects that offset their immediate positive effects and grow stronger with repetition. And that helps explain both tolerance and withdrawal. As the opposing, negative aftereffects grow stronger, it takes larger and larger doses to produce the desired high (*tolerance*), causing the aftereffects to worsen in the drug’s absence (*withdrawal*). This in turn creates a need to switch off the withdrawal symptoms by taking yet more of the drug (which may lead to *addiction*).

THC the major active ingredient in marijuana; triggers a variety of effects, including mild hallucinations.



Table 3.3

A Guide to Selected Psychoactive Drugs

Drug	Type	Pleasurable Effects	Adverse Effects
<i>Alcohol</i>	Depressant	Initial high followed by relaxation and disinhibition	Depression, memory loss, organ damage, impaired reactions
<i>Heroin</i>	Depressant	Rush of euphoria, relief from pain	Depressed physiology, agonizing withdrawal
<i>Caffeine</i>	Stimulant	Increased alertness and wakefulness	Anxiety, restlessness, and insomnia in high doses; uncomfortable withdrawal
<i>Methamphetamine</i>	Stimulant	Euphoria, alertness, energy	Irritability, insomnia, hypertension, seizures
<i>Cocaine</i>	Stimulant	Rush of euphoria, confidence, energy	Cardiovascular stress, suspiciousness, depressive crash
<i>Nicotine</i>	Stimulant	Arousal and relaxation, sense of well-being	Heart disease, cancer
<i>Ecstasy (MDMA)</i>	Stimulant; mild hallucinogen	Emotional elevation, disinhibition	Dehydration, overheating, depressed mood, impaired cognitive and immune functioning
<i>Marijuana (THC)</i>	Mild hallucinogen	Enhanced sensation, relief of pain, distortion of time, relaxation	Impaired learning and memory, increased risk of psychological disorders, lung damage from smoke

RETRIEVE IT

“How strange would appear to be this thing that men call pleasure! And how curiously it is related to what is thought to be its opposite, pain! . . . Wherever the one is found, the other follows up behind.”

Plato, Phaedo, fourth century B.C.E.

- How does this pleasure-pain description apply to the repeated use of psychoactive drugs?

ANSWER: Psychoactive drugs create pleasure by altering brain chemistry. With repeated use of the drug, the brain develops tolerance and needs more of the drug to achieve the desired effect. (Marijuana is an exception.) As the user becomes dependent, discontinuing use of the substance produces painful or psychologically unpleasant withdrawal symptoms.

Influences on Drug Use

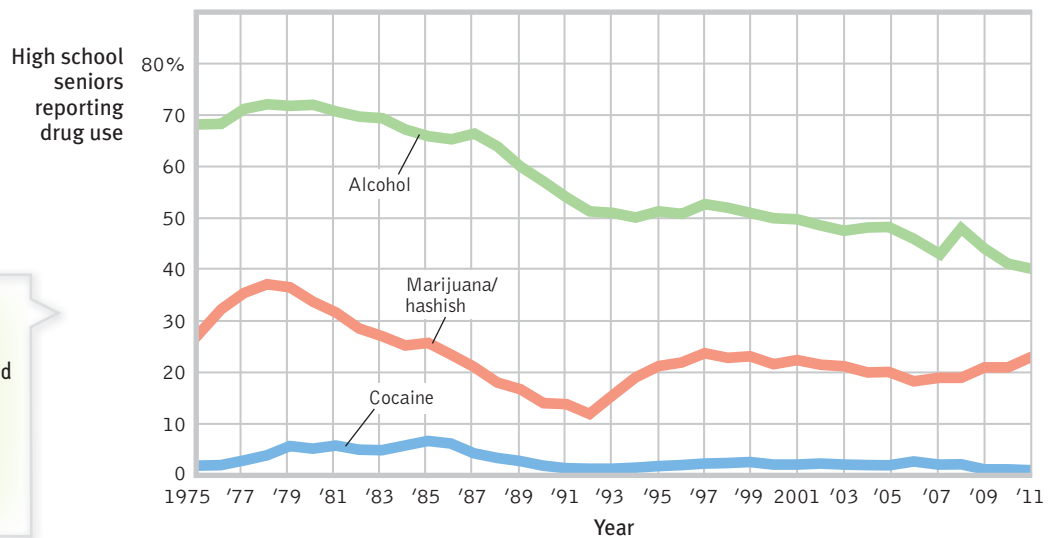


3-17: Why do some people become regular users of consciousness-altering drugs?

Drug use by North American youth increased during the 1970s. Then, with increased drug education and a more realistic and deglamorized media depiction of taking drugs, drug use declined sharply. After the early 1990s, the cultural antidrug voice softened, and drugs for a time were again glamorized in some music and films. Consider, for example, historical trends in the use of marijuana:

- In the University of Michigan’s annual survey of 15,000 U.S. high school seniors, the proportion who said there is “great risk” in regular marijuana use rose from 35 percent in 1978 to 79 percent in 1991, then retreated to 47 percent in 2010 (Johnston et al., 2011).
- After peaking in 1978, marijuana use by U.S. high school seniors declined through 1992, then rose, but has recently been tapering off (see **FIGURE 3.21** on the next page). Among Canadian 15- to 24-year-olds, 23 percent report using marijuana monthly, weekly, or daily (Health Canada, 2012).

For some adolescents, occasional drug use represents thrill seeking. Why, though, do others become regular drug users? In search of answers, researchers have engaged biological, psychological, and social-cultural levels of analysis.

**FIGURE 3.21**

Trends in drug use The percentage of U.S. high school seniors who report having used alcohol, marijuana, or cocaine during the past 30 days declined from the late 1970s to 1992, when it partially rebounded for a few years. (From Johnston et al., 2012.)

Biological Influences

Some people may be biologically vulnerable to particular drugs. For example, heredity influences some aspects of substance abuse problems, especially those appearing by early adulthood (Crabbe, 2002):

- Having an identical rather than fraternal twin with alcohol dependence puts one at increased risk for alcohol problems. In marijuana use also, identical twins more closely resemble each other than do fraternal twins (Kendler et al., 2002).
- Boys who at age 6 are excitable, impulsive, and fearless (genetically influenced traits) are more likely as teens to smoke, drink, and use other drugs (Masse & Tremblay, 1997).
- Researchers have identified genes that are more common among people and animals predisposed to alcohol dependence, and they are seeking genes that contribute to tobacco addiction (NIH, 2006; Nurnberger & Bierut, 2007). These culprit genes seemingly produce deficiencies in the brain's natural dopamine reward system: While triggering temporary dopamine-produced pleasure, the addictive drugs disrupt normal dopamine balance. Studies of how drugs reprogram the brain's reward systems raise hopes for anti-addiction drugs that might block or blunt the effects of alcohol and other drugs (Miller, 2008; Wilson & Kuhn, 2005).



Nic-A-Teen Virtually nobody starts smoking past the vulnerable teen years. Eager to hook customers whose addiction will give them business for years to come, cigarette companies target teens. Portrayals of smoking by popular actors, such as Robert Pattinson in *Remember Me*, entice teens to imitate.

Psychological and Social-Cultural Influences

Throughout this text, you will see that biological, psychological, and social-cultural influences interact to produce behavior. So, too, with drug use (**FIGURE 3.22**). One psychological factor that has appeared in studies of youth and young adults is the feeling that life is meaningless and directionless (Newcomb & Harlow, 1986). This feeling is common among school dropouts who subsist without job skills, without privilege, and with little hope.

Sometimes the psychological influence is obvious. Many heavy users of alcohol, marijuana, and cocaine have experienced significant stress or failure and are depressed. Girls with a history of depression, eating disorders, or sexual or physical abuse are at risk for substance addiction. So are youth undergoing school or neighborhood transitions (CASA, 2003; Logan et al., 2002). Collegians who have not yet achieved a clear identity are also at greater risk (Bishop et al., 2005). By temporarily dulling the pain of self-awareness, psychoactive drugs may offer a way to avoid coping with depression, anger, anxiety, or insomnia. (As Chapter 7 explains, behavior is often controlled more by its immediate consequences than by its later ones.)

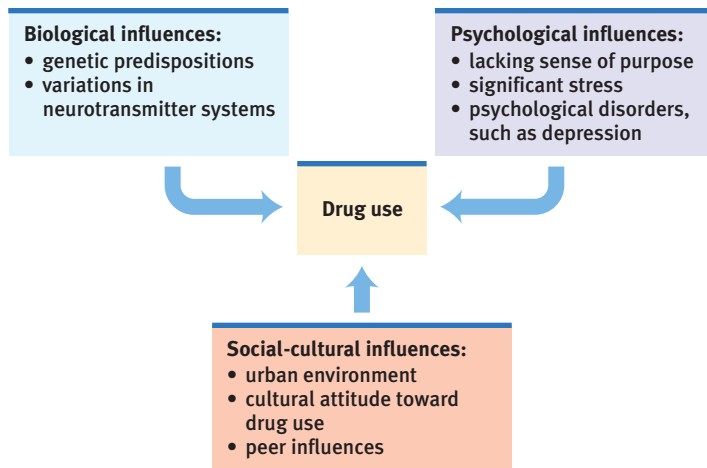


FIGURE 3.22
Levels of analysis for drug use The biopsychosocial approach enables researchers to investigate drug use from complementary perspectives.

Smoking usually begins during early adolescence. (If you are in college or university, and the cigarette manufacturers haven't yet made you their devoted customer, they almost surely never will.) Adolescents, self-conscious and often thinking the world is watching their every move, are vulnerable to smoking's allure. They may first light up to imitate glamorous celebrities, or to project a mature image, or to get the social reward of being accepted by other smokers (Cin et al., 2007; Tickle et al., 2006). Mindful of these tendencies, cigarette companies have effectively modeled smoking with themes that appeal to youths: sophistication, independence, adventure-seeking, social approval. Typically, teens who start smoking also have friends who smoke, who suggest its pleasures and offer them cigarettes (Rose et al., 1999). Among teens whose parents and best friends are nonsmokers, the smoking rate is close to zero (Moss et al., 1992; also see **FIGURE 3.23**). Most teen drinking is also done for social reasons, not as a way to cope with problems (Kuntsche et al., 2005).

Rates of drug use also vary across cultural and ethnic groups. One survey of 100,000 teens in 35 European countries found that marijuana use in the prior 30 days ranged from zero to 1 percent in Romania and Sweden, to 20 to 22 percent in Britain, Switzerland, and France (ESPAD, 2003). Independent U.S. government studies of drug use in households nationwide and among high schoolers in all regions reveal that African-American teens have sharply lower rates of drinking, smoking, and cocaine use (Johnston et al., 2007). Alcohol and other drug addiction rates have also been low among actively religious people, with extremely low rates among Orthodox Jews, Mormons, Mennonites, and the Amish (Trimble, 1994; Yeung et al., 2009). Relatively drug-free small towns and rural areas tend to constrain any genetic predisposition to drug use (Legrand et al., 2005). So does active parental monitoring (Lac & Crano, 2009). For those whose genetic predispositions nudge them toward substance use, cities offer more opportunities and less supervision.

Whether in cities or rural areas, peers influence attitudes about drugs. They also throw the parties and provide (or don't provide) the drugs. If an adolescent's friends use drugs, the odds are that he or she will, too. If the friends do not, the opportunity may not even arise. Teens who come from happy families, who do not begin drinking before age 15, and who do well in school tend not to use drugs, largely because they rarely associate with those who do (Bachman et al., 2007; Hingson et al., 2006; Odgers et al., 2008).

Peer influence is more than what friends do or say. Adolescents' expectations—what they *believe* friends are doing and favoring— influence their behavior (Vitória et al., 2009). One study surveyed sixth graders in 22 U.S. states. How many believed their friends had smoked marijuana? About 14 percent. How many of those friends acknowledged doing so? Only 4 percent

Culture and alcohol

Percentage drinking weekly or more:

United States	30%
Canada	40%
Britain	58%

(Gallup Poll, from Moore, 2006)

FIGURE 3.23

Peer influence Kids don't smoke if their friends don't (Philip Morris, 2003). A correlation-causation question: Does the close link between teen smoking and friends' smoking reflect peer influence? Teens seeking similar friends? Or both?

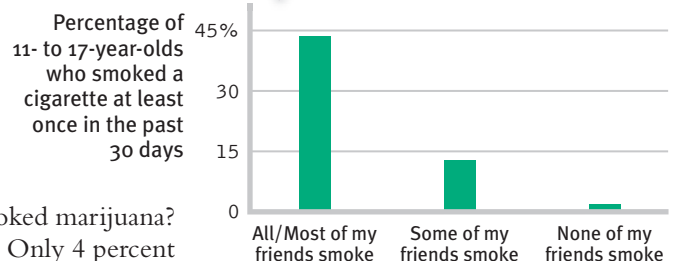


Table 3.4
Facts About “Higher” Education

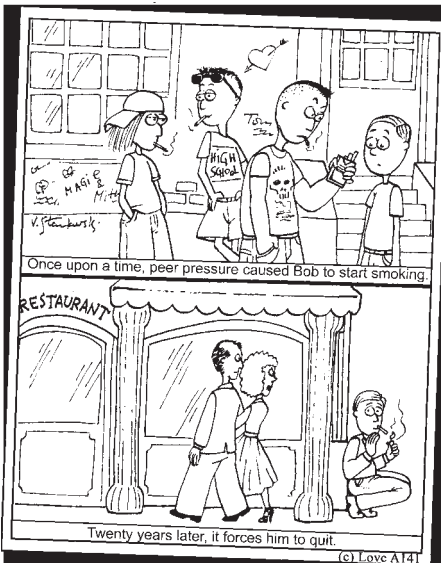
College and university students drink more alcohol than their nonstudent peers and exhibit 2.5 times the general population’s rate of substance abuse.

Fraternity and sorority members report nearly twice the binge-drinking rate of nonmembers.

Since 1993, campus smoking rates have declined, alcohol use has been steady, and abuse of prescription opioids, stimulants, tranquilizers, and sedatives has increased, as has marijuana use.

Source: NCASA, 2007.

SNAPSHOTS



Snapshots at jasonlove.com

(Wren, 1999). University students are not immune to such misperceptions: Drinking dominates social occasions partly because students overestimate their fellow students’ enthusiasm for alcohol and underestimate their views of its risks (Prentice & Miller, 1993; Self, 1994) (**TABLE 3.4**). When students’ overestimates of peer drinking are corrected, alcohol use often subsides (Moreira et al., 2009).

People whose beginning use of drugs was influenced by their peers are more likely to stop using when friends stop or the social network changes (Kandel & Raveis, 1989). One study that followed 12,000 adults over 32 years found that smokers tend to quit in clusters (Christakis & Fowler, 2008). Within a social network, the odds of a person’s quitting increased when a spouse, friend, or co-worker stopped smoking. Similarly, most soldiers who became drug addicted while in Vietnam ceased their drug use after returning home (Robins et al., 1974).

As always with correlations, the traffic between friends’ drug use and our own may be two-way: Our friends influence us. Social networks matter. But we also select as friends those who share our likes and dislikes.

What do the findings on drug use suggest for drug prevention and treatment programs? Three channels of influence seem possible:

- Educate young people about the long-term costs of a drug’s temporary pleasures.
- Help young people find other ways to boost their self-esteem and purpose in life.
- Attempt to modify peer associations or to “inoculate” youths against peer pressures by training them in refusal skills.

People rarely abuse drugs if they understand the physical and psychological costs, feel good about themselves and the direction their lives are taking, and are in a peer group that disapproves of using drugs. These educational, psychological, and social-cultural factors may help explain why 26 percent of U.S. high school dropouts, but only 6 percent of those with a postgraduate education, report smoking (CDC, 2011).

RETRIEVE IT

- Studies have found that people who begin drinking in the early teens are much more likely to become alcohol dependent than are those who begin at age 21 or after. What possible explanations might there be for this correlation between early use and later abuse?

ANSWER: Possible explanations include (a) a biological predisposition to both early use and later abuse; (b) brain changes and taste preferences triggered by early use; and (c) enduring habits, attitudes, activities, or peer relationships that foster alcohol abuse.



CHAPTER REVIEW

Consciousness and the Two-Track Mind

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

The Brain and Consciousness

- 3-1:** What is the place of consciousness in psychology's history?
- 3-2:** What is the "dual-processing" being revealed by today's cognitive neuroscience?
- 3-3:** How much information do we consciously attend to at once?

Sleep and Dreams

- 3-4:** How do our biological rhythms influence our daily functioning?
- 3-5:** What is the biological rhythm of our sleeping and dreaming stages?
- 3-6:** How do biology and environment interact in our sleep patterns?
- 3-7:** What are sleep's functions?

- 3-8:** How does sleep loss affect us, and what are the major sleep disorders?
- 3-9:** What do we dream?
- 3-10:** What are the functions of dreams?

Hypnosis

- 3-11:** What is hypnosis, and what powers does a hypnotist have over a hypnotized subject?
- 3-12:** Is hypnosis an extension of normal consciousness or an altered state?

Drugs and Consciousness

- 3-13:** What are tolerance, dependence, and addiction, and what are some common misconceptions about addiction?
- 3-14:** What are depressants, and what are their effects?
- 3-15:** What are stimulants, and what are their effects?
- 3-16:** What are hallucinogens, and what are their effects?
- 3-17:** Why do some people become regular users of consciousness-altering drugs?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

- | | | |
|---|--|--|
| consciousness, p. 78 | inattentional blindness, p. 81 | suprachiasmatic nucleus, p. 87 |
| cognitive neuroscience, p. 78 | change blindness, p. 82 | insomnia, p. 91 |
| dual processing, p. 79 | circadian [ser-KAY-dee-an] rhythm, p. 83 | narcolepsy, p. 92 |
| blindsight, p. 79 | REM sleep, p. 84 | sleep apnea, p. 92 |
| selective attention, p. 80 | alpha waves, p. 85 | night terrors, p. 93 |
| | sleep, p. 85 | dream, p. 93 |
| | hallucinations, p. 85 | manifest content, p. 94 |
| | delta waves, p. 85 | latent content, p. 95 |

REM rebound, p. 96

hypnosis, p. 97

posthypnotic suggestion, p. 98

dissociation, p. 99

psychoactive drug, p. 100

tolerance, p. 100

addiction, p. 101

withdrawal, p. 102

physical dependence, p. 102

psychological dependence, p. 102

depressants, p. 102

alcohol dependence, p. 102

barbiturates, p. 103

opiates, p. 103

stimulants, p. 104

amphetamines, p. 104

nicotine, p. 104

methamphetamine, p. 106

Ecstasy (MDMA), p. 107

hallucinogens, p. 107

LSD, p. 107

near-death experience, p. 107

THC, p. 108

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Failure to see visible objects because our attention is occupied elsewhere is called _____.
- We register and react to stimuli outside of our awareness by means of _____ processing. When we devote deliberate attention to stimuli, we use _____ processing.
- Our body temperature tends to rise and fall in sync with a biological clock, which is referred to as _____.
- During Stage NREM-1 sleep, a person is most likely to experience
 - sleep spindles.
 - hallucinations.
 - night terrors or nightmares.
 - rapid eye movements.
- The brain emits large, slow delta waves during _____ sleep.
- As the night progresses, what happens to the REM stage of sleep?
- Which of the following is NOT one of the theories that have been proposed to explain why we need sleep?
 - Sleep has survival value.
 - Sleep helps us recuperate.
 - Sleep rests the eyes.
 - Sleep plays a role in the growth process.
- What is the difference between narcolepsy and sleep apnea?
 - physical dependence, p. 102
 - psychological dependence, p. 102
 - depressants, p. 102
 - alcohol dependence, p. 102
 - barbiturates, p. 103
 - opiates, p. 103
 - stimulants, p. 104
 - amphetamines, p. 104
 - nicotine, p. 104
 - methamphetamine, p. 106
 - Ecstasy (MDMA), p. 107
 - hallucinogens, p. 107
 - LSD, p. 107
 - near-death experience, p. 107
 - THC, p. 108
- In interpreting dreams, Freud was most interested in their
 - information-processing function.
 - physiological function.
 - manifest content, or story line.
 - latent content, or hidden meaning.
- What is the *neural activation* theory of dreaming?
- “For what one has dwelt on by day, these things are seen in visions of the night” (Menander of Athens [342–292 B.C.E.], *Fragments*). How might the information-processing perspective on dreaming interpret this quote?
- The tendency for REM sleep to increase following REM sleep deprivation is referred to as _____.
- People who are hypnotizable and will carry out a hypnotic suggestion typically
 - are able to focus totally on a task.
 - have low self-esteem.
 - are subject to hallucinations.
 - are faking their actions.
- Most experts agree that hypnosis can be effectively used to
 - elicit testimony about a “forgotten” event.
 - re-create childhood experiences.
 - relieve pain.
 - block sensory input.
- Hilgard believed that hypnosis involves a state of divided consciousness, or _____.
- After continued use of a psychoactive drug, the drug user needs to take larger doses to get the desired effect. This is referred to as _____.
- The depressants include alcohol, barbiturates,
 - and opiates.
 - cocaine, and morphine.
 - caffeine, nicotine, and marijuana.
 - and amphetamines.

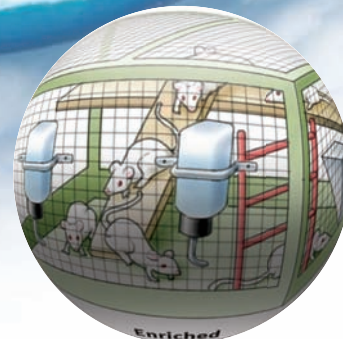
18. Why might alcohol make a person more helpful *or* more aggressive?
19. Long-term use of Ecstasy can
- depress sympathetic nervous system activity.
 - deplete the brain's supply of epinephrine.
 - deplete the brain's supply of dopamine.
 - damage serotonin-producing neurons.
20. Near-death experiences are strikingly similar to the hallucinations evoked by _____.
21. Use of marijuana
- impairs motor coordination, perception, reaction time, and memory.
 - inhibits people's emotions.
 - leads to dehydration and overheating.
 - stimulates brain cell development.
22. An important psychological contributor to drug use is
- inflated self-esteem.
 - the feeling that life is meaningless and directionless.
 - genetic predispositions.
 - overprotective parents.

Find answers to these questions in Appendix E, in the back of the book.



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DEVELOPMENTAL PSYCHOLOGY'S MAJOR ISSUES

PRENATAL DEVELOPMENT AND THE NEWBORN

- Conception
- Prenatal Development
- The Competent Newborn

INFANCY AND CHILDHOOD

- Physical Development
- Cognitive Development
- CLOSE-UP:** Autism and "Mind-Blindness"
- Social Development
- Reflections on Nature and Nurture

ADOLESCENCE

- Physical Development
- Cognitive Development
- Social Development
- THINKING CRITICALLY ABOUT:** How Much Credit or Blame Do Parents Deserve?
- Emerging Adulthood
- Reflections on Continuity and Stages

ADULTHOOD

- Physical Development
- Cognitive Development
- Social Development
- Reflections on Stability and Change



Developing Through the Life Span



Life is a journey, from womb to tomb. So it is for me, and so it will be for you. My story, and yours, began when a man and a woman contributed 20,000+ genes to an egg that became a unique person. Those genes coded

the protein building blocks that, with astonishing precision, formed our bodies and predisposed our traits. My grandmother bequeathed to my mother a rare hearing-loss pattern, which she, in turn, gave to me (the least of her gifts). My father was an amiable extravert, and sometimes I forget to stop talking. As a child, my talking was impeded by painful stuttering, for which Seattle Public Schools gave me speech therapy.

Along with my parents' nature, I also received their nurture. Like you, I was born into a particular family and culture, with its own way of viewing the world.

My values have been shaped by a family culture filled with talking and laughter, by a religious culture that speaks of love and justice, and by an academic culture that encourages critical thinking (asking, *What do you mean? How do you know?*).

We are formed by our genes, and by our contexts, so our stories will differ. But in many ways we are each like nearly everyone else on Earth. Being human, you and I have a need to belong. My mental video library, which began after age 4, is filled with scenes of social attachment. Over time, my attachments to parents loosened as peer friendships grew. After lacking confidence to date in high school, I fell in love with a college classmate and married at age 20. Natural selection disposes us to survive and perpetuate our genes. Sure enough, two years later a child entered our lives and I experienced a new form of love that surprised me with its intensity.

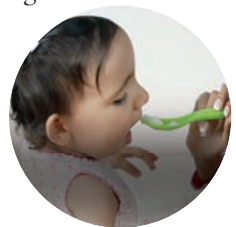
But life is marked by change. That child now lives 2000 miles away, and one of his two siblings has found her calling in South Africa. The tight rubber bands linking parent and child have loosened, as yours likely have as well.

Change also marks most vocational lives, which for me transitioned from a teen working in the family insurance agency, to a premed chemistry major and hospital aide, to (after discarding my half-completed medical school applications) a psychology professor and author. I predict that in 10 years you, too, will be doing things you do not currently anticipate.

Stability also marks our development. When I look in the mirror I do not see the person I once was, but I feel like the person I have always been. I am the same person who, as a late teen, played basketball and discovered love. A half-century later, I still play basketball and still love (with less passion but more security) the life partner with whom I have shared life's griefs and joys.

We experience a continuous self, but that self morphs through stages—growing up, raising children, enjoying a career, and, eventually, life's final stage, which will demand my presence. As I wend my way through this cycle of life and death, I am mindful that life's journey is a continuing process of development, seeded by nature and shaped by nurture, animated by love and focused by work, begun with wide-eyed curiosity and completed, for those blessed to live to a good old age, with peace and never-ending hope.

Across the life span we grow from newborn to toddler, from toddler to teenager, and from teen to mature adult. At each stage of life's journey there are physical, cognitive, and social milestones. Let's begin at the very beginning.



developmental psychology a branch of psychology that studies physical, cognitive, and social change throughout the life span.

zygote the fertilized egg; it enters a 2-week period of rapid cell division and develops into an embryo.

embryo the developing human organism from about 2 weeks after fertilization through the second month.

fetus the developing human organism from 9 weeks after conception to birth.

“Nature is all that a man brings with him into the world; nurture is every influence that affects him after his birth.”

Francis Galton, *English Men of Science, 1874*

Developmental Psychology’s Major Issues



4-1: What three issues have engaged developmental psychologists?

Developmental psychology examines our physical, cognitive, and social development across the life span, with a focus on three major issues:

1. **Nature and nurture:** How does our genetic inheritance (*our nature*) interact with our experiences (*our nurture*) to influence our development? How have your nature and your nurture influenced *your* life story?
2. **Continuity and stages:** What parts of development are gradual and continuous, like riding an escalator? What parts change abruptly in separate stages, like climbing rungs on a ladder?
3. **Stability and change:** Which of our traits persist through life? How do we change as we age?

We will reflect on these three developmental issues throughout this chapter.

Prenatal Development and the Newborn



4-2: What is the course of prenatal development, and how do teratogens affect that development?

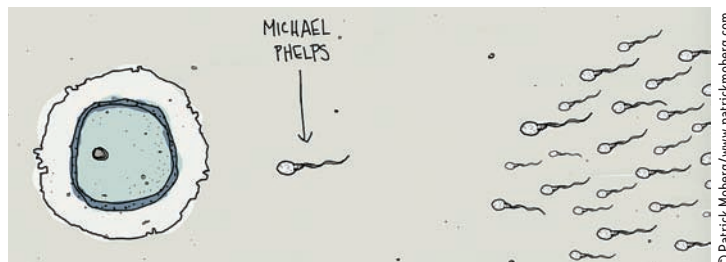
Conception

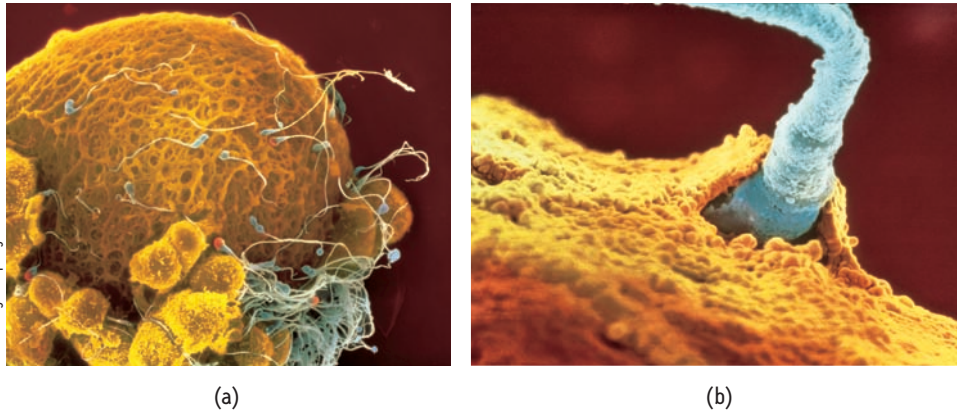
Nothing is more natural than a species reproducing itself. And nothing is more wondrous. With humans, the process starts when a woman’s ovary releases a mature egg—a cell roughly the size of the period at the end of this sentence. Like space voyagers approaching a huge planet, the 200 million or more deposited sperm begin their race upstream, approaching a cell 85,000 times their own size. The relatively few reaching the egg release digestive enzymes that eat away its protective coating (**FIGURE 4.1a**). As soon as one sperm penetrates that coating and is welcomed in (Figure 4.1b), the egg’s surface blocks out the others. Before half a day elapses, the egg nucleus and the sperm nucleus fuse. The two have become one.

Consider it your most fortunate of moments. Among 200 million sperm, the one needed to make you, in combination with that one particular egg, won the race. And

so it was for innumerable generations before us. If any one of our ancestors had been conceived with a different sperm or egg, or died before conceiving, or not chanced to meet the partner or . . . the mind boggles at the improbable, unbroken chain of events that produced you and me.

First known photo of Michael Phelps (If the playful cartoonist were to convey literal truth, a second arrow would also point to the egg that contributed the other half of Michael Phelps’ genes.)



Both photos: Lennart Nilsson/Albert Bonnier
Publishing Company**FIGURE 4.1**

Life is sexually transmitted (a) Sperm cells surround an egg. (b) As one sperm penetrates the egg's jelly-like outer coating, a series of chemical events begins that will cause sperm and egg to fuse into a single cell. If all goes well, that cell will subdivide again and again to emerge 9 months later as a 100-trillion-cell human being.

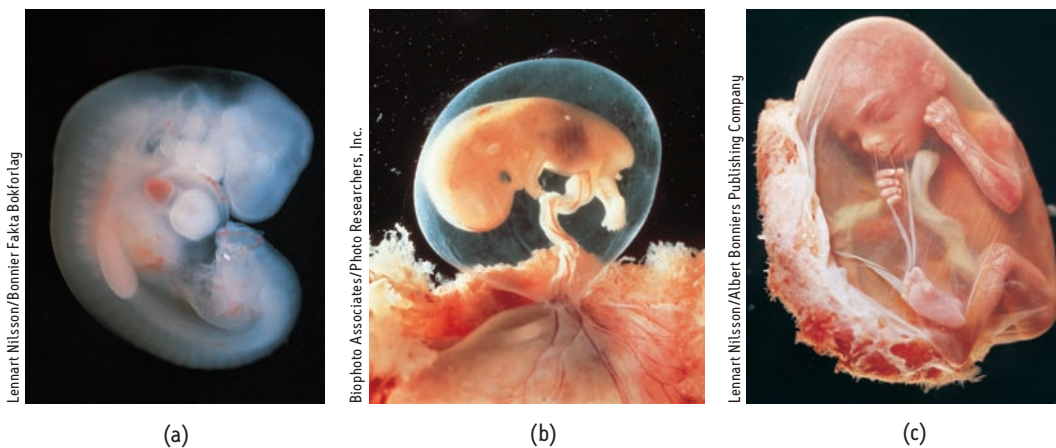
Prenatal Development

Fewer than half of all fertilized eggs, called **zygotes**, survive beyond the first 2 weeks (Grobstein, 1979; Hall, 2004). But for you and me, good fortune prevailed. One cell became 2, then 4—each just like the first—until this cell division had produced some 100 identical cells within the first week. Then the cells began to differentiate—to specialize in structure and function. How identical cells do this—as if one decides “I’ll become a brain, you become intestines!”—is a puzzle that scientists are just beginning to solve.

About 10 days after conception, the zygote attaches to the mother’s uterine wall, beginning approximately 37 weeks of the closest human relationship. The zygote’s inner cells become the **embryo** (FIGURE 4.2a). The outer cells become the *placenta*, the life-link that transfers nutrients and oxygen from mother to embryo. Over the next 6 weeks, the embryo’s organs begin to form and function. The heart begins to beat.

By 9 weeks after conception, an embryo looks unmistakably human (Figure 4.2b). It is now a **fetus** (Latin for “offspring” or “young one”). During the sixth month, organs such as the stomach have developed enough to give the fetus a chance of survival if born prematurely.

At each prenatal stage, genetic and environmental factors affect our development. By the sixth month, microphone readings taken inside the uterus reveal that the fetus is responsive to sound and is exposed to the sound of its mother’s muffled voice (Ecklund-Flores, 1992; Hepper, 2005). Immediately after birth, newborns prefer her voice to another woman’s or to their father’s (Busnel et al., 1992; DeCasper et al., 1984, 1986, 1994). They also prefer hearing their mother’s language. If she spoke two languages during pregnancy, they display interest in both (Byers-Heinlein et al., 2010). And just after birth, the melodic ups and downs of newborns’ cries bear the tuneful signature of their

**FIGURE 4.2**

Prenatal development (a) The embryo grows and develops rapidly. At 40 days, the spine is visible and the arms and legs are beginning to grow. (b) By the end of the second month, when the fetal period begins, facial features, hands, and feet have formed. (c) As the fetus enters the fourth month, its 3 ounces could fit in the palm of your hand.

teratogens (literally, “monster maker”) agents, such as toxins, chemicals, and viruses, that can reach the embryo or fetus during prenatal development and cause harm.

fetal alcohol syndrome (FAS)

physical and cognitive abnormalities in children caused by a pregnant woman’s heavy drinking. In severe cases, symptoms include noticeable facial misproportions.

Prenatal development

zygote:	conception to 2 weeks
embryo:	2 weeks through 8 weeks
fetus:	9 weeks to birth

“You shall conceive and bear a son. So then drink no wine or strong drink.”

Judges 13:7

“I felt like a man trapped in a woman’s body. Then I was born.”

Comedian Chris Bliss



moodboard/JupiterImages

mother’s native tongue (Mampe et al., 2009). Babies born to French-speaking mothers tend to cry with the rising intonation of French; babies born to German-speaking mothers cry with the falling tones of German. Would you have guessed? The learning of language begins in the womb.

In the two months before birth, fetuses demonstrate learning in other ways, as when they adapt to a vibrating, honking device placed on their mother’s abdomen (Dirix et al., 2009). Like people who adapt to the sound of trains in their neighborhood, fetuses get used to the honking. Moreover, four weeks later, they recall the sound (as evidenced by their blasé response, compared with the reactions of those not previously exposed).

Sounds are not the only stimuli fetuses are exposed to in the womb. In addition to transferring nutrients and oxygen from mother to fetus, the placenta screens out many harmful substances, but some slip by. **Teratogens**, agents such as toxins, viruses, and drugs, can damage an embryo or fetus. This is one reason pregnant women are advised not to drink alcoholic beverages. A pregnant woman never drinks alone. As alcohol enters her bloodstream, and her fetus’, it depresses activity in both their central nervous systems. Alcohol use during pregnancy may prime the woman’s offspring to like alcohol and may put them at risk for heavy drinking and alcohol dependence during their teens. In experiments, when pregnant rats drank alcohol, their young offspring later displayed a liking for alcohol’s taste and odor (Youngentob et al., 2007, 2009).

Even light drinking or occasional binge drinking can affect the fetal brain (Braun, 1996; Ikonomidou et al., 2000; Sayal et al., 2009). Persistent heavy drinking puts the fetus at risk for birth defects and for future behavior problems, hyperactivity, and lower intelligence. For 1 in about 800 infants, the effects are visible as **fetal alcohol syndrome (FAS)**, marked by a small, misproportioned head and lifelong brain abnormalities (May & Gossage, 2001). The fetal damage may occur because alcohol has what Chapter 2 called an *epigenetic effect*: It leaves chemical marks on DNA that switch genes abnormally on or off (Liu et al., 2009).

RETRIEVE IT

- The first two weeks of prenatal development is the period of the _____. The period of the _____ lasts from 9 weeks after conception until birth. The time between those two prenatal periods is considered the period of the _____.

ANSWERS: zygote; fetus; embryo

The Competent Newborn



4-3: What are some newborn abilities, and how do researchers explore infants’ mental abilities?

Babies come with software preloaded on their neural hard drives. Having survived prenatal hazards, we as newborns came equipped with automatic reflex responses ideally suited for our survival. We withdrew our limbs to escape pain. If a cloth over our face interfered with our breathing, we turned our head from side to side and swiped at it.

New parents are often in awe of the coordinated sequence of reflexes by which their baby gets food. When something touches their cheek, babies turn toward that touch, open their mouth, and vigorously *root* for a nipple. Finding one, they automatically close on it and begin *sucking*—which itself requires a coordinated sequence of reflexive *tonguing*, *swallowing*, and *breathing*. Failing to find satisfaction, the hungry baby may *cry*—a behavior parents find highly unpleasant and very rewarding to relieve.

The pioneering American psychologist William James presumed that newborns experience a “blooming, buzzing confusion,” an assumption few people challenged until the 1960s. Then scientists discovered that babies can tell you a lot—if you know how to ask. To ask, you must capitalize on what babies can do—gaze, suck, turn their heads. So,

equipped with eye-tracking machines and pacifiers wired to electronic gear, researchers set out to answer parents' age-old questions: What can my baby see, hear, smell, and think?

Consider how researchers exploit **habituation**—a decrease in responding with repeated stimulation. We saw this earlier when fetuses adapted to a vibrating, honking device placed on their mother's abdomen. The novel stimulus gets attention when first presented. With repetition, the response weakens. This seeming boredom with familiar stimuli gives us a way to ask infants what they see and remember.

Indeed, even as newborns, we prefer sights and sounds that facilitate social responsiveness. We turn our heads in the direction of human voices. We gaze longer at a drawing of a face-like image (**FIGURE 4.3**). We prefer to look at objects 8 to 12 inches away, which—wonder of wonders—just happens to be the approximate distance between a nursing infant's eyes and its mother's (Maurer & Maurer, 1988).

Within days after birth, our brain's neural networks were stamped with the smell of our mother's body. Week-old nursing babies, placed between a gauze pad from their mother's bra and one from another nursing mother, have usually turned toward the smell of their own mother's pad (MacFarlane, 1978). What's more, that smell preference lasts. One experiment capitalized on the fact that some nursing mothers in a French maternity ward used a chamomile-scented balm to prevent nipple soreness (Delaunay-El Allam, 2010). Twenty-one months later, their toddlers preferred playing with chamomile-scented toys! Their peers who had not sniffed the scent while breast feeding showed no such preference. (This makes me wonder: Will adults, who as babies associated chamomile scent with their mother's breast, become devoted chamomile tea drinkers?)



Lightscaapes Photography, Inc. Corbis



Asia Images/Getty Images

Prepared to feed and eat Animals are predisposed to respond to their offsprings' cries for nourishment.

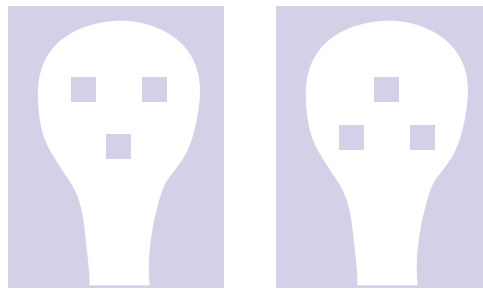


FIGURE 4.3
Newborns' preference for faces

When shown these two stimuli with the same elements, Italian newborns spent nearly twice as many seconds looking at the face-like image (Johnson & Morton, 1991). Canadian newborns—average age 53 minutes in one study—displayed the same apparently inborn preference to look toward faces (Mondloch et al., 1999).

Infancy and Childhood

As a flower unfolds in accord with its genetic instructions, so do we humans. **Maturation**—the orderly sequence of biological growth—decrees many of our commonalities. We stand before walking. We use nouns before adjectives. Severe deprivation or abuse can retard our development, but the genetic growth tendencies are inborn. Maturation (nature) sets the basic course of development; experience (nurture) adjusts it. Once again, we see genes and scenes interacting.

Physical Development



4-4: During infancy and childhood, how do the brain and motor skills develop?

Brain Development

The formative nurture that conspired with nature began at conception, with the pre-natal environment in the womb. Nurture continues outside the womb, where our early experiences foster brain development.

“It is a rare privilege to watch the birth, growth, and first feeble struggles of a living human mind.”

Annie Sullivan, in Helen Keller's The Story of My Life, 1903

habituation decreasing responsiveness with repeated stimulation. As infants gain familiarity with repeated exposure to a visual stimulus, their interest wanes and they look away sooner.

maturation biological growth processes that enable orderly changes in behavior, relatively uninfluenced by experience.

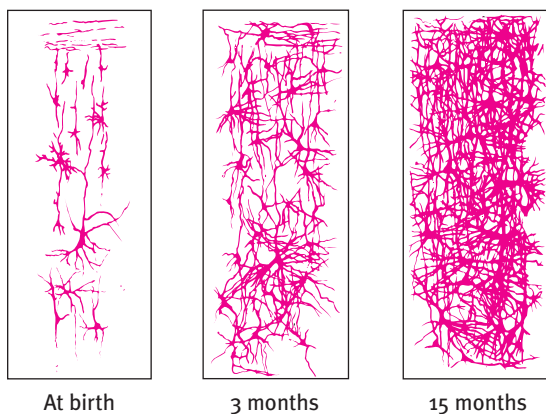


FIGURE 4.4
Drawings of human cerebral cortex sections In humans, the brain is immature at birth. As the child matures, the neural networks grow increasingly complex.



Stringing the circuits young String musicians who started playing before age 12 have larger and more complex neural circuits controlling the note-making left-hand fingers than do string musicians whose training started later (Elbert et al., 1995).

FIGURE 4.5
Experience affects brain development Mark Rosenzweig and David Krech raised rats either alone in an environment without playthings, or with other rats in an environment enriched with playthings changed daily. In 14 of 16 repetitions of this basic experiment, rats in the enriched environment developed significantly more cerebral cortex (relative to the rest of the brain's tissue) than did those in the impoverished environment.

In your mother's womb, your developing brain formed nerve cells at the explosive rate of nearly one-quarter million per minute. From infancy on, brain and mind—neural hardware and cognitive software—develop together. On the day you were born, you had most of the brain cells you would ever have. However, the wiring among these cells—your nervous system—was immature: After birth, these neural networks had a wild growth spurt branching and linking in patterns that would eventually enable you to walk, talk, and remember (**FIGURE 4.4**).

From ages 3 to 6, the most rapid brain growth was in your frontal lobes, which enable rational planning. During those years, your ability to control your attention and behavior developed rapidly (Garon et al., 2008; Thompson-Schill et al., 2009).

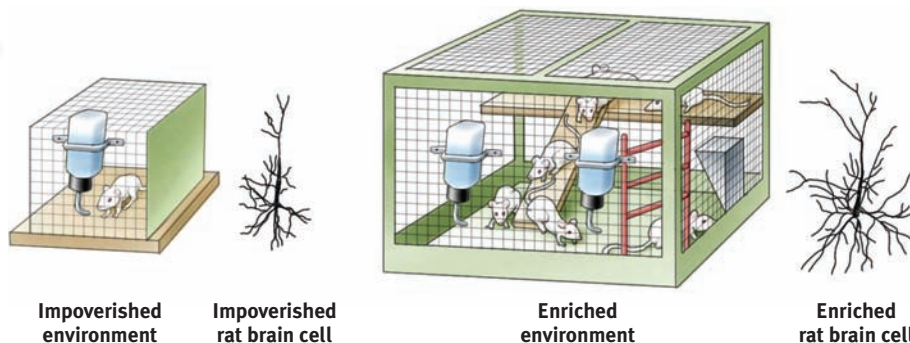
Frontal lobe development continues into adolescence and beyond. The last cortical areas to develop are the association areas—those linked with thinking, memory, and language. As they develop, mental abilities surge (Chugani & Phelps, 1986; Thatcher et al., 1987). The neural pathways supporting language and agility proliferate into puberty. Then, a use-it-or-lose-it *pruning process* shuts down unused links and strengthens others (Paus et al., 1999; Thompson et al., 2000).

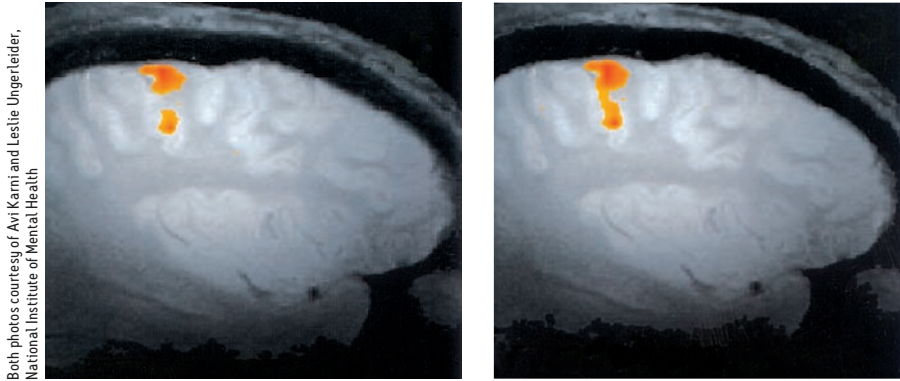
Your genes dictated your overall brain architecture, rather like the lines of a coloring book, but experience fills in the details (Kenrick et al., 2009). So how do early experiences leave their “marks” in the brain? Mark Rosenzweig and David Krech opened a window on that process when they raised some young rats in solitary confinement in an impoverished environment, and others in a communal playground that simulated a natural environment. When the researchers later analyzed the rats' brains, those who died with the most toys had won. The rats living in the enriched environment had usually developed a heavier and thicker brain cortex (**FIGURE 4.5**).

Rosenzweig was so surprised by this discovery that he repeated the experiment several times before publishing his findings (Renner & Rosenzweig, 1987; Rosenzweig, 1984). So great are the effects that, shown brief video clips, you could tell from the rats' activity and curiosity whether their environment had been impoverished or enriched (Renner & Renner, 1993). After 60 days in the enriched environment, the rats' brain weights increased 7 to 10 percent and the number of synapses mushroomed by about 20 percent (Kolb & Whishaw, 1998).

Such results have motivated improvements in environments for laboratory, farm, and zoo animals—and for children in institutions. Stimulation by touch or massage also benefits infant rats and premature babies (Field et al., 2007). “Handled” infants of both species develop faster neurologically and gain weight more rapidly. By giving preemies massage therapy, neonatal intensive care units help them to go home sooner (Field et al., 2006).

Nature and nurture together sculpt our synapses. Brain maturation provides us with an abundance of neural connections. Experiences—sights and smells, touches and tugs—activate and strengthen some neural pathways while others weaken from disuse. Like forest pathways, popular tracks are broadened and less-traveled ones gradually disappear. The result by puberty is a massive loss of unemployed connections.





Both photos courtesy of Avi Karni and Leslie Ungerleider, National Institute of Mental Health

FIGURE 4.6

A trained brain A well-learned finger-tapping task activates more motor cortex neurons (orange area, right) than were active in the same brain before training (left). (From Karni et al., 1998.)

Here at the juncture of nurture and nature is the biological reality of early childhood learning. During early childhood—while excess connections are still on call—youngsters can most easily master such skills as the grammar and accent of another language. We seem to have a **critical period** for some skills. Lacking any exposure to spoken, written, or signed language before adolescence, a person will never master any language (see Chapter 9). Likewise, lacking visual experience during the early years, a person whose vision is restored by cataract removal will never achieve normal perceptions (more on this in Chapter 6). Without stimulation, the brain cells normally assigned to vision will die during the pruning process or be diverted to other uses. The maturing brain's rule: Use it or lose it.

Although normal stimulation during the early years is critical, the brain's development does not end with childhood. As we saw in Chapter 2's discussion of brain plasticity, our neural tissue is ever changing and new neurons are born. If a monkey pushes a lever with the same finger several thousand times a day, brain tissue controlling that finger changes to reflect the experience. Human brains work similarly (**FIGURE 4.6**). Whether learning to keyboard or skateboard, we perform with increasing skill as our brain incorporates the learning (Ambrose, 2010).

Motor Development

The developing brain enables physical coordination. As an infant's muscles and nervous system mature, skills emerge. With occasional exceptions, the sequence of physical (motor) development is universal. Babies roll over before they sit unsupported, and they usually crawl on all fours before they walk (**FIGURE 4.7**). These behaviors reflect not imitation but a maturing nervous system; blind children, too, crawl before they walk.

There are, however, individual differences in timing. In the United States, for example, 25 percent of all babies walk by 11 months of age, 50 percent within a week after their first birthday, and 90 percent by age 15 months (Frankenburg et al., 1992). The recommended infant *back-to-sleep position* (putting babies to sleep on their backs to reduce the risk of a smothering crib death) has been associated with somewhat later crawling but not with later walking (Davis et al., 1998; Lipsitt, 2003).

Genes guide motor development. Identical twins typically begin walking on nearly the same day (Wilson, 1979). Maturation—including the rapid development of the cerebellum at the back of the brain—creates our readiness to learn walking at about age 1. Experience before that time has a limited effect. The same is true for other physical skills, including bowel and bladder control. Before necessary muscular and neural maturation, neither pleading nor punishment will produce successful toilet training.



Juice Images/JupiterImages

critical period an optimal period early in the life of an organism when exposure to certain stimuli or experiences produces normal development.

“Genes and experiences are just two ways of doing the same thing—wiring synapses.”

Joseph LeDoux,
The Synaptic Self, 2002

In the eight years following the 1994 launch of a U.S. Back to Sleep educational campaign, the number of infants sleeping on their stomach dropped from 70 to 11 percent—and SIDS (sudden infant death syndrome) deaths fell by half (Braiker, 2005).

FIGURE 4.7

Physical development Sit, crawl, walk, run—the sequence of these motor development milestones is the same the world around, though babies reach them at varying ages.

RETRIEVE IT

- The biological growth process, called _____, explains why most children begin walking by about 12 to 15 months.

ANSWER: maturation

Brain Maturation and Infant Memory

Can you recall your first day of preschool or your third birthday party? Our earliest memories seldom predate our third birthday. We see this *infantile amnesia* in the memories of some preschoolers who experienced an emergency fire evacuation caused by a burning popcorn maker. Seven years later, they were able to recall the alarm and what caused it—if they were 4 to 5 years old at the time. Those experiencing the event as 3-year-olds could not remember the cause and usually misrecalled being already outside when the alarm sounded (Pillemer, 1995). Other studies have confirmed that the average age of earliest conscious memory is 3.5 years (Bauer, 2002, 2007). As children mature, from 4 to 6 to 8 years, childhood amnesia is giving way, and they become increasingly capable of remembering experiences, even for a year or more (Bruce et al., 2000; Morris et al., 2010). The brain areas underlying memory, such as the hippocampus and frontal lobes, continue to mature into adolescence (Bauer, 2007).

Although we *consciously* recall little from before age 4, our brain was processing and storing information during those early years. In 1965, while finishing her doctoral work in psychology, Carolyn Rovee-Collier observed an infant memory. She was a new mom, whose colicky 2-month-old, Benjamin, could be calmed by moving a crib mobile. Weary of hitting the mobile, she strung a cloth ribbon connecting the mobile to Benjamin's foot. Soon, he was kicking his foot to move the mobile. Thinking about her unintended home experiment, Rovee-Collier realized that, contrary to popular opinion in the 1960s, babies are capable of learning. To know for sure that her son wasn't just a whiz kid, she repeated the experiment with other infants (Rovee-Collier, 1989, 1999). Sure enough, they, too, soon kicked more when hitched to a mobile, both on the day of the experiment and the day after. They had learned the link between moving legs and moving mobiles. If, however, she hitched them to a different mobile the next day, the infants showed no learning, indicating that they remembered the original mobile and recognized the difference. Moreover, when tethered to the familiar mobile a month later, they remembered the association and again began kicking (**FIGURE 4.8**).

Traces of forgotten childhood languages may also persist. One study tested English-speaking British adults who had no conscious memory of the Hindi or Zulu they had spoken as children. Yet, up to age 40, they could relearn subtle sound contrasts in these languages that other people could *not* learn (Bowers et al., 2009). What the conscious mind does not know and cannot express in words, the nervous system and our two-track mind somehow remembers.



Michael Newman/PhotoEdit

FIGURE 4.8

Infant at work Babies only 3 months old can learn that kicking moves a mobile, and they can retain that learning for a month. (From Rovee-Collier, 1989, 1997.)

cognition all the mental activities associated with thinking, knowing, remembering, and communicating.

schema a concept or framework that organizes and interprets information.

assimilation interpreting our new experiences in terms of our existing schemas.

accommodation adapting our current understandings (schemas) to incorporate new information.

Cognitive Development



4-5: From the perspectives of Piaget, Vygotsky, and today's researchers, how does a child's mind develop?

Cognition refers to all the mental activities associated with thinking, knowing, remembering, and communicating. Somewhere on your life journey, you became conscious. When was that, and how did your mind unfold from there? Developmental psychologist Jean Piaget [pee-ah-ZHAY] spent his life searching for the answers to such questions. His interest began in 1920, when he was in Paris developing questions for children's intelligence tests. While administering the tests, Piaget became intrigued by children's wrong answers, which were often strikingly similar among same-age children. Where others saw childish mistakes, Piaget saw intelligence at work.

Both photos: Courtesy Judy DeLoache



FIGURE 4.9
Scale errors Psychologists Judy DeLoache, David Uttal, and Karl Rosengren (2004) have reported that 18- to 30-month-old children may fail to take the size of an object into account when trying to perform impossible actions with it. At left, a 21-month-old attempts to slide down a miniature slide. At right, a 24-month-old opens the door to a miniature car and tries to step inside.

A half-century spent with children convinced Piaget that a child’s mind is not a miniature model of an adult’s. Thanks partly to his work, we now understand that children reason *differently* than adults, in “wildly illogical ways about problems whose solutions are self-evident to adults” (Brainerd, 1996).

Piaget’s studies led him to believe that a child’s mind develops through a series of stages, in an upward march from the newborn’s simple reflexes to the adult’s abstract reasoning power. Thus, an 8-year-old can comprehend things a toddler cannot, such as the analogy that “getting an idea is like having a light turn on in your head,” or that a miniature slide is too small for sliding, and a miniature car is much too small to get into (**FIGURE 4.9**).

Piaget’s core idea is that the driving force behind our intellectual progression is an unceasing struggle to make sense of our experiences. To this end, the maturing brain builds **schemas**, concepts or mental molds into which we pour our experiences (**FIGURE 4.10**). By adulthood we have built countless schemas, ranging from *cats* and *dogs* to our concept of *love*.

To explain how we use and adjust our schemas, Piaget proposed two more concepts. First, we **assimilate** new experiences—we interpret them in terms of our current understandings (schemas). Having a simple schema for *dog*, for example, a toddler may call all four-legged animals *dogs*. But as we interact with the world, we also adjust, or **accommodate**, our schemas to incorporate information provided by new experiences. Thus, the child soon learns that the original *dog* schema is too broad and accommodates by refining the category.



Bill Anderson/Photo Researchers, Inc.

Jean Piaget (1896–1980) “If we examine the intellectual development of the individual or of the whole of humanity, we shall find that the human spirit goes through a certain number of stages, each different from the other” (1930).

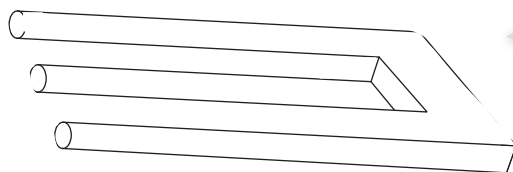


FIGURE 4.10
An impossible object Look carefully at this “devil’s tuning fork.” Now look away—no, better first study it some more—and then look away and draw it. . . . Not so easy, is it? Because this tuning fork is an impossible object, you have no schema for such an image.



Image Source/Getty Images

Pretend play



Table 4.1

Piaget's Stages of Cognitive Development

Typical Age Range	Description of Stage	Developmental Phenomena
Birth to nearly 2 years	<i>Sensorimotor</i> Experiencing the world through senses and actions (looking, hearing, touching, mouthing, and grasping)	<ul style="list-style-type: none"> • Object permanence • Stranger anxiety
About 2 to about 6 or 7 years	<i>Preoperational</i> Representing things with words and images; using intuitive rather than logical reasoning	<ul style="list-style-type: none"> • Pretend play • Egocentrism
About 7 to 11 years	<i>Concrete operational</i> Thinking logically about concrete events; grasping concrete analogies and performing arithmetical operations	<ul style="list-style-type: none"> • Conservation • Mathematical transformations
About 12 through adulthood	<i>Formal operational</i> Abstract reasoning	<ul style="list-style-type: none"> • Abstract logic • Potential for mature moral reasoning

sensorimotor stage in Piaget's theory, the stage (from birth to about 2 years of age) during which infants know the world mostly in terms of their sensory impressions and motor activities.

object permanence the awareness that things continue to exist even when not perceived.

Piaget's Theory and Current Thinking

Piaget believed that children construct their understanding of the world while interacting with it. Their minds experience spurts of change, followed by greater stability as they move from one cognitive plateau to the next, each with distinctive characteristics that permit specific kinds of thinking. TABLE 4.1 summarizes the four stages in Piaget's theory.

Sensorimotor Stage In the **sensorimotor stage**, from birth to nearly age 2, babies take in the world through their senses and actions—through looking, hearing, touching, mouthing, and grasping. As their hands and limbs begin to move, they learn to make things happen.

Very young babies seem to live in the present: Out of sight is out of mind. In one test, Piaget showed an infant an appealing toy and then flopped his beret over it. Before the age of 6 months, the infant acted as if the toy ceased to exist. Young infants lack **object permanence**—the awareness that objects continue to exist when not perceived. By 8 months, infants begin exhibiting memory for things no longer seen. If you hide a toy, the infant will momentarily look for it (FIGURE 4.11). Within another month or two, the infant will look for it even after being restrained for several seconds.

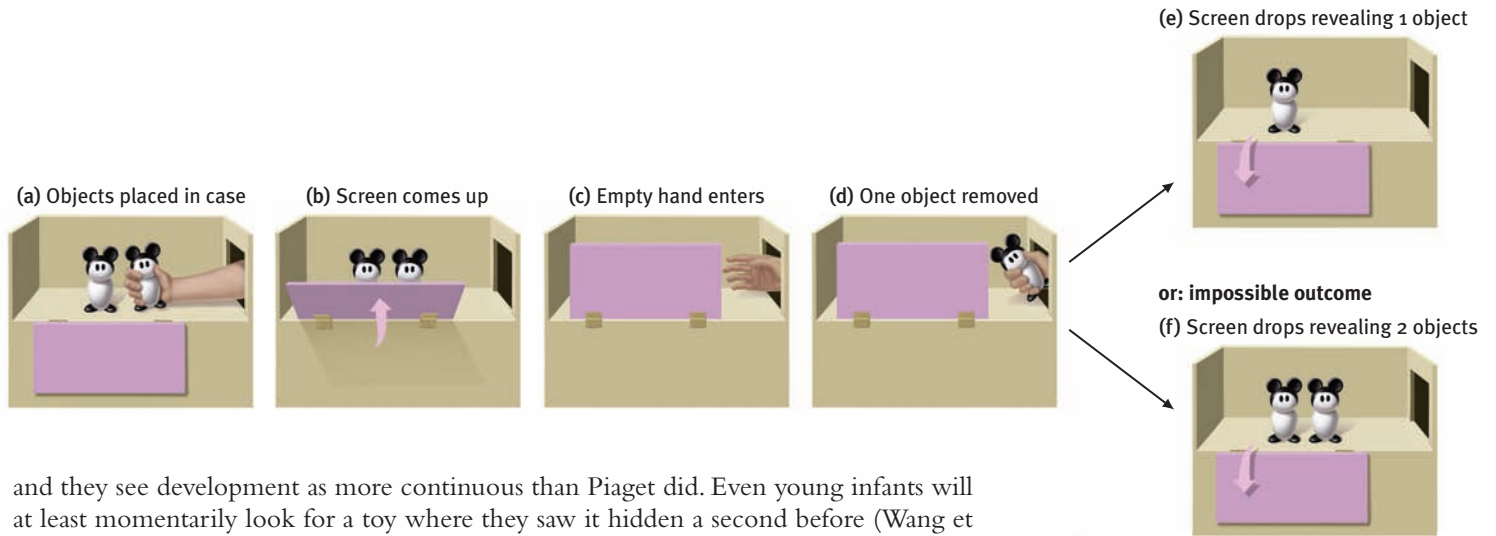
So does object permanence in fact blossom at 8 months, much as tulips blossom in spring? Today's researchers think not. They believe object permanence unfolds gradually,

FIGURE 4.11

Object permanence Infants younger than 6 months seldom understand that things continue to exist when they are out of sight. But for this older infant, out of sight is definitely not out of mind.



Doug Goodman



and they see development as more continuous than Piaget did. Even young infants will at least momentarily look for a toy where they saw it hidden a second before (Wang et al., 2004).

Researchers also believe Piaget and his followers underestimated young children’s competence. Consider these simple experiments:

- **Baby physics:** Like adults staring in disbelief at a magic trick (the “Whoa!” look), infants look longer at an unexpected and unfamiliar scene of a car seeming to pass through a solid object, a ball stopping in midair, or an object violating object permanence by magically disappearing (Baillargeon, 1995, 2008; Wellman & Gelman, 1992).
- **Baby math:** Karen Wynn (1992, 2000) showed 5-month-olds one or two objects (FIGURE 4.12a). Then she hid the objects behind a screen, and visibly removed or added one (Figure 4.12d). When she lifted the screen, the infants sometimes did a double take, staring longer when shown a wrong number of objects (Figure 4.12f). But were they just responding to a greater or smaller *mass* of objects, rather than a change in *number* (Feigenson et al., 2002)? Later experiments showed that babies’ number sense extends to larger numbers, to ratios, and to such things as drumbeats and motions (Libertus & Brannon, 2009; McCrink & Wynn, 2004; Spelke & Kinzler, 2007). If accustomed to a Daffy Duck puppet jumping three times on stage, they showed surprise if it jumped only twice.

Clearly, infants are smarter than Piaget appreciated. Even as babies, we had a lot on our minds.

Preoperational Stage Piaget believed that until about age 6 or 7, children are in a **preoperational stage**—too young to perform *mental operations* (such as imagining an action and mentally reversing it). For a 5-year-old, the milk that seems “too much” in a tall, narrow glass may become an acceptable amount if poured into a short, wide glass. Focusing only on the height dimension, this child cannot perform the operation of mentally pouring the milk back. Before about age 6, said Piaget, children lack the concept of **conservation**—the principle that quantity remains the same despite changes in shape (FIGURE 4.13).

FIGURE 4.12
Baby math Shown a numerically impossible outcome, 5-month-old infants stare longer. (From Wynn, 1992.)

preoperational stage in Piaget’s theory, the stage (from about 2 to about 6 or 7 years of age) during which a child learns to use language but does not yet comprehend the mental operations of concrete logic.

conservation the principle (which Piaget believed to be a part of concrete operational reasoning) that properties such as mass, volume, and number remain the same despite changes in the forms of objects.

FIGURE 4.13
Piaget’s test of conservation This preoperational child does not yet understand the principle of conservation of substance. When the milk is poured into a tall, narrow glass, it suddenly seems like “more” than when it was in the shorter, wider glass. In another year or so, she will understand that the volume stays the same.



Bianca Moscatelli/Worth Publishers



"It's too late, Roger—they've seen us."

Roger has not outgrown his early childhood egocentrism.

egocentrism in Piaget's theory, the preoperational child's difficulty taking another's point of view.

theory of mind people's ideas about their own and others' mental states—about their feelings, perceptions, and thoughts, and the behaviors these might predict.

concrete operational stage in Piaget's theory, the stage of cognitive development (from about 6 or 7 to 11 years of age) during which children gain the mental operations that enable them to think logically about concrete events.

formal operational stage in Piaget's theory, the stage of cognitive development (normally beginning about age 12) during which people begin to think logically about abstract concepts.

PRETEND PLAY A child who can perform mental operations can think in symbols and therefore begins to enjoy *pretend play*. Contemporary researchers have found that symbolic thinking appears at an earlier age than Piaget supposed. Judy DeLoache (1987) showed children a model of a room and hid a miniature stuffed dog behind its miniature couch. The 2½-year-olds easily remembered where to find the miniature toy, but they could not use the model to locate an actual stuffed dog behind a couch in a real room. Three-year-olds—only 6 months older—usually went right to the actual stuffed animal in the real room, showing they *could* think of the model as a symbol for the room. Piaget did not view the stage transitions as abrupt shifts. Even so, he probably would have been surprised to see symbolic thinking at such an early age.

EGOCENTRISM Piaget contended that preschool children are **egocentric**: They have difficulty perceiving things from another's point of view. Asked to "show Mommy your picture," 2-year-old Gabriella holds the picture up facing her own eyes. Three-year-old Gray makes himself "invisible" by putting his hands over his eyes, assuming that if he can't see his grandparents, they can't see him. Children's conversations also reveal their egocentrism, as one young boy demonstrated (Phillips, 1969, p. 61):

"Do you have a brother?"

"Yes."

"What's his name?"

"Jim."

"Does Jim have a brother?"

"No."

Like Gabriella, TV-watching preschoolers who block your view of the TV assume that you see what they see. They simply have not yet developed the ability to take another's viewpoint. Even we adults may overestimate the extent to which others share our opinions and perspectives, a trait known as the *curse of knowledge*. We assume that something will be clear to others if it is clear to us, or that e-mail recipients will "hear" our "just kidding" intent (Epley et al., 2004; Kruger et al., 2005). Children are even more susceptible to such egocentrism.

THEORY OF MIND When Little Red Riding Hood realized her "grandmother" was really a wolf, she swiftly revised her ideas about the creature's intentions and raced away. Preschoolers, although still egocentric, develop this ability to infer others' mental states when they begin forming a **theory of mind** (a term first coined by psychologists David Premack and Guy Woodruff [1978], to describe chimpanzees' seeming ability to read intentions).

As the ability to take another's perspective gradually develops, preschoolers come to understand what made a playmate angry, when a sibling will share, and what might make a parent buy a toy. And they begin to tease, empathize, and persuade. Between about 3½ and 4½, children worldwide come to realize that others may hold false beliefs (Callaghan et al., 2005; Sabbagh et al., 2006). Jennifer Jenkins and Janet Astington (1996) showed Toronto children a Band-Aids box and asked them what was inside. Expecting Band-Aids, the children were surprised to discover that the box actually contained pencils. Asked what a child who had never seen the box would think was inside, 3-year-olds typically answered "pencils." By age 4 to 5, the children's theory of mind had leapt forward, and they anticipated their friends' false belief that the box would hold Band-Aids. Children with *autism* (see Close-Up: Autism and "Mind Blindness," next page) have difficulty understanding that another's state of mind differs from their own.

Concrete Operational Stage By age 6 or 7, said Piaget, children enter the **concrete operational stage**. Given concrete (physical) materials, they begin to grasp conservation. Understanding that change in form does not mean change in quantity, they can mentally pour milk back and forth between glasses of different shapes. They also enjoy jokes that use this new understanding:

Mr. Jones went into a restaurant and ordered a whole pizza for his dinner. When the waiter asked if he wanted it cut into 6 or 8 pieces, Mr. Jones said, “Oh, you’d better make it 6, I could never eat 8 pieces!” (McGhee, 1976)

Piaget believed that during the concrete operational stage, children become able to comprehend mathematical transformations and conservation. When my daughter, Laura, was 6, I was astonished at her inability to reverse simple arithmetic. Asked, “What is 8 plus 4?” she required 5 seconds to compute “12,” and another 5 seconds to then compute 12 minus 4. By age 8, she could answer a reversed question instantly.

Formal Operational Stage By about age 12, our reasoning expands from the purely concrete (involving actual experience) to encompass abstract thinking (involving imagined realities and symbols). As children approach adolescence, said Piaget, many become capable of thinking more like scientists. They can ponder hypothetical propositions and deduce consequences: *If this, then that*. Systematic reasoning, what Piaget called **formal operational** thinking, is now within their grasp.

Although full-blown logic and reasoning await adolescence, the rudiments of formal operational thinking begin earlier than Piaget realized. Consider this simple problem:

If John is in school, then Mary is in school. John is in school. What can you say about Mary?

Formal operational thinkers have no trouble answering correctly. But neither do most 7-year-olds (Suppes, 1982).

An Alternative Viewpoint: Lev Vygotsky and the Social Child

As Piaget was forming his theory of cognitive development, Russian psychologist Lev Vygotsky (1896–1934) was also studying how children think and learn. He noted that by age 7, they increasingly think in words and use words to solve problems. They do this, he said, by internalizing their culture’s language and relying on inner speech (Fernyhough, 2008). Parents who say “No, no!” when pulling a child’s hand away from a cake are giving the child a self-control tool. When the child later needs to resist temptation, he may likewise say “No, no!” Second-graders who muttered to themselves while doing math problems grasped third-grade math better the following year (Berk, 1994). Whether out loud or inaudibly, talking to themselves helps children control their behavior and emotions and master new skills.

Where Piaget emphasized how the child’s mind grows through interaction with the physical environment, Vygotsky emphasized how the child’s mind grows through interaction with the *social* environment. If Piaget’s child was a young scientist, Vygotsky’s was a young apprentice. By mentoring children and giving them new words, parents and others provide a temporary *scaffold* from which children can step to higher levels of thinking (Renninger & Granott, 2005). Language, an important ingredient of social mentoring, provides the building blocks for thinking, noted Vygotsky (who was born the same year as Piaget, but died prematurely of tuberculosis).

Reflecting on Piaget’s Theory

What remains of Piaget’s ideas about the child’s mind? Plenty—enough to merit his being singled out by *Time* magazine as one of the twentieth century’s 20 most influential scientists and thinkers and rated in a survey of British psychologists as the last century’s greatest psychologist (*Psychologist*, 2003). Piaget identified significant cognitive milestones and stimulated worldwide interest in how the mind develops. His emphasis was less on the ages at which children typically reach specific milestones than on their sequence. Studies around the globe, from aboriginal Australia to Algeria to North America, have confirmed that human cognition unfolds basically in the sequence Piaget described (Lourenco & Machado, 1996; Segall et al., 1990).

However, today’s researchers see development as more continuous than did Piaget. By detecting the beginnings of each type of thinking at earlier ages, they have revealed conceptual abilities Piaget missed. Moreover, they view formal logic as a smaller part of cognition than he did. Piaget would not be surprised that today, as part of our own cognitive development, we are adapting his ideas to accommodate new findings.



James V. Wertsch/Washington University

Lev Vygotsky (1896–1934) Vygotsky, a Russian developmental psychologist pictured here with his daughter, studied how a child’s mind feeds on the language of social interaction.

“Assessing the impact of Piaget on developmental psychology is like assessing the impact of Shakespeare on English literature.”

Developmental psychologist Harry Beilin (1992)

CLOSE UP:

Autism and “Mind-Blindness”

Diagnoses of **autism**, a disorder marked by social deficiencies, have been increasing. Once believed to affect 1 in 2500 children, autism or a related disorder now affects 1 in 110 American children and about 1 in 100 in Britain (CDC, 2009; Lilienfeld & Arkowitz, 2007; NAS, 2011). The increase in autism diagnoses has been offset by a decrease in the number of children considered “cognitively disabled” or “learning disabled,” which suggests a relabeling of children’s disorders (Gernsbacher et al., 2005; Grinker, 2007; Shattuck, 2006). A massive \$6.7 billion National Children’s Study now under way aims to enroll 100,000 pregnant women in 105 countries and to follow their babies until they turn 21. Researchers hope this study will help explain the rising rates of autism, as well as premature births, childhood obesity, and asthma (Belluck, 2010; Murphy, 2008).

The underlying source of autism’s symptoms seems to be poor communication among brain regions that normally work together to let us take another’s viewpoint. People with autism are therefore said to have an *impaired theory of mind* (Rajendran & Mitchell, 2007; Senju et al., 2009). They have difficulty inferring others’ thoughts and feelings. They do not appreciate that playmates and parents might view things differently. Mind reading that most of us find intuitive (*Is that face conveying a smirk or a sneer?*) is difficult for those with autism. Most children learn that another child’s pouting mouth signals sadness, and that twinkling eyes mean happiness or mischief. A child with autism fails to understand these signals (Frith & Frith, 2001). In hopes of a cure, desperate parents have sometimes subjected children to ineffective therapies (Shute, 2010).

Autism spectrum disorder is a term used to encompass a range of variations, one of which

.....
autism a disorder that appears in childhood and is marked by deficient communication, social interaction, and understanding of others’ states of mind.



Ozler Muhammad/The New York Times/Redux

Autism This speech-language pathologist is helping a boy with autism learn to form sounds and words. Autism, which afflicts four boys for every girl, is marked by deficient social communication and difficulty grasping others’ states of mind.

.....

is *Asperger syndrome*, a high-functioning form of autism. Asperger syndrome is marked by normal intelligence, often accompanied by exceptional skill or talent in a specific area, but deficient social and communication skills and a tendency to become distracted by irrelevant stimuli (Remington et al., 2009).

Autism afflicts four boys for every girl. Children for whom amniotic fluid analyses indicated high prenatal testosterone develop more masculine and autistic traits (Auyeung et al., 2009). Psychologist Simon Baron-Cohen (2008, 2009) argues that autism represents an “extreme male brain.” Girls are naturally predisposed to be “empathizers,” he contends. They are better at reading facial expressions and gestures, though less so if given testosterone (van Honk et al., 2011). Reading faces is a challenging task for those with autism. Although the sexes overlap, boys are, Baron-Cohen believes, better “systemizers”—better at understanding things according to rules or laws, as in mathematical and mechanical systems.

“If two ‘systemizers’ have a child, this will increase the risk of the child having autism,” Baron-Cohen theorizes. And because of *assortative mating*—people’s tendency to seek spouses who share their interests—two

systemizers will indeed often mate. “I do not discount environmental factors,” he notes. “I’m just saying, don’t forget about biology.”

Twin and sibling studies provide some evidence for biology’s influence. If one identical twin is diagnosed with autism, the chances are 50 to 70 percent that the co-twin will also receive this diagnosis (Lichtenstein et al., 2010; Sebat et al., 2007). A younger sibling of a child with autism also is at a heightened risk (Sutcliffe, 2008). Random genetic mutations in sperm-producing cells may also play a role. As men age, these mutations become more frequent, which may help explain why an over-40 man has a much higher risk of fathering a child with autism than does a man under 30 (Reichenberg et al., 2007). Researchers are now sleuthing autism spectrum disorder’s



Miller Mobley/Redux

Autism case number 1 In 1943, Donald Gray Triplett, an “odd” child with unusual gifts and social deficits, was the first person to receive the diagnosis of a previously unreported condition, which psychiatrist Leo Kanner termed *autism*. In 2010, at age 77, Triplett was still living in his native home and Mississippi town, where he often played golf (Donvan & Zucker, 2010).

Implications for Parents and Teachers Future parents and teachers, remember this: Young children are incapable of adult logic. Preschoolers who block one’s view of the TV simply have not learned to take another’s viewpoint. What seems simple and obvious to us—getting off a teeter-totter will cause a friend on the other end to crash—may be incomprehensible to a 3-year-old. Also remember that children are not

telltale signs in the brain’s synaptic and gray matter (Crawley, 2007; Ecker et al., 2010; Garber, 2007).

Biology’s role in autism also appears in brain-function studies. People without autism often yawn after seeing others yawn. And as they view and imitate another’s smiling or frowning, they feel something of what the other is feeling. Not so among those with autism spectrum disorder, who are less imitative and show much less activity in brain areas involved in mirroring others’ actions (Dapretto et al., 2006; Perra et al., 2008; Senju et al., 2007). When people with autism watch another person’s hand movements, for example, their brain displays less-than-normal mirroring activity (Oberman & Ramachandran, 2007; Théoret et al., 2005). Scientists are continuing to explore and vigorously debate the idea that the brains of people with autism have “broken mirrors” (Gallese et al., 2011).

Seeking to “systemize empathy,” Baron-Cohen and his Cambridge University colleagues

(2007; Golan et al., 2010) collaborated with Britain’s National Autistic Society and a film production company. Knowing that television shows with vehicles have been popular among kids with autism, they created animations with toy vehicle characters in a pretend boy’s bedroom, grafting emotion-conveying faces onto toy trams, trains, and tractors (FIGURE 4.14). After the boy leaves for school, the characters

come to life and have experiences that lead them to display various emotions (which I predict you would enjoy viewing at www.thetransporters.com). The children were surprisingly able to generalize what they had learned to a new, real context. By the intervention’s end, their previously deficient ability to recognize emotions on real faces equaled that of children without autism.

RETRIEVE IT

- What does *theory of mind* have to do with autism?

ANSWER: Theory of mind focuses on our ability to understand our own and others’ mental states. Those with autism struggle with this ability.

FIGURE 4.14

Transported into a world of emotion (a) A research team at Cambridge University’s Autism Research Centre introduced children with autism to emotions experienced and displayed by toy vehicles. (b) After four weeks of viewing animations, the children displayed a markedly increased ability to recognize emotions not only in the toy faces but also in humans.

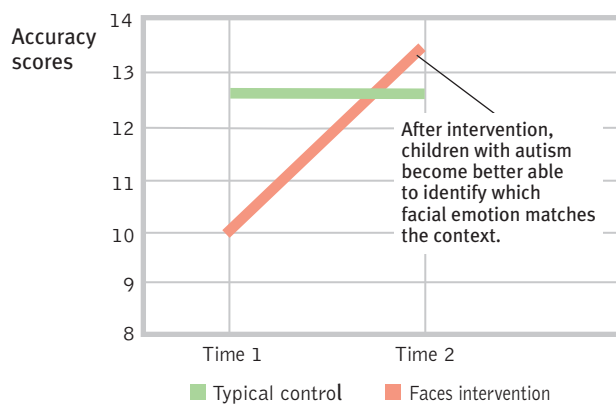


(a) Emotion-conveying faces were grafted onto toy trains.



“The neighbor’s dog has bitten people before. He is barking at Louise.”

Point to the face that shows how Louise is feeling.



(b) Children matched the correct face with the story. (The graph above shows data for two trials.)

passive receptacles waiting to be filled with knowledge. Better to build on what they already know, engaging them in concrete demonstrations and stimulating them to think for themselves. Finally, accept children’s cognitive immaturity as adaptive. It is nature’s strategy for keeping children close to protective adults and providing time for learning and socialization (Bjorklund & Green, 1992).

“Childhood has its own way of seeing, thinking, and feeling, and there is nothing more foolish than the attempt to put ours in its place.”

Philosopher Jean-Jacques Rousseau, 1798

stranger anxiety the fear of strangers that infants commonly display, beginning by about 8 months of age.

attachment an emotional tie with another person; shown in young children by their seeking closeness to the caregiver and showing distress on separation.

imprinting the process by which certain animals form attachments during a critical period very early in life.

RETRIEVE IT

- Object permanence, pretend play, conservation, and abstract logic are developmental milestones for which of Piaget's stages, respectively?

ANSWER: Object permanence for the sensorimotor stage, pretend play for the preoperational stage, conservation for the concrete operational stage, and abstract logic for the formal operational stage.

- Match the developmental phenomena (1–6) to the correct cognitive developmental stage (a–d).

a. Sensorimotor b. Preoperational c. Concrete operational d. Formal operational

1. Thinking about abstract concepts, such as “freedom.”
2. Enjoying imaginary play (such as dress-up).
3. Understanding that physical properties stay the same even when objects change form.
4. Ability to reverse math operations.
5. Understanding that something is not gone for good when it disappears from sight, as when Mom “disappears” behind the shower curtain.
6. Difficulty taking another's point of view (as when blocking someone's view of the TV).

ANSWERS: 1. d, 2. b, 3. c, 4. c, 5. a, 6. b

Social Development



4-6: How do parent-infant attachment bonds form?

From birth, babies are social creatures, developing an intense bond with their caregivers. Infants come to prefer familiar faces and voices, then to coo and gurgle when given a parent's attention. After about 8 months, soon after object permanence emerges and children become mobile, a curious thing happens: They develop **stranger anxiety**. They may greet strangers by crying and reaching for familiar caregivers. “No! Don't leave me!” their distress seems to say. Children this age have schemas for familiar faces; when they cannot assimilate the new face into these remembered schemas, they become distressed (Kagan, 1984). Once again, we see an important principle: *The brain, mind, and social-emotional behavior develop together.*

Origins of Attachment

One-year-olds typically cling tightly to a parent when they are frightened or expect separation. Reunited after being apart, they shower the parent with smiles and hugs. No social behavior is more striking than the intense and mutual infant-parent bond. This **attachment** bond is a powerful survival impulse that keeps infants close to their caregivers. Infants become attached to those—typically their parents—who are comfortable and familiar. For many years, psychologists reasoned that infants became attached to those who satisfied their need for nourishment. It made sense. But an accidental finding overturned this explanation.

Body Contact During the 1950s, University of Wisconsin psychologists Harry Harlow and Margaret Harlow bred monkeys for their learning studies. To equalize experiences and to isolate any disease, they separated the infant monkeys from their mothers shortly after birth and raised them in sanitary individual cages, which included a cheese-cloth baby blanket (Harlow et al., 1971). Then came a surprise: When their blankets were taken to be laundered, the monkeys became distressed.

The Harlows recognized that this intense attachment to the blanket contradicted the idea that attachment derives from an association with nourishment. But how could they show this more convincingly? To pit the drawing power of a food source against the contact comfort of the blanket, they created two artificial mothers. One was a bare wire cylinder with a wooden head and an attached feeding bottle, the other a cylinder wrapped with terry cloth.

Stranger anxiety A newly emerging ability to evaluate people as unfamiliar and possibly threatening helps protect babies 8 months and older.



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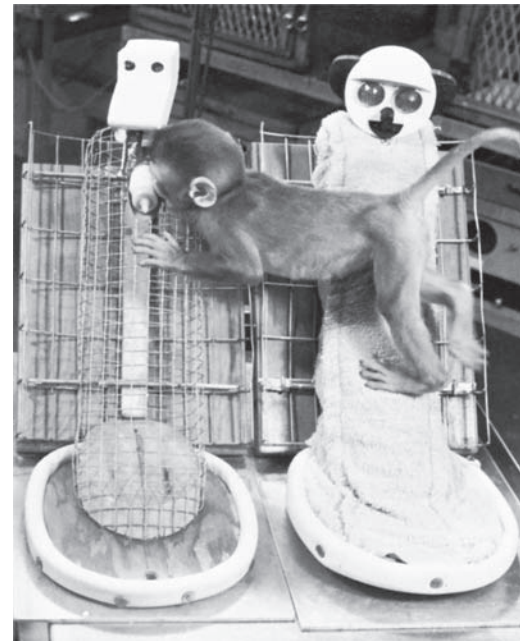
When raised with both, the monkeys overwhelmingly preferred the comfy cloth mother (**FIGURE 4.15**). Like other infants clinging to their live mothers, the monkey babies would cling to their cloth mothers when anxious. When exploring their environment, they used her as a *secure base*, as if attached to her by an invisible elastic band that stretched only so far before pulling them back. Researchers soon learned that other qualities—rocking, warmth, and feeding—made the cloth mother even more appealing.

Human infants, too, become attached to parents who are soft and warm and who rock, feed, and pat. Much parent-infant emotional communication occurs via touch (Hertenstein et al., 2006), which can be either soothing (snuggles) or arousing (tickles). Human attachment also consists of one person providing another with a secure base from which to explore and a safe haven when distressed. As we mature, our secure base and safe haven shift—from parents to peers and partners (Cassidy & Shaver, 1999). But at all ages we are social creatures. We gain strength when someone offers, by words and actions, a safe haven: “I will be here. I am interested in you. Come what may, I will support you” (Crowell & Waters, 1994).

Familiarity Contact is one key to attachment. Another is familiarity. In many animals, attachments based on familiarity form during a *critical period*—an optimal period when certain events must take place to facilitate proper development (Bornstein, 1989). As noted earlier, humans seem to have a critical period for language. Goslings, ducklings, and chicks have a critical period for attachment, called **imprinting**, which falls in the hours shortly after hatching, when the first moving object they see is normally their mother. From then on, the young fowl follow her, and her alone.

Konrad Lorenz (1937) explored this rigid attachment process. He wondered: What would ducklings do if he was the first moving creature they observed? What they did was follow him around: Everywhere that Konrad went, the ducks were sure to go. Although baby birds imprint best to their own species, they also will imprint on a variety of moving objects—an animal of another species, a box on wheels, a bouncing ball (Colombo, 1982; Johnson, 1992). Once formed, this attachment is difficult to reverse.

Children—unlike ducklings—do not imprint. However, they do become attached to what they’ve known. *Mere exposure* to people and things fosters fondness (see Chapter 13). Children like to reread the same books, rewatch the same movies, reenact family traditions. They prefer to eat familiar foods, live in the same familiar neighborhood, attend school with the same old friends. Familiarity is a safety signal. Familiarity breeds content.



Harlow Primate Laboratory, University of Wisconsin

FIGURE 4.15

The Harlows’ mothers Psychologists Harry Harlow and Margaret Harlow raised monkeys with two artificial mothers—one a bare wire cylinder with a wooden head and an attached feeding bottle, the other a cylinder with no bottle but covered with foam rubber and wrapped with terry cloth. The Harlows’ discovery surprised many psychologists: The infants much preferred contact with the comfortable cloth mother, even while feeding from the nourishing mother.



Mark Peterson/Redux

Imprinting Whooping cranes normally learn to migrate by following their parents. These cranes, hand-raised from eggs, imprinted on a crane-costumed ultralight pilot, who then guided them to winter nesting grounds (Mooallem, 2009).

temperament a person's characteristic emotional reactivity and intensity.

basic trust according to Erik Erikson, a sense that the world is predictable and trustworthy; said to be formed during infancy by appropriate experiences with responsive caregivers.

FIGURE 4.16

Social deprivation and fear In the Harlows' experiments, monkeys raised with artificial mothers were terror-stricken when placed in strange situations without those mothers. (Today's climate of greater respect for animal welfare prevents such primate studies.)



Harlow Primate Laboratory, University of Wisconsin

RETRIEVE IT

- What distinguishes imprinting from attachment?

ANSWER: Attachment is the normal process by which we form emotional ties with important others. Imprinting occurs only in certain animals that have a critical period very early in their development during which they must form their attachments, and they do so in an inflexible manner.

Attachment Differences



4-7: How have psychologists studied attachment differences, and what have they learned?

What accounts for children's attachment differences? To answer this question, Mary Ainsworth (1979) designed the *strange situation* experiment. She observed mother-infant pairs at home during their first six months. Later she observed the 1-year-old infants in a strange situation (usually a laboratory playroom). Such research has shown that about 60 percent of infants display *secure attachment*. In their mother's presence they play comfortably, happily exploring their new environment. When she leaves, they become distressed; when she returns, they seek contact with her.

Other infants avoid attachment or show *insecure attachment*, marked either by *anxiety* or *avoidance* of trusting relationships. They are less likely to explore their surroundings; they may even cling to their mother. When she leaves, they either cry loudly and remain upset or seem indifferent to her departure and return (Ainsworth, 1973, 1989; Kagan, 1995; van IJzendoorn & Kroonenberg, 1988).

Ainsworth and others found that sensitive, responsive mothers—those who noticed what their babies were doing and responded appropriately—had infants who exhibited secure attachment (De Wolff & van IJzendoorn, 1997). Insensitive, unresponsive mothers—mothers who attended to their babies when they felt like doing so but ignored them at other times—often had infants who were insecurely attached. The Harlows' monkey studies, with unresponsive artificial mothers, produced even more striking effects. When put in strange situations without their artificial mothers, the deprived infants were terrified (**FIGURE 4.16**).

But is attachment style the *result* of parenting? Or are other factors also at work?

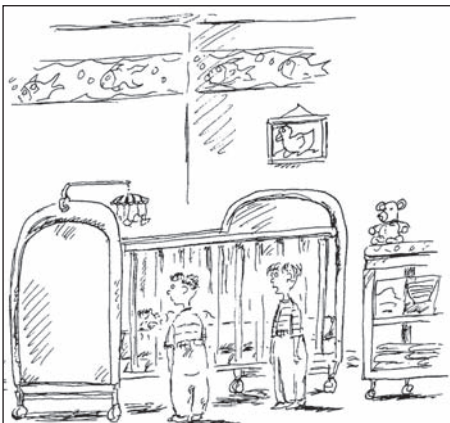
Temperament and Attachment How does **temperament**—a person's characteristic emotional reactivity and intensity—affect attachment style? Temperament is genetically influenced. Shortly after birth, some babies are noticeably difficult—irritable, intense, and unpredictable. Others are easy—cheerful, relaxed, and feeding and sleeping on predictable schedules (Chess & Thomas, 1987).

The genetic effect appears in physiological differences. Anxious, inhibited infants have high and variable heart rates and a reactive nervous system. When facing new or strange situations, they become more physiologically aroused (Kagan & Snidman, 2004). One form of a gene that regulates the neurotransmitter serotonin predisposes a fearful temperament and, in combination with unsupportive caregiving, an inhibited child (Fox et al., 2007).

Temperament differences typically persist. Consider:

- The most emotionally reactive newborns have tended also to be the most reactive 9-month-olds (Wilson & Matheny, 1986; Wrobey & Blajda, 1989).
- Exceptionally inhibited and fearful 2-year-olds often were still relatively shy as 8-year-olds; about half became introverted adolescents (Kagan et al., 1992, 1994).
- The most emotionally intense preschoolers have tended to be relatively intense young adults (Larsen & Diener, 1987). In one long-term study of more than 900 New Zealanders, emotionally reactive and impulsive 3-year-olds developed into somewhat more impulsive, aggressive, and conflict-prone 21-year-olds (Caspi, 2000).

Such evidence supports the conclusion that our biologically rooted temperament helps form our enduring personality (McCrae et al., 2000, 2007; Rothbart et al., 2000).



"Oh, he's cute, all right, but he's got the temperament of a car alarm."

Parenting studies that neglect such inborn differences, noted Judith Harris (1998), do the equivalent of “comparing foxhounds reared in kennels with poodles reared in apartments.” To separate the effects of nature and nurture on attachment, we would need to vary parenting while controlling temperament. (Pause and think: If you were the researcher, how might you have done this?)

Dutch researcher Dymphna van den Boom’s solution was to randomly assign 100 temperamentally difficult 6- to 9-month-olds to either an experimental group, in which mothers received personal training in sensitive responding, or to a control group, in which they did not. At 12 months of age, 68 percent of the experimental group infants were rated securely attached, as were only 28 percent of the control group infants. Other studies have confirmed that intervention programs can increase parental sensitivity and, to a lesser extent, infant attachment security (Bakermans-Kranenburg et al., 2003; Van Zeijl et al., 2006).

As many of these examples indicate, researchers have more often studied mother care than father care, but fathers are more than just mobile sperm banks. Despite the widespread attitude that “fathering a child” means impregnating, and “mothering” means nurturing, nearly 100 studies worldwide have shown that a father’s love and acceptance are comparable to a mother’s love in predicting an offspring’s health and well-being (Rohner & Veneziano, 2001). In one mammoth British study following 7259 children from birth to adulthood, those whose fathers were most involved in parenting (through outings, reading to them, and taking an interest in their education) tended to achieve more in school, even after controlling for other factors such as parental education and family wealth (Flouri & Buchanan, 2004). Fathers matter.

Children’s anxiety over separation from parents peaks at around 13 months, then gradually declines (FIGURE 4.17). This happens whether they live with one parent or two, are cared for at home or in a day-care center, live in North America, Guatemala, or the Kalahari Desert. Does this mean our need for and love of others also fades away? Hardly. Our capacity for love grows, and our pleasure in touching and holding those we love never ceases. The power of early attachment does nonetheless gradually relax, allowing us to move into a wider range of situations, communicate with strangers more freely, and stay emotionally attached to loved ones despite distance.

Attachment Styles and Later Relationships Developmental theorist Erik Erikson (1902–1994), working with his wife, Joan Erikson, believed that securely attached children approach life with a sense of **basic trust**—a sense that the world is predictable and reliable. He attributed basic trust not to environment or inborn temperament, but to early parenting. He theorized that infants blessed with sensitive, loving caregivers form a lifelong attitude of trust rather than fear.

Although debate continues, many researchers now believe that our early attachments form the foundation for our adult relationships (Birnbbaum et al., 2006; Fraley, 2002). Our adult styles of romantic love tend to exhibit secure, trusting attachment; insecure-anxious attachment; or insecure-avoidant attachment (Feeney & Noller, 1990; Rholes & Simpson, 2004; Shaver & Mikulincer, 2007). Feeling insecurely attached to others during childhood, for example, may take two main forms in adulthood (Fraley et al., 2011). One is anxiety, in which people constantly crave acceptance but remain vigilant to signs of possible rejection. The other is avoidance, in which people experience discomfort getting close to others and use avoidant strategies to maintain distance from others.

Adult attachment styles can also affect relationships with one’s own children. Avoidant people’s discomfort with closeness makes parenting more stressful and unsatisfying (Rholes et al., 2006). But say this for those (nearly half of all humans) who exhibit insecure attachments: Anxious or avoidant tendencies have helped our groups detect or escape dangers (Ein-Dor et al., 2010).

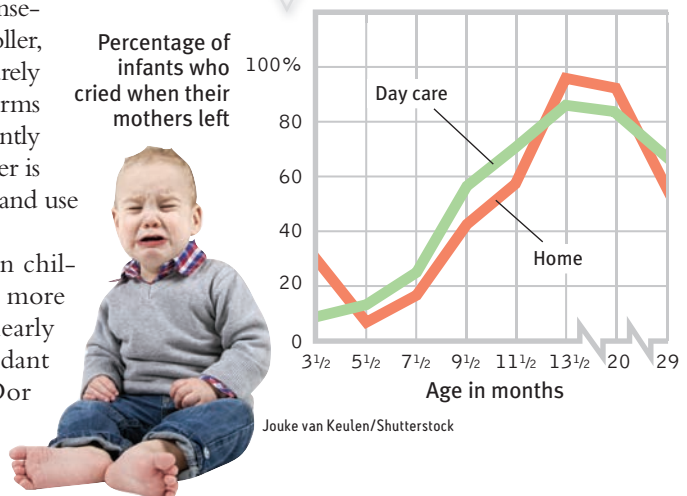


Full-time dad Financial analyst Walter Cranford, shown here with his baby twins, is one of a growing number of stay-at-home dads. Cranford says the experience has made him appreciate how difficult the work can be: “Sometimes at work you can just unplug, but with this you’ve got to be going all the time.”

“Out of the conflict between trust and mistrust, the infant develops hope, which is the earliest form of what gradually becomes faith in adults.”

Erik Erikson (1983)

FIGURE 4.17
Infants’ distress over separation from parents In an experiment, groups of infants were left by their mothers in an unfamiliar room. In both groups, the percentage who cried when their mother left peaked at about 13 months. Whether the infant had experienced day care made little difference. (From Kagan, 1976.)



Deprivation of Attachment



4-8: How does childhood neglect or abuse affect children's attachments?

"What is learned in the cradle, lasts to the grave."

French proverb

If secure attachment fosters social trust, what happens when circumstances prevent a child's forming attachments? In all of psychology, there is no sadder research literature. Babies locked away at home under conditions of abuse or extreme neglect are often withdrawn, frightened, even speechless. The same is true of those reared in institutions without the stimulation and attention of a regular caregiver, as was tragically illustrated during the 1970s and 1980s in Romania. Having decided that economic growth for his impoverished country required more human capital, Nicolae Ceaușescu, Romania's Communist dictator, outlawed contraception, forbade abortion, and taxed families with fewer than five children. The birthrate indeed skyrocketed. But unable to afford the children they had been coerced into having, many families abandoned them to government-run orphanages with untrained and overworked staff. Child-to-caregiver ratios often were 15 to 1, so the children were deprived of healthy attachments with at least one adult. When tested after Ceaușescu was assassinated in 1989, these children had lower intelligence scores and double the 20 percent rate of anxiety symptoms found in children assigned to quality foster care settings (Nelson et al., 2009). Dozens of other studies across 19 countries have confirmed that orphaned children tend to fare better on later intelligence tests if raised in family homes. This is especially so for those placed at an early age (van IJzendoorn et al., 2008).

Most children growing up under adversity (as did the surviving children of the Holocaust) are *resilient*; they become normal adults (Helmreich, 1992; Masten, 2001). So do most victims of childhood sexual abuse, notes Harvard researcher Susan Clancy (2010), while emphasizing that using children for sex is revolting and never the victim's fault.

But others, especially those who experience no sharp break from their abusive past, don't bounce back so readily. The Harlows' monkeys raised in total isolation, without even an artificial mother, bore lifelong scars. As adults, when placed with other monkeys their age, they either cowered in fright or lashed out in aggression. When they reached sexual maturity, most were incapable of mating. If artificially impregnated, females often were neglectful, abusive, even murderous toward their first-born. Another primate experiment confirmed the abuse-breeds-abuse phenomenon in rhesus monkeys: 9 of 16 females who had been abused by their mothers became abusive parents, as did *no* female raised by a nonabusive mother (Maestripieri, 2005).

In humans, too, the unloved may become the unloving. Most abusive parents—and many condemned murderers—have reported being neglected or battered as children (Kempe & Kempe, 1978; Lewis et al., 1988). Some 30 percent of people who have been abused later abuse their children—a rate lower than that found in the primate study, but four times the U.S. national rate of child abuse (Dumont et al., 2007; Kaufman & Zigler, 1987).

Although most abused children do *not* later become violent criminals or abusive parents, extreme early trauma may nevertheless leave footprints on the brain. Abused children exhibit hypersensitivity to angry faces (Pollak, 2008). As adults, they exhibit stronger startle responses (Jovanovic et al., 2009). If repeatedly threatened and attacked while young, normally placid golden hamsters grow up to be cowards when caged with same-sized hamsters, or bullies when caged with weaker ones (Ferris, 1996). Such animals show changes in the brain chemical serotonin, which calms aggressive impulses. A similarly sluggish serotonin response has been found in abused children who become aggressive teens and adults. "Stress can

The deprivation of attachment In this Romanian orphanage, the 250 children between ages 1 and 5 outnumbered caregivers 10 to 1.



set off a ripple of hormonal changes that permanently wire a child's brain to cope with a malevolent world," concluded abuse researcher Martin Teicher (2002).

Such findings help explain why young children who have survived severe or prolonged physical abuse, childhood sexual abuse, or wartime atrocities are at increased risk for health problems, psychological disorders, substance abuse, and criminality (Freyd et al., 2005; Kendall-Tackett et al., 1993, 2004; Wegman & Stetler, 2009). Abuse victims are at considerable risk for depression *if* they carry a gene variation that spurs stress-hormone production (Bradley et al., 2008). As we will see again and again, behavior and emotion arise from a particular environment interacting with particular genes.

We adults also suffer when our attachment bonds are severed. Whether through death or separation, a break produces a predictable sequence. Agitated preoccupation with the lost partner is followed by deep sadness and, eventually, the beginnings of emotional detachment and a return to normal living (Hazan & Shaver, 1994). Newly separated couples who have long ago ceased feeling affection are sometimes surprised at their desire to be near the former partner. Deep and longstanding attachments seldom break quickly. Detaching is a process, not an event.

Day Care



4-9: How does day care affect children?

Developmental psychologists' research has uncovered no major impact of maternal employment on children's development, attachments, and achievements (Friedman & Boyle, 2008; Goldberg et al., 2008; Lucas-Thompson et al., 2010).

Contemporary research now focuses on the effects of differing quality of day care on different types and ages of children (Vandell et al., 2010). Sandra Scarr (1997) explained: Around the world, "high-quality child care consists of warm, supportive interactions with adults in a safe, healthy, and stimulating environment. . . . Poor care is boring and unresponsive to children's needs." Even well-run orphanages can produce healthy, thriving children. In Africa and Asia, where more and more children are losing parents to AIDS and other diseases, orphanages typically are unlike those in Ceaușescu's Romania, and the children living in quality orphanages fare about as well as those living in communities (Whetten et al., 2009).

Children thrive under varied types of responsive caregiving. Westernized attachment features one or two caregivers and their offspring, but multiple caregivers are the norm in other cultures, such as the Efe of Zaire (Field, 1996; Whaley et al., 2002). Even before an Efe mother holds her newborn, the baby is passed among several women. In the weeks to come, the infant will be constantly held (and fed) by other women and will form strong multiple attachments.

One ongoing study in 10 American cities has followed 1100 children since the age of 1 month. The researchers found that at ages 4½ to 6, children who had spent the most time in day care had slightly advanced thinking and language skills. They also had an increased rate of aggressiveness and defiance (NICHD, 2002, 2003, 2006). But the child's temperament, the parents' sensitivity, and the family's economic and educational level influenced aggression more than did the time spent in day care.

There is little disagreement that the children who merely exist for nine hours a day in understaffed centers deserve better. What all children need is a consistent, warm relationship with people they can learn to trust. The importance of such relationships extends beyond the preschool years, as Finnish psychologist Lea Pulkkinen (2006) observed in her career-long study of 285 individuals tracked from age 8 to 42. Her finding—that adult monitoring of children predicts favorable outcomes—led her to undertake, with support from Finland's parliament, a nationwide program of adult-supervised activities for all first and second graders (Pulkkinen, 2004; Rose, 2004).

An example of high-quality day care Research has shown that young children thrive socially and intellectually in safe, stimulating environments with a ratio of one caregiver for every three or four children.



Parenting Styles



4-10: What are three parenting styles, and how do children's traits relate to them?

Some parents spank, some reason. Some are strict, some are lax. Some show little affection, some liberally hug and kiss. Do such differences in parenting styles affect children?

The most heavily researched aspect of parenting has been how, and to what extent, parents seek to control their children. Investigators have identified three parenting styles:

1. **Authoritarian** parents impose rules and expect obedience: “Don’t interrupt.” “Keep your room clean.” “Don’t stay out late or you’ll be grounded.” “Why? Because I said so.”
2. **Permissive** parents submit to their children’s desires. They make few demands and use little punishment.
3. **Authoritative** parents are both demanding and responsive. They exert control by setting rules, but, especially with older children, they encourage open discussion and allow exceptions.

Too hard, too soft, and just right, these styles have been called. Research indicates that children with the highest self-esteem, self-reliance, and social competence usually have warm, concerned, *authoritative* parents (Baumrind, 1996; Buri et al., 1988; Coopersmith, 1967). Those with authoritarian parents tend to have less social skill and self-esteem, and those with permissive parents tend to be more aggressive and immature. The participants in most studies have been middle-class White families, and some critics suggest that effective parenting may vary by culture. Yet studies with families of other races and in more than 200 cultures worldwide have confirmed the social and academic correlates of loving and authoritative parenting (Rohner & Veneziano, 2001; Sorkhabi, 2005; Steinberg & Morris, 2001). For example, two studies of thousands of Germans found that those whose parents had maintained a curfew exhibited better adjustment and greater achievements in young adulthood than did those with permissive parents (Haase et al., 2008).

A word of caution: The association between certain parenting styles (being firm but open) and certain childhood outcomes (social competence) is correlational. *Correlation is not causation.* Perhaps you can imagine possible explanations for this parenting-competence link.

Parents who struggle with conflicting advice should also remember that *all advice reflects the advice giver’s values.* For parents who prize unquestioning obedience or whose children live in dangerous environments, an authoritarian style may have the desired effect. For those who value children’s sociability and self-reliance, authoritative firm-but-open parenting is advisable.

Cultures vary Parents everywhere care about their children, but raise and protect them differently depending on the surrounding culture. Parents raising children in New York City keep them close. In Scotland’s Orkney Islands’ town of Stromness, social trust has enabled parents to park their toddlers outside shops.



Culture and Child Rearing Child-rearing practices reflect not only individual values, but also cultural values, which vary across time and place. Should children be independent or comply? If you live in a Westernized culture, you likely prefer independence. “You are responsible for yourself,” Western families and schools tell their children. “Follow your conscience. Be true to yourself. Discover your gifts. Think through your personal needs.” A half-century ago and more, however, Western cultural values placed greater priority on obedience, respect, and sensitivity to others (Alwin, 1990; Remley, 1988). “Be true to your traditions,” parents then taught their children. “Be loyal to your heritage and country. Show respect toward your parents and other superiors.” Cultures can change.

Children across time and place have thrived under various child-rearing systems. Many Americans now give children their own

bedrooms and entrust them to day care. Upper-class British parents traditionally handed off routine caregiving to nannies, then sent their 10-year-olds off to boarding school. These children generally grew up to be pillars of British society, as did their parents and their boarding-school peers.

Many Asian and African cultures place less value on independence and more on a strong sense of *family self*—a feeling that what shames the child shames the family, and what brings honor to the family brings honor to the self. These cultures also value emotional closeness, and infants and toddlers may sleep with their mothers and spend their days close to a family member (Morelli et al., 1992; Whiting & Edwards, 1988). In the African Gusii society, babies nurse freely but spend most of the day on their mother's back—with lots of body contact but little face-to-face and language interaction. When the mother becomes pregnant again, the toddler is weaned and handed over to someone else, often an older sibling. Westerners may wonder about the negative effects of this lack of verbal interaction, but then the African Gusii may in turn wonder about Western mothers pushing their babies around in strollers and leaving them in playpens (Small, 1997).

Such diversity in child rearing cautions us against presuming that our culture's way is the only way to rear children successfully. One thing is certain, however: Whatever our culture, the investment in raising a child buys many years not only of joy and love but of worry and irritation. Yet for most people who become parents, a child is one's biological and social legacy—one's personal investment in the human future. To paraphrase psychiatrist Carl Jung, we reach backward into our parents and forward into our children, and through their children into a future we will never see, but about which we must therefore care.



Indeed/Getty Images

Parental involvement promotes development Parents in every culture facilitate their children's discovery of their world, but cultures differ in what they deem important. Asian cultures place more emphasis on school and hard work than do North American cultures. This may help explain why Japanese and Taiwanese children get higher scores on mathematics achievement tests.

"You are the bows from which your children as living arrows are sent forth."

Kahlil Gibran, The Prophet, 1923

RETRIEVE IT

- The three parenting styles have been called "too hard, too soft, and just right." Which one is "too hard," which one "too soft," and which one "just right," and why?

ANSWER: The authoritarian style would be too hard, the permissive style too soft, and the authoritative style just right. Parents using the authoritative style tend to have children with high self-esteem, self-reliance, and social competence.

Reflections on Nature and Nurture

The unique gene combination created when our mother's egg engulfed our father's sperm helped form us, as individuals. Genes predispose both our shared humanity and our individual differences.

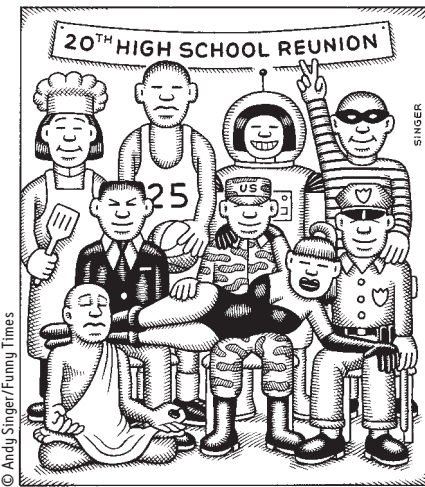
But it is also true that our experiences form us. In the womb, in our families, and in our peer social relationships, we learn ways of thinking and acting. Even differences initiated by our nature may be amplified by our nurture. We are not formed by either nature or nurture, but by the interaction between them. Biological, psychological, and social-cultural forces interact.

Mindful of how others differ from us, however, we often fail to notice the similarities stemming from our shared biology. Regardless of our culture, we humans share the same life cycle. We speak to our infants in similar ways and respond similarly to their coos and cries (Bornstein et al., 1992a,b). All over the world, the children of warm and supportive parents feel better about themselves and are less hostile than are the children of punishing and rejecting parents (Rohner, 1986; Scott et al., 1991). Although Hispanic, Asian, Black, and White Americans differ in school achievement and delinquency, the differences are "no more than skin deep." To the extent that family structure, peer influences, and parental education predict behavior in one of these ethnic groups, they do so for the others as well. Compared with the person-to-person differences within groups, the differences between groups are small.

adolescence the transition period from childhood to adulthood, extending from puberty to independence.

puberty the period of sexual maturation, during which a person becomes capable of reproducing.

How will you look back on your life 10 years from now? Are you making choices that someday you will recollect with satisfaction?



At a five-year high school reunion, former best friends may be surprised at their divergence; a decade or more later, they may have trouble sustaining a conversation.

Adolescence



4-11: How is adolescence defined, and how do physical changes affect developing teens?

Many psychologists once believed that childhood sets our traits. Today's developmental psychologists see development as lifelong. As this *life-span perspective* emerged, psychologists began to look at how maturation and experience shape us not only in infancy and childhood, but also in adolescence and beyond. **Adolescence**—the years spent morphing from child to adult—starts with the physical beginnings of sexual maturity and ends with the social achievement of independent adult status. In some cultures, where teens are self-supporting, this means that adolescence hardly exists.

G. Stanley Hall (1904), one of the first psychologists to describe adolescence, believed that the tension between biological maturity and social dependence creates a period of “storm and stress.” Indeed, after age 30, many who grow up in independence-fostering Western cultures look back on their teenage years as a time they would not want to relive, a time when their peers' social approval was imperative, their sense of direction in life was in flux, and their feeling of alienation from their parents was deepest (Arnett, 1999; Macfarlane, 1964).

But for many, adolescence is a time of vitality without the cares of adulthood, a time of rewarding friendships, heightened idealism, and a growing sense of life's exciting possibilities.

Physical Development

Adolescence begins with **puberty**, the time when we mature sexually. Puberty follows a surge of hormones, which may intensify moods and which trigger a series of bodily changes outlined in Chapter 5, Gender and Sexuality.

Just as in the earlier life stages, the *sequence* of physical changes in puberty (for example, breast buds and visible pubic hair before *menarche*—the first menstrual period) is far more predictable than their *timing*. Some girls start their growth spurt at 9, some boys as late as age 16. Though such variations have little effect on height at maturity, they may have psychological consequences: It is not only when we mature that counts, but how people react to our physical development.

For boys, early maturation has mixed effects. Boys who are stronger and more athletic during their early teen years tend to be more popular, self-assured, and independent, though also more at risk for alcohol use, delinquency, and premature sexual activity (Conley & Rudolph, 2009; Copeland et al., 2010; Lynne et al., 2007). For girls, early maturation can be a challenge (Mendle et al., 2007). If a young girl's body and hormone-fed feelings are out of sync with her emotional maturity and her friends' physical development and experiences, she may begin associating with older adolescents or may suffer teasing or sexual harassment (Ge & Natsuaki, 2009).

An adolescent's brain is also a work in progress. Until puberty, brain cells increase their connections, like trees growing more roots and branches. Then, during adolescence, comes a selective pruning of unused neurons and connections (Blake-more, 2008). What we don't use, we lose.

As teens mature, their frontal lobes also continue to develop. The growth of *myelin*, the fatty tissue that forms around axons and speeds neurotransmission, enables better communication with other brain regions (Kuhn, 2006; Silveri et al., 2006). These developments bring improved judgment, impulse control, and long-term planning.

Maturation of the frontal lobes nevertheless lags behind that of the emotional limbic system. Puberty's hormonal surge and limbic system development help explain teens' occasional impulsiveness, risky behaviors, and emotional storms—slamming doors and turning up the music (Casey et al., 2008). No wonder younger teens (whose unfinished frontal lobes aren't yet fully equipped for making long-term plans and curbing impulses) so often succumb to the tobacco corporations, which most adult smokers could tell them they will later regret. Teens actually don't underestimate the risks of smoking—or fast



Erik Isakson/JupiterImages

driving or unprotected sex. They just, when reasoning from their gut, weigh the immediate benefits more heavily (Reyna & Farley, 2006; Steinberg, 2007, 2010). They seek thrills and rewards, but they can't yet locate the brake pedal controlling their impulses.

So, when Junior drives recklessly and academically self-destructs, should his parents reassure themselves that “he can't help it; his frontal cortex isn't yet fully grown”? They can at least take hope: The brain with which Junior begins his teens differs from the brain with which he will end his teens. Unless he slows his brain development with heavy drinking—leaving him prone to impulsivity and addiction—his frontal lobes will continue maturing until about age 25 (Beckman, 2004; Crews et al., 2007).

In 2004, the American Psychological Association joined seven other medical and mental health associations in filing U.S. Supreme Court briefs arguing against the death penalty for 16- and 17-year-olds. The briefs documented the teen brain's immaturity “in areas that bear upon adolescent decision making.” Teens are “less guilty by reason of adolescence,” suggested psychologist Laurence Steinberg and law professor Elizabeth Scott (2003; Steinberg et al., 2009). In 2005, by a 5-to-4 margin, the Court concurred, declaring juvenile death penalties unconstitutional.

Cognitive Development

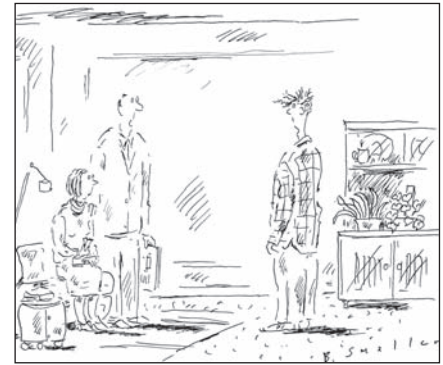


4-12: How did Piaget, Kohlberg, and later researchers describe adolescent cognitive and moral development?

During the early teen years, reasoning is often self-focused. Adolescents may think their private experiences are unique, something parents just could not understand: “But, Mom, *you* don't really know how it feels to be in love” (Elkind, 1978). Capable of thinking about their own thinking, and about other people's thinking, they also begin imagining what others are thinking about *them*. (They might worry less if they understood their peers' similar self-absorption.) Gradually, though, most begin to reason more abstractly.

Developing Reasoning Power

When adolescents achieve the intellectual summit that Jean Piaget called *formal operations*, they apply their new abstract reasoning tools to the world around them. They may think about what is ideally possible and compare that with the imperfect reality of their society, their parents, and even themselves. They may debate human nature, good and evil, truth and justice. Their sense of what's fair changes from simple equality—to what's proportional to merit (Almas et al., 2010). Having left behind the concrete images of early childhood, they may now seek a deeper conception of God and existence (Elkind, 1970; Worthington, 1989). Reasoning hypothetically and deducing consequences also enables adolescents to detect inconsistencies and spot hypocrisy in others' reasoning, sometimes leading to heated debates with parents and silent vows never to lose sight of their own ideals (Peterson et al., 1986).



“Young man, go to your room and stay there until your cerebral cortex matures.”

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“If a gun is put in the control of the prefrontal cortex of a hurt and vengeful 15-year-old, and it is pointed at a human target, it will very likely go off.”

National Institutes of Health brain scientist Daniel R. Weinberger, “A Brain Too Young for Good Judgment,” 2001

“When the pilot told us to brace and grab our ankles, the first thing that went through my mind was that we must all look pretty stupid.”

Jeremiah Rawlings, age 12, after a 1989 DC-10 crash in Sioux City, Iowa



“Ben is in his first year of high school, and he's questioning all the right things.”

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Richard B. Levine/Newsome



Jeff Malet/Newscom

Demonstrating their reasoning ability Although on opposite sides of the immigration policy debate, these teens are all demonstrating their ability to think logically about abstract topics. According to Piaget, they are in the final cognitive stage, formal operations.



Moral reasoning Survivors of the 2010 Haiti earthquake were faced with a moral dilemma: Should they steal household necessities? Their reasoning likely reflected different levels of moral thinking, even if they behaved similarly.

Developing Morality

Two crucial tasks of childhood and adolescence are discerning right from wrong and developing character—the psychological muscles for controlling impulses. To be a moral person is to *think* morally and *act* accordingly. Jean Piaget and Lawrence Kohlberg proposed that moral reasoning guides moral actions. A more recent view builds on psychology’s game-changing new recognition that much of our functioning occurs not on the “high road” of deliberate, conscious thinking but on the “low road” of unconscious, automatic thinking.

Moral Reasoning Piaget (1932) believed that children’s moral judgments build on their cognitive development. Agreeing with Piaget, Lawrence Kohlberg (1981, 1984) sought to describe the development of *moral reasoning*, the thinking that occurs as we consider right and wrong. Kohlberg posed moral dilemmas (for example, whether a person should steal medicine to save a loved one’s life) and asked children, adolescents, and adults whether the action was right or wrong. His analysis of their answers led him to propose three basic levels of moral thinking: preconventional, conventional, and postconventional (**TABLE 4.2**). Kohlberg claimed these levels form a moral ladder. As with all stage theories, the sequence is unvarying. We begin on the bottom rung and ascend to varying heights. Kohlberg’s critics have noted that his postconventional stage is culturally limited, appearing mostly among people who prize individualism (Eckensberger, 1994; Miller & Bersoff, 1995).

Moral Intuition Psychologist Jonathan Haidt (2002, 2006, 2010) believes that much of our morality is rooted in *moral intuitions*—“quick gut feelings, or affectively laden intuitions.” In this intuitionist view, the mind makes moral judgments as it makes aesthetic judgments—quickly and automatically. *We feel* disgust when seeing people engaged in degrading or subhuman acts. Even a disgusting taste in the mouth heightens people’s disgust over various moral digressions (Eskine et al., 2011). *We feel* elevation—a tingly, warm, glowing feeling in the chest—when seeing people display exceptional generosity, compassion, or courage. Such feelings in turn trigger moral reasoning, says Haidt.

One woman recalled driving through her snowy neighborhood with three young men as they passed “an elderly woman with a shovel in her driveway. I did not think much of it, when one of the guys in the back asked the driver to let him off there. . . . When I saw him jump out of the back seat and approach the lady, my mouth dropped in shock as I realized that he was offering to shovel her walk for her.” Witnessing this unexpected goodness triggered elevation: “I felt like jumping out of the car and hugging this guy. I felt like singing and running, or skipping and laughing. I felt like saying nice things about people” (Haidt, 2000).

“Could human morality really be run by the moral emotions,” Haidt wonders, “while moral reasoning struts about pretending to be in control?” Consider the desire to punish. Laboratory games reveal that the desire to punish wrongdoings is mostly driven not

Table 4.2

Kohlberg’s Levels of Moral Thinking

Level (approximate age)	Focus	Example
<i>Preconventional morality</i> (before age 9)	Self-interest; obey rules to avoid punishment or gain concrete rewards.	“If you save your dying wife, you’ll be a hero.”
<i>Conventional morality</i> (early adolescence)	Uphold laws and rules to gain social approval or maintain social order.	“If you steal the drug for her, everyone will think you’re a criminal.”
<i>Postconventional morality</i> (adolescence and beyond)	Actions reflect belief in basic rights and self-defined ethical principles.	“People have a right to live.”

by reason (such as an objective calculation that punishment deters crime) but rather by emotional reactions, such as moral outrage (Darley, 2009). After the emotional fact, moral reasoning—our mind’s press secretary—aims to convince us and others of the logic of what we have intuitively felt.

This intuitionist perspective on morality finds support in a study of moral paradoxes. Imagine seeing a runaway trolley headed for five people. All will certainly be killed unless you throw a switch that diverts the trolley onto another track, where it will kill one person. Should you throw the switch? Most say *Yes*. Kill one, save five.

Now imagine the same dilemma, except that your opportunity to save the five requires you to push a large stranger onto the tracks, where he will die as his body stops the trolley. Kill one, save five? The logic is the same, but most say *No*. Seeking to understand why, a Princeton research team led by Joshua Greene (2001) used brain imaging to spy on people’s neural responses as they contemplated such dilemmas. Only when given the body-pushing type of moral dilemma did their brain’s emotion areas activate. Despite the identical logic, the personal dilemma engaged emotions that altered moral judgment.

While the new research illustrates the many ways moral intuitions trump moral reasoning, other research reaffirms the importance of moral reasoning. The religious and moral reasoning of the Amish, for example, shapes their practices of forgiveness, communal life, and modesty (Narvaez, 2010). Joshua Greene (2010) likens our moral cognition to a camera. Usually, we rely on the automatic point-and-shoot mode. But sometimes we use reason to manually override the camera’s automatic impulse.

Moral Action Our moral thinking and feeling surely affect our moral talk. But sometimes talk is cheap and emotions are fleeting. Morality involves *doing* the right thing, and what we do also depends on social influences. As political theorist Hannah Arendt (1963) observed, many Nazi concentration camp guards during World War II were ordinary “moral” people who were corrupted by a powerfully evil situation.

Today’s character education programs tend to focus on the whole moral package—thinking, feeling, and *doing* the right thing. Research has demonstrated that as children’s *thinking* matures, their *behavior* also becomes less selfish and more caring (Krebs & Van Hesteren, 1994; Miller et al., 1996). Programs now also teach children *empathy* for others’ feelings, and the self-discipline needed to restrain one’s own impulses—to delay small gratifications now to enable bigger rewards later. Those who have learned to *delay gratification* have become more socially responsible, academically successful, and productive (Funder & Block, 1989; Mischel et al., 1988, 1989). In service-learning programs, where teens have tutored, cleaned up their neighborhoods, and assisted older adults, their sense of competence and desire to serve has increased, and their school absenteeism and drop-out rates have diminished (Andersen, 1998; Piliavin, 2003). Moral action feeds moral attitudes.

RETRIEVE IT

- According to Kohlberg, _____ morality focuses on upholding laws and social rules, _____ morality focuses on self-interest, and _____ morality focuses on self-defined ethical principles.

ANSWERS: conventional; preconventional; postconventional

Social Development



4-13: What are the social tasks and challenges of adolescence?

Theorist Erik Erikson (1963) contended that each stage of life has its own *psychosocial* task, a crisis that needs resolution. Young children wrestle with issues of *trust*, then *autonomy* (independence), then *initiative*. School-age children strive for *competence*, feeling able and productive. The adolescent’s task is to synthesize past, present,



“This might not be ethical. Is that a problem for anybody?”

“It is a delightful harmony when doing and saying go together.”

Michel Eyquem de Montaigne
(1533–1592)

“Somewhere between the ages of 10 and 13 (depending on how hormone-enhanced their beef was), children entered adolescence, a.k.a. ‘the de-cutening.’”

Jon Stewart et al.,
Earth (The Book), 2010



© Ron Chapple/Corbis

Competence vs. inferiority



© Oliver Rossi/Corbis

Intimacy vs. isolation

Table 4.3
Erikson's Stages of Psychosocial Development

Stage (approximate age)	Issue	Description of Task
<i>Infancy (to 1 year)</i>	Trust vs. mistrust	If needs are dependably met, infants develop a sense of basic trust.
<i>Toddlerhood (1 to 3 years)</i>	Autonomy vs. shame and doubt	Toddlers learn to exercise their will and do things for themselves, or they doubt their abilities.
<i>Preschool (3 to 6 years)</i>	Initiative vs. guilt	Preschoolers learn to initiate tasks and carry out plans, or they feel guilty about their efforts to be independent.
<i>Elementary school (6 years to puberty)</i>	Competence vs. inferiority	Children learn the pleasure of applying themselves to tasks, or they feel inferior.
<i>Adolescence (teen years into 20s)</i>	Identity vs. role confusion	Teenagers work at refining a sense of self by testing roles and then integrating them to form a single identity, or they become confused about who they are.
<i>Young adulthood (20s to early 40s)</i>	Intimacy vs. isolation	Young adults struggle to form close relationships and to gain the capacity for intimate love, or they feel socially isolated.
<i>Middle adulthood (40s to 60s)</i>	Generativity vs. stagnation	In middle age, people discover a sense of contributing to the world, usually through family and work, or they may feel a lack of purpose.
<i>Late adulthood (late 60s and up)</i>	Integrity vs. despair	Reflecting on his or her life, an older adult may feel a sense of satisfaction or failure.

and future possibilities into a clearer sense of self (**TABLE 4.3**). Adolescents wonder, “Who am I as an individual? What do I want to do with my life? What values should I live by? What do I believe in?” Erikson called this quest the adolescent’s *search for identity*.

Forming an Identity

To refine their sense of identity, adolescents in individualistic cultures usually try out different “selves” in different situations. They may act out one self at home, another with friends, and still another at school or on Facebook. If two situations overlap—as when a teenager brings friends home—the discomfort can be considerable. The teen asks, “Which self should I be? Which is the real me?” The resolution is a self-definition that unifies the various selves into a consistent and comfortable sense of who one is—an **identity**.

For both adolescents and adults, group identities are often formed by how we differ from those around us. When living in Britain, I become conscious of my Americanness. When spending time with my daughter in Africa, I become conscious of my minority White race. When surrounded by women, I am mindful of my gender identity. For international students, for those of a minority ethnic group, for people with a disability, for those on a team, a **social identity** often forms around their distinctiveness.

Erikson noticed that some adolescents forge their identity early, simply by adopting their parents’ values and expectations. (Traditional, less individualistic cultures teach adolescents who they are, rather than encouraging them to decide on their own.) Other adolescents may adopt the identity of a particular peer group—jocks, preps, geeks, goths.

Most young people do develop a sense of contentment with their lives. When American teens were asked whether a series of statements described them, 81 percent said *Yes* to “I would choose my life the way it is right now.” The other 19 percent agreed that “I wish I were somebody else” (Lyons, 2004). Reflecting on their existence, 75 percent of American collegians say they “discuss religion/spirituality” with friends, “pray,” and agree that “we are all spiritual beings” and “search for meaning/purpose in life” (Astin

“Self-consciousness, the recognition of a creature by itself as a ‘self,’ [cannot] exist except in contrast with an ‘other,’ a something which is not the self.”

C. S. Lewis, *The Problem of Pain*, 1940

identity our sense of self; according to Erikson, the adolescent’s task is to solidify a sense of self by testing and integrating various roles.

social identity the “we” aspect of our self-concept; the part of our answer to “Who am I?” that comes from our group memberships.

et al., 2004; Bryant & Astin, 2008). This would not surprise Stanford psychologist William Damon and his colleagues (2003), who have contended that a key task of adolescence is to achieve a purpose—a desire to accomplish something personally meaningful that makes a difference to the world beyond oneself.

Several nationwide studies indicate that young Americans’ self-esteem falls during the early to mid-teen years, and, for girls, depression scores often increase. But then self-image rebounds during the late teens and twenties (Erol & Orth, 2011; Robins et al., 2002; Twenge & Nolen-Hoeksema, 2002). Late adolescence is also a time when agreeableness and emotional stability scores increase (Klimstra et al., 2009).

These are the years when many people in industrialized countries begin exploring new opportunities by attending college or working full time. Many college seniors have achieved a clearer identity and a more positive self-concept than they had as first-year students (Waterman, 1988). Collegians who have achieved a clear sense of identity are less prone to alcohol abuse (Bishop et al., 2005).

Erikson contended that adolescent identity formation (which continues into adulthood) is followed in young adulthood by a developing capacity for **intimacy**, the ability to form emotionally close relationships. Romantic relationships, which tend to be emotionally intense, are reported by some two in three North American 17-year-olds, but fewer among those in collectivist countries such as China (Collins et al., 2009; Li et al., 2010). Those who enjoy high-quality (intimate, supportive) relationships with family and friends tend also to enjoy similarly high-quality romantic relationships in adolescence, which set the stage for healthy adult relationships. Such relationships are, for most of us, a source of great pleasure.



Tristan Savatier/Getty Images



Wiklund, Juliana/Getty Images

Who shall I be today? By varying the way they look, adolescents try out different “selves.” Although we eventually form a consistent and stable sense of identity, the self we present may change with the situation.

Parent and Peer Relationships



4-14: How do parents and peers influence adolescents?

As adolescents in Western cultures seek to form their own identities, they begin to pull away from their parents (Shanahan et al., 2007). The preschooler who can’t be close enough to her mother, who loves to touch and cling to her, becomes the 14-year-old who wouldn’t be caught dead holding hands with Mom. The transition occurs gradually (**FIGURE 4.18**), but this period is typically a time of diminishing parental influence and growing peer influence.

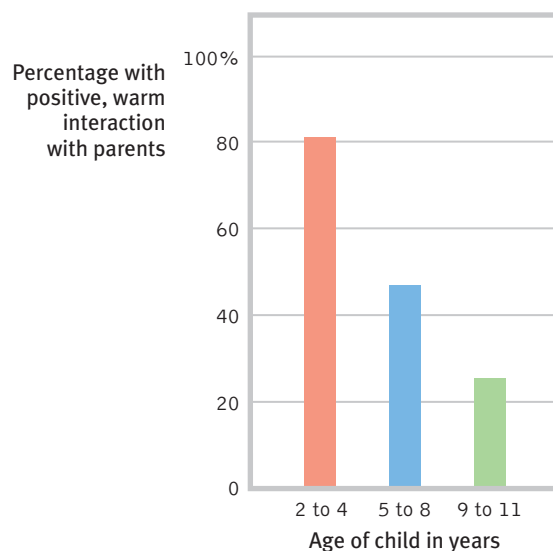


FIGURE 4.18
The changing parent-child relationship In a large, national study of Canadian families, interviews revealed that the typically close, warm relationships between parents and preschoolers loosened as children became older. (Data from Statistics Canada, 1999.)



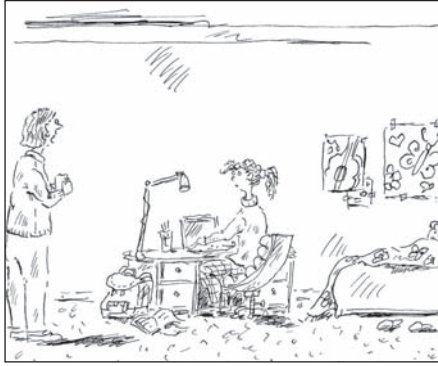
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“She says she’s someone from your past who gave birth to you, and raised you, and sacrificed everything so you could have whatever you wanted.”

intimacy in Erikson’s theory, the ability to form close, loving relationships; a primary developmental task in late adolescence and early adulthood.

“Men resemble the times more than they resemble their fathers.”

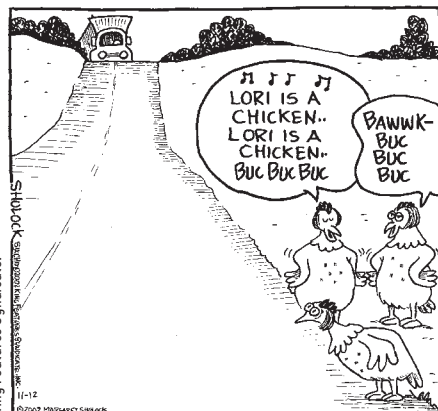
Ancient Arab proverb



“It’s you who don’t understand me—I’ve been fifteen, but you have never been forty-eight.”

“I love u guys.”

Emily Keyes’ final text message to her parents before dying in a Colorado school shooting, 2006



Nine times out of ten, it’s all about peer pressure.

As Aristotle long ago recognized, we humans are “the social animal.” At all ages, but especially during childhood and adolescence, we seek to fit in with our groups and are influenced by them (Harris, 1998, 2000):

- Children who hear English spoken with one accent at home and another in the neighborhood and at school will invariably adopt the accent of their peers, not their parents. Accents (and slang) reflect culture, “and children get their culture from their peers,” noted Judith Rich Harris (2007).
- Teens who start smoking typically have friends who model smoking, suggest its pleasures, and offer cigarettes (J. S. Rose et al., 1999; R. J. Rose et al., 2003). Part of this peer similarity may result from a *selection effect*, as kids seek out peers with similar attitudes and interests. Those who smoke (or don’t) may select as friends those who also smoke (or don’t).
- When Mihaly Csikszentmihalyi [chick-SENT-me-hi] and Jeremy Hunter (2003) used a beeper to sample the daily experiences of American teens, they found them unhappiest when alone and happiest when with friends.

By adolescence, parent-child arguments occur more often, usually over mundane things—household chores, bedtime, homework (Tesser et al., 1989). Conflict during the transition to adolescence tends to be greater with first-born than with second-born children, and greater with mothers than with fathers (Burk et al., 2009; Shanahan et al., 2007).

For a minority of parents and their adolescents, differences lead to real splits and great stress (Steinberg & Morris, 2001). But most disagreements are at the level of harmless bickering. And most adolescents—6000 of them in 10 countries, from Australia to Bangladesh to Turkey—have said they like their parents (Offer et al., 1988). “We usually get along but . . .” adolescents often reported (Galambos, 1992; Steinberg, 1987).

Positive parent-teen relations and positive peer relations often go hand in hand. High school girls who had the most affectionate relationships with their mothers tended also to enjoy the most intimate friendships with girlfriends (Gold & Yanof, 1985). And teens who felt close to their parents have tended to be healthy and happy and to do well in school (Resnick et al., 1997). Of course, we can state this correlation the other way: Misbehaving teens are more likely to have tense relationships with parents and other adults.

Although heredity does much of the heavy lifting in forming individual temperament and personality differences, parents and peers influence teen’s behaviors and attitudes (See Thinking Critically About: How Much Credit or Blame Do Parents Deserve?)

Most teens are herd animals, talking, dressing, and acting more like their peers than their parents. What their friends are, they often become, and what “everybody’s doing,” they often do. In teen calls to hotline counseling services, peer relationships have been the most discussed topic (Boehm et al., 1999). In 2008, according to a Nielsen study, the average American 13- to 17-year-old sent or received more than 1700 text messages a month (Steinhauer & Holson, 2008). Many adolescents become absorbed by social networking, sometimes with a compulsive use that produces “Facebook fatigue.” Online communication stimulates intimate self-disclosure—both for better (support groups) and for worse (online predators and extremist groups) (Subrahmanyam & Greenfield, 2008; Valkenburg & Peter, 2009).

For those who feel excluded by their peers, the pain is acute. “The social atmosphere in most high schools is poisonously clique-driven and exclusionary,” observed social psychologist Elliot Aronson (2001). Most excluded “students suffer in silence. . . . A small number act out in violent ways against their classmates.” Those who withdraw are vulnerable to loneliness, low self-esteem, and depression (Steinberg & Morris, 2001). Peer approval matters.

Teens have tended to see their parents as having more influence in other areas—for example, in shaping their religious faith and in thinking about college and career choices (*Emerging Trends*, 1997). A Gallup Youth Survey revealed that most shared their parent’s political views (Lyons, 2005).

THINKING CRITICALLY ABOUT:

How Much Credit or Blame Do Parents Deserve?

In procreation, a woman and a man shuffle their gene decks and deal a life-forming hand to their child-to-be, who is then subjected to countless influences beyond their control. Parents, nonetheless, feel enormous satisfaction in their children's successes, and feel guilt or shame over their failures. They beam over the child who wins an award. They wonder where they went wrong with the child who is repeatedly called into the principal's office. Freudian psychiatry and psychology encouraged such ideas, by blaming problems from asthma to schizophrenia on "bad mothering," and society has reinforced parent blaming. Believing that parents shape their offspring as a potter molds clay, people readily praise parents for their children's virtues and blame them for their children's vices. Popular culture endlessly proclaims the psychological harm toxic parents inflict on their fragile children. No wonder having and raising children can seem so risky.

But do parents really produce future adults with an inner wounded child by being (take your pick from the toxic-parenting lists) overbearing—or uninvolved? Pushy—or ineffectual? Overprotective—or distant? Are children really so easily wounded? If so, should we then blame our parents for our failings, and ourselves for our children's failings? Or does talk of wounding fragile children through normal parental mistakes trivialize the brutality of real abuse?

Parents do matter. The power of parenting is clearest at the extremes: the abused

children who become abusive, the neglected who become neglectful, the loved but firmly handled who become self-confident and socially competent. The power of the family environment also appears in the remarkable academic and vocational successes of children of people who fled from Vietnam and Cambodia—successes attributed to close-knit, supportive, even demanding families (Caplan et al., 1992).

Yet in personality measures, shared environmental influences from the womb onward typically account for less than 10 percent of children's differences. In the words of behavior geneticists Robert Plomin and Denise Daniels (1987; Plomin, 2011), "Two children in the same family are [apart from their shared genes] as different from one another as are pairs of children selected randomly from the population."

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"So I blame you for everything—whose fault is that?"



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"To be frank, officer, my parents never set boundaries."

To developmental psychologist Sandra Scarr (1993), this implied that "parents should be given less credit for kids who turn out great and blamed less for kids who don't." Knowing children are not easily sculpted by parental nurture, perhaps parents can relax a bit more and love their children for who they are.

"If you want to blame your parents for your own adult problems, you are entitled to blame the genes they gave you, but you are not entitled—by any facts I know—to blame the way they treated you. . . . We are not prisoners of our past."

Martin Seligman, *What You Can Change and What You Can't*, 1994

Even among chimpanzees, when one infant is hurt by another, the victim's mother will often attack the offender's mother (Goodall, 1968).

Howard Gardner (1998) has concluded that parents and peers are complementary:

Parents are more important when it comes to education, discipline, responsibility, orderliness, charitableness, and ways of interacting with authority figures. Peers are more important for learning cooperation, for finding the road to popularity, for inventing styles of interaction among people of the same age. Youngsters may find their peers more interesting, but they will look to their parents when contemplating their own futures. Moreover, parents [often] choose the neighborhoods and schools that supply the peers.



Allan Shoemaker/Getty Images

Peer power As we develop, we play, mate, and partner with peers. No wonder children and youths are so sensitive and responsive to peer influences.

emerging adulthood for some people in modern cultures, a period from the late teens to mid-twenties, bridging the gap between adolescent dependence and full independence and responsible adulthood.

This power to select a child's neighborhood and schools gives parents an ability to influence the culture that shapes the child's peer group. And because neighborhood influences matter, parents may want to become involved in intervention programs that aim at a whole school or neighborhood. If the vapors of a toxic climate are seeping into a child's life, that climate—not just the child—needs reforming. Even so, peers are but one medium of cultural influence. As an African proverb declares, "It takes a village to raise a child."

RETRIEVE IT

- What is the *selection effect*, and how might it affect a teen's decision to join sports teams at school?

ANSWER: Adolescents tend to select similar others and to sort themselves into like-minded groups. For an athletic teen, this could lead to finding other athletic teens and joining school teams together.

Emerging Adulthood



4-15: What is emerging adulthood?

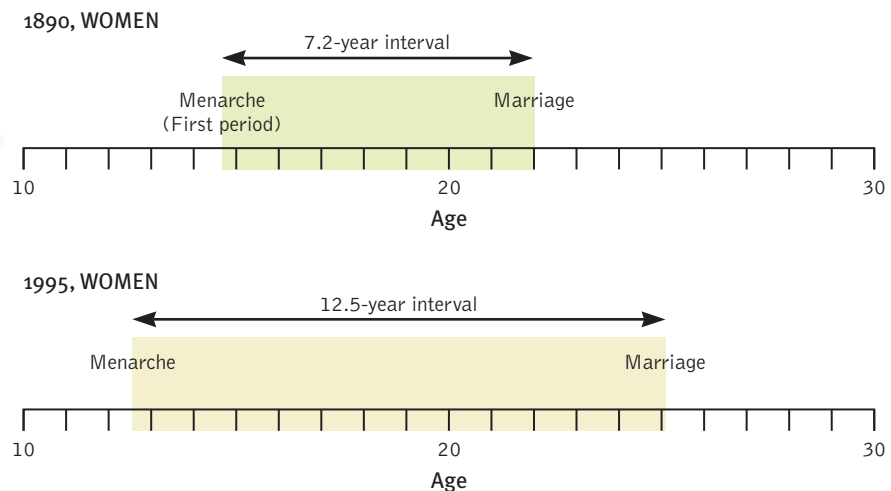
In the Western world, adolescence now roughly corresponds to the teen years. At earlier times, and in other parts of the world today, this slice of life has been much smaller (Baumeister & Tice, 1986). Shortly after sexual maturity, young people would assume adult responsibilities and status. The event might be celebrated with an elaborate initiation—a public rite of passage. The new adult would then work, marry, and have children.

When schooling became compulsory in many Western countries, independence was put on hold until after graduation. From Europe to Australia, adolescents are now taking more time to establish themselves as adults. In the United States, for example, the average age at first marriage has increased more than 4 years since 1960 (to 28 for men, 26 for women). In 1960, three in four women and two in three men had, by age 30, finished school, left home, become financially independent, married, and had a child. Today, fewer than half of 30-year-old women and one-third of men have achieved these five milestones (Henig, 2010).

Delayed independence has overlapped with an earlier onset of puberty. Together, later independence and earlier sexual maturity have widened the once-brief interlude between biological maturity and social independence (**FIGURE 4.19**). In prosperous communities, the time from 18 to the mid-twenties is an increasingly not-yet-settled

FIGURE 4.19

The transition to adulthood is being stretched from both ends In the 1890s, the average interval between a woman's first menstrual period and marriage, which typically marked a transition to adulthood, was about 7 years; in industrialized countries today it is about 12 years (Guttmacher, 1994, 2000). Although many adults are unmarried, later marriage combines with prolonged education and earlier menarche to help stretch out the transition to adulthood.



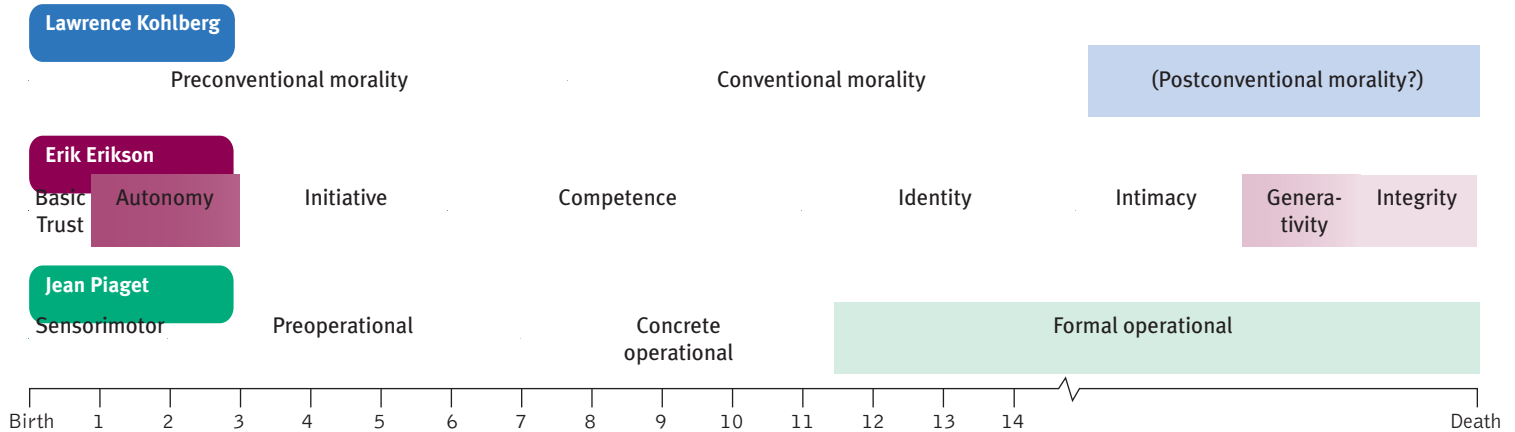


FIGURE 4.20
Comparing the stage theories
 (With thanks to Dr. Sandra Gibbs,
 Muskegon Community College, for inspiring
 this illustration.)

RETRIEVE IT

- What findings in psychology support the stage theory of development? What findings challenge these ideas?

ANSWERS: Stage theory is supported by the work of Piaget (cognitive development), Kohlberg (moral development), and Erikson (psychosocial development), but it is challenged by findings that change is more gradual and less culturally universal than these theorists supposed.

Adulthood

The unfolding of people's adult lives continues across the life span. It is, however, more difficult to generalize about adulthood stages than about life's early years. If you know that James is a 1-year-old and Jamal is a 10-year-old, you could say a great deal about each child. Not so with adults who differ by a similar number of years. The boss may be 30 or 60; the marathon runner may be 20 or 50; the 19-year-old may be a parent who supports a child or a child who receives an allowance. Yet our life courses are in some ways similar. Physically, cognitively, and especially socially, we differ at age 50 from our 25-year-old selves. In the discussion that follows, we recognize these differences and use three terms: *early adulthood* (roughly twenties and thirties), *middle adulthood* (to age 65), and *late adulthood* (the years after 65). Within each of these stages, people will vary widely in physical, psychological, and social development.



"I just don't know what to do with myself in that long stretch after college but before social security."

Physical Development



4-16: What physical changes occur during middle and late adulthood?

Like the declining daylight after the summer solstice, our physical abilities—muscular strength, reaction time, sensory keenness, and cardiac output—all begin an almost imperceptible decline in our mid-twenties. Athletes are often the first to notice. World-class sprinters and swimmers peak by their early twenties. Women—who mature earlier than men—also peak earlier. But most of us—especially those of us whose daily lives do not require top physical performance—hardly perceive the early signs of decline.

Physical Changes in Middle Adulthood

Post-40 athletes know all too well that physical decline gradually accelerates. During early and middle adulthood, physical vigor has less to do with age than with a person's health and exercise habits. Many of today's physically fit 50-year-olds run 4 miles with

menopause the time of natural cessation of menstruation; also refers to the biological changes a woman experiences as her ability to reproduce declines.

ease, while sedentary 25-year-olds find themselves huffing and puffing up two flights of stairs.

Aging also brings a gradual decline in fertility, especially for women. For a 35- to 39-year-old woman, the chances of getting pregnant after a single act of intercourse are only half those of a woman 19 to 26 (Dunson et al., 2002). Men experience a gradual decline in sperm count, testosterone level, and speed of erection and ejaculation. Women experience **menopause**, as menstrual cycles end, usually within a few years of age 50. Expectations and attitudes influence the emotional impact of this event. Is it a sign of lost femininity and growing old? Or is it liberation from menstrual periods and fears of pregnancy? For men, too, expectations can influence perceptions. Some experience distress related to a perception of declining virility and physical capacities, but most age without such problems.

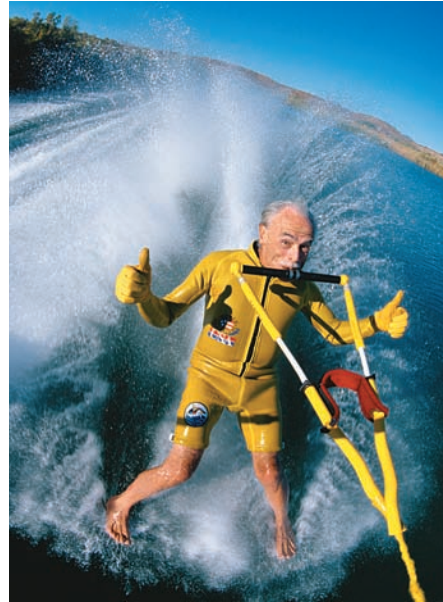
With age, sexual activity lessens. Nevertheless, most men and women remain capable of satisfying sexual activity, and most express satisfaction with their sex life. This was true of 70 percent of Canadians surveyed (ages 40 to 64) and 75 percent of Finns (ages 65 to 74) (Kontula & Haavio-Mannila, 2009; Wright, 2006). In another survey, 75 percent of respondents reported being sexually active into their eighties (Schick et al., 2010). And in an American Association of Retired Persons sexuality survey, it was not until age 75 or older that most women and nearly half of men reported little sexual desire (DeLamater & Sill, 2005). Given good health and a willing partner, the flames of desire, though simmered down, live on. As Alex Comfort (1992, p. 240) jested, “The things that stop you having sex with age are exactly the same as those that stop you riding a bicycle (bad health, thinking it looks silly, no bicycle).”

Physical Changes in Later Life

Is old age “more to be feared than death” (Juvenal, *Satires*)? Or is life “most delightful when it is on the downward slope” (Seneca, *Epistulae ad Lucilium*)? What is it like to grow old?

Strength and Stamina Although physical decline begins in early adulthood, we are not usually acutely aware of it until later life, when the stairs get steeper, the print gets smaller, and other people seem to mumble more. Muscle strength, reaction time, and stamina diminish in late adulthood. As a lifelong basketball player, I find myself increasingly not racing for that loose ball. But even diminished vigor is sufficient for normal activities. Moreover, exercise slows aging. Active older adults tend to be mentally quick older adults. Physical exercise not only enhances muscles, bones, and energy and helps to prevent obesity and heart disease, it also stimulates brain cell development and neural connections, thanks perhaps to increased oxygen and nutrient flow (Erickson et al., 2010; Pereira et al., 2007).

Sensory Abilities With age, visual sharpness diminishes, and distance perception and adaptation to light-level changes are less acute. The eye’s pupil shrinks and its lens becomes less transparent, reducing the amount of light reaching the retina: A 65-year-old retina receives only about one-third as much light as its 20-year-old counterpart (Kline & Schieber, 1985). Thus, to see as well as a 20-year-old when reading or driving, a 65-year-old needs three times as much light—a reason for buying cars with untinted windshields. This also explains why older people sometimes ask younger people, “Don’t you need better light for reading?”



Rick Dogler/Corbis

Adult abilities vary widely 97-year-olds: Don’t try this. In 2002, George Blair became the world’s oldest barefoot water skier, just days after reaching age 87. And he did it again in 2012, at age 97!



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“Happy fortieth. I’ll take the muscle tone in your upper arms, the girlish timbre of your voice, your amazing tolerance for caffeine, and your ability to digest french fries. The rest of you can stay.”

“For some reason, possibly to save ink, the restaurants had started printing their menus in letters the height of bacteria.”

Dave Barry,
Dave Barry Turns Fifty, 1998

Most stairway falls taken by older people occur on the top step, precisely where the person typically descends from a window-lit hallway into the darker stairwell (Fozard & Popkin, 1978). Our knowledge of aging could be used to design environments that would reduce such accidents (National Research Council, 1990).

cross-sectional study a study in which people of different ages are compared with one another.

longitudinal study research in which the same people are restudied and retested over a long period.

How old does a person have to be before you think of him or her as old? Depends on who you ask. For 18- to 29-year-olds, 67 was old. For those 60 and over, old was 76 (Yankelovich, 1995).

“I am still learning.”

Michelangelo, 1560, at age 85

The senses of smell and hearing also diminish. In Wales, teens’ loitering around a convenience store has been discouraged by a device that emits an aversive high-pitched sound almost no one over 30 can hear (Lyll, 2005). Some students have also used that pitch to their advantage with cell-phone ringtones their instructors cannot hear (Vitello, 2006).

Health For those growing older, there is both bad and good news about health. The bad news: The body’s disease-fighting immune system weakens, making older adults more susceptible to life-threatening ailments, such as cancer and pneumonia. The good news: Thanks partly to a lifetime’s accumulation of antibodies, people over 65 suffer fewer short-term ailments, such as common flu and cold viruses. One study found they were half as likely as 20-year-olds and one-fifth as likely as preschoolers to suffer upper respiratory flu each year (National Center for Health Statistics, 1990).

The Aging Brain Up to the teen years, we process information with greater and greater speed (Fry & Hale, 1996; Kail, 1991). But compared with teens and young adults, older people take a bit more time to react, to solve perceptual puzzles, even to remember names (Bashore et al., 1997; Verhaeghen & Salthouse, 1997). The neural processing lag is greatest on complex tasks (Cerella, 1985; Poon, 1987). At video games, most 70-year-olds are no match for a 20-year-old.

Slower neural processing combined with diminished sensory abilities can increase accident risks. As **FIGURE 4.21** indicates, fatal accident rates per mile driven increase sharply after age 75. By age 85, they exceed the 16-year-old level. Nevertheless, because older people drive less, they account for fewer than 10 percent of crashes (Coughlin et al., 2004).

Brain regions important to memory begin to atrophy during aging (Schacter, 1996). In young adulthood, a small, gradual net loss of brain cells begins, contributing by age 80 to a brain-weight reduction of 5 percent or so. Earlier, we noted that late-maturing frontal lobes help account for teen impulsivity. Late in life, atrophy of the inhibition-controlling frontal lobes seemingly explains older people’s occasional blunt questions and comments (“Have you put on weight?”) (von Hippel, 2007).

As noted earlier, exercise helps counteract some effects of brain aging. It aids memory by stimulating the development of neural connections and by promoting neurogenesis, the birth of new nerve cells, in the hippocampus. Sedentary older adults randomly assigned to aerobic exercise programs exhibit enhanced memory, sharpened judgment, and reduced risk of dementia (Colcombe et al., 2004; Liang et al., 2010; Nazimek, 2009).

Exercise also helps maintain the *telomeres*, which protect the ends of chromosomes (Cherkas et al., 2008; Erickson, 2009; Pereira et al., 2007). With age, telomeres wear down, much as the tip of a shoelace frays. This wear is accentuated by smoking, obesity, or stress. As telomeres shorten, aging cells may die without being replaced with perfect genetic replicas (Epel, 2009).

The message for seniors is clear: We are more likely to rust from disuse than to wear out from overuse.

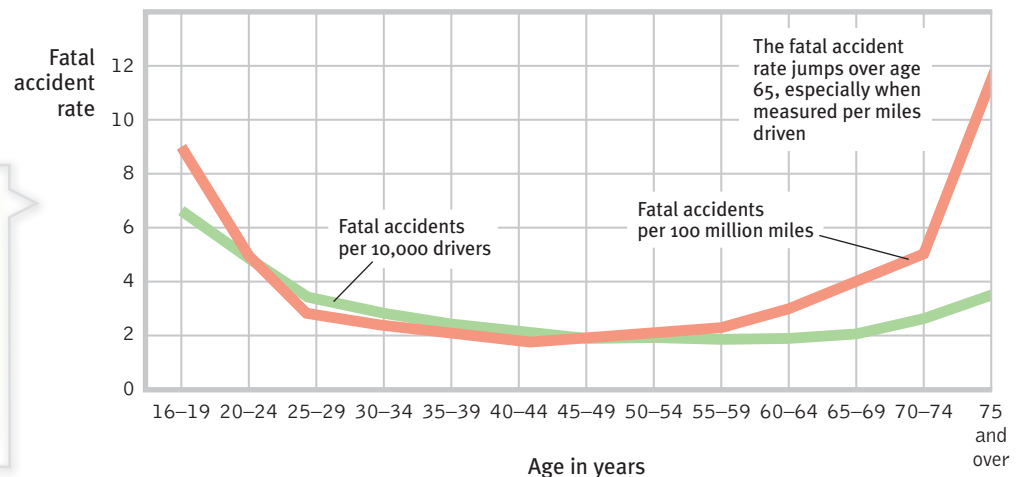


FIGURE 4.21

Age and driver fatalities Slowing reactions contribute to increased accident risks among those 75 and older, and their greater fragility increases their risk of death when accidents happen (NHTSA, 2000). Would you favor driver exams based on performance, not age, to screen out those whose slow reactions or sensory impairments indicate accident risk?

Cognitive Development



4-17: How does memory change with age?

Among the most intriguing developmental psychology questions is whether adult cognitive abilities, such as memory, intelligence, and creativity, parallel the gradually accelerating decline of physical abilities.

As we age, we remember some things well. Looking back in later life, people asked to recall the one or two most important events over the last half-century tend to name events from their teens or twenties (Conway et al., 2005; Rubin et al., 1998). Whatever people experience around this time of life—the events of 9/11, the civil rights movement, World War II—becomes pivotal (Pillemer, 1998; Schuman & Scott, 1989). Our teens and twenties are a time of so many memorable “firsts”—first date, first job, first day at college or university, first meeting of in-laws.

Early adulthood is indeed a peak time for some types of learning and remembering. In one test of recall, people (1205 of them) watched videotapes as 14 strangers said their names, using a common format: “Hi, I’m Larry” (Crook & West, 1990). Then those strangers reappeared and gave additional details. For example, saying “I’m from Philadelphia” provided visual *and* voice cues for remembering the person’s name. As **FIGURE 4.22** shows, after a second and third replay of the introductions, everyone remembered more names, but younger adults consistently surpassed older adults.

Perhaps it is not surprising, then, that nearly two-thirds of people over age 40 say their memory is worse than it was 10 years ago (KRC, 2001). In fact, how well older people remember depends on the task. In another experiment (Schonfield & Robertson, 1966), when asked to *recognize* 24 words they had earlier tried to memorize, people showed only a minimal decline in memory. When asked to *recall* that information without clues, the decline was greater (**FIGURE 4.23**).

In our capacity to learn and remember, as in other areas of development, we differ. Younger adults vary in their abilities to learn and remember, but 70-year-olds vary much more. “Differences between the most and least able 70-year-olds become much greater than between the most and least able 50-year-olds,” reports Oxford researcher Patrick Rabbitt (2006). Some 70-year-olds perform below nearly all 20-year-olds; other 70-year-olds match or outdo the average 20-year-old.

No matter how quick or slow we are, remembering seems also to depend on the type of information we are trying to retrieve. If the information is meaningless—nonsense syllables or unimportant events—then the older we are, the more errors we are likely to make. If the information is *meaningful*, older people’s rich web of existing knowledge will help them to hold it. But they may take longer than younger adults to *produce* the words and things they know: Quick-thinking game show winners are usually young or middle-aged adults (Burke & Shafto, 2004). Older people’s capacity to learn and remember *skills* declines less than their verbal recall (Graf, 1990; Labouvie-Vief & Schell, 1982; Perlmutter, 1983).

Chapter 9, Thinking, Language, and Intelligence, explores another dimension of cognitive development: intelligence. As we will see, **cross-sectional studies** (comparing people of different ages) and **longitudinal studies** (restudying people over time) have identified mental abilities that do and do not change as people age. Age is less a predictor of memory and intelligence than is proximity to death. Tell me whether someone is 8 months or 8 years from death and, regardless of age, you’ve given me a clue to that person’s mental ability. Especially in the last three or four years of life, cognitive decline typically accelerates (Wilson et al., 2007). Researchers call this near-death drop *terminal decline* (Backman & MacDonald, 2006).

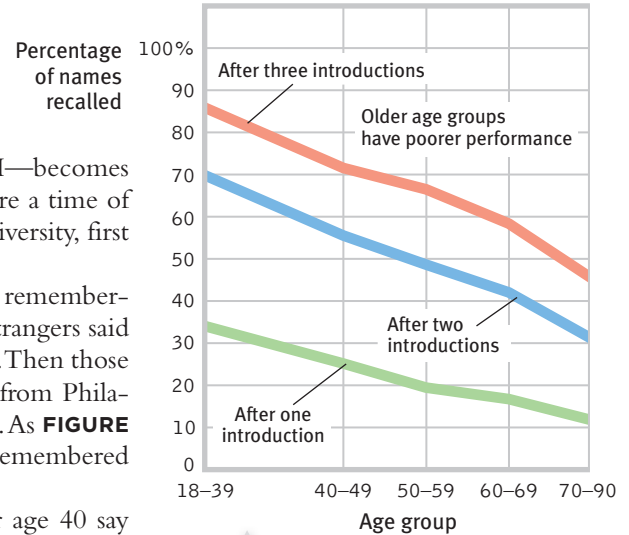


FIGURE 4.22 Tests of recall Recalling new names introduced once, twice, or three times is easier for younger adults than for older ones. (Data from Crook & West, 1990.)

If you are within 5 years of 20, what experiences from the past year will you likely never forget? (This is the time of your life you may best remember when you are 50.)

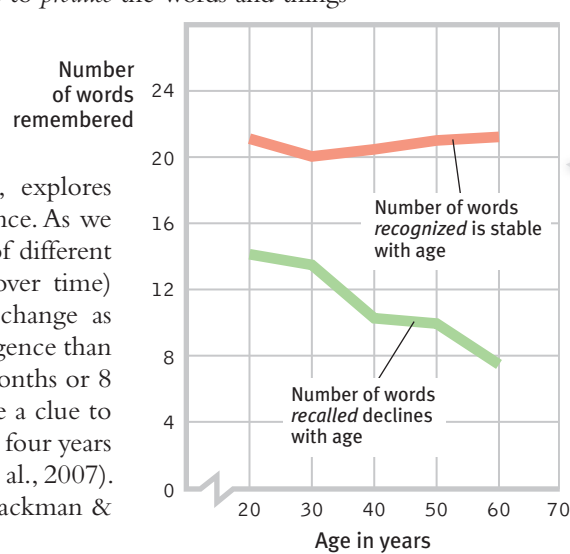


FIGURE 4.23 Recall and recognition in adulthood In this experiment, the ability to *recall* new information declined during early and middle adulthood, but the ability to *recognize* new information did not. (From Schonfield & Robertson, 1966.)

social clock the culturally preferred timing of social events such as marriage, parenthood, and retirement.

Social Development



4-18: What themes and influences mark our social journey from early adulthood to death?

Many differences between younger and older adults are created by significant life events. A new job means new relationships, new expectations, and new demands. Marriage brings the joy of intimacy and the stress of merging two lives. The three years surrounding the birth of a child bring increased life satisfaction for most parents (Dyrdal & Lucas, 2011). The death of a loved one creates an irreplaceable loss. Do these adult life events shape a sequence of life changes?

Adulthood's Ages and Stages

As people enter their forties, they undergo a transition to middle adulthood, a time when they realize that life will soon be mostly behind instead of ahead of them. Some psychologists have argued that for many the *midlife transition* is a crisis, a time of great struggle, regret, or even feeling struck down by life. The popular image of the midlife crisis is an early-forties man who forsakes his family for a younger girlfriend and a hot sports car. But the fact—reported by large samples of people—is that unhappiness, job dissatisfaction, marital dissatisfaction, divorce, anxiety, and suicide do *not* surge during the early forties (Hunter & Sundel, 1989; Mroczek & Kolarz, 1998). Divorce, for example, is most common among those in their twenties, suicide among those in their seventies and eighties. One study of emotional instability in nearly 10,000 men and women found “not the slightest evidence” that distress peaks anywhere in the midlife age range (McCrae & Costa, 1990).

For the 1 in 4 adults who report experiencing a life crisis, the trigger is not age but a major event, such as illness, divorce, or job loss (Lachman, 2004). Some middle-aged adults describe themselves as a “sandwich generation,” simultaneously supporting their aging parents and their emerging adult children or grandchildren (Riley & Bowen, 2005).

Life events trigger transitions to new life stages at varying ages. The **social clock**—the definition of “the right time” to leave home, get a job, marry, have children, or retire—varies from era to era and culture to culture. The once-rigid sequence for many Western women—of student to worker to wife to at-home mom to worker again—has loosened. Contemporary women occupy these roles in any order or all at once. The social clock still ticks, but people feel freer about being out of sync with it.

Even *chance events* can have lasting significance, by deflecting us down one road rather than another (Bandura, 1982). Albert Bandura (2005) recalls the ironic true story of a book editor who came to one of Bandura's lectures on the “Psychology of Chance Encounters and Life Paths”—and ended up marrying the woman who happened to sit next to him. The sequence that led to my authoring this book (which was not my idea) began with my being seated near, and getting to know, a distinguished colleague at an international conference. Chance events can change our lives.

“Midway in the journey of our life I found myself in a dark wood, for the straight way was lost.”

Dante, *The Divine Comedy*, 1314

“The important events of a person's life are the products of chains of highly improbable occurrences.”

Joseph Traub, “Traub's Law,” 2003



Adulthood's Commitments

Two basic aspects of our lives dominate adulthood. Erik Erikson called them *intimacy* (forming close relationships) and *generativity* (being productive and supporting future generations). Researchers have chosen various terms—*affiliation* and *achievement*, *attachment* and *productivity*, *connectedness* and *competence*. Sigmund Freud (1935) put it most simply: The healthy adult, he said, is one who can *love* and *work*.

Love We typically flirt, fall in love, and commit—one person at a time. “Pair-bonding is a trademark of the human animal,” observed anthropologist Helen Fisher (1993). From an evolutionary perspective, relatively monogamous pairing makes sense: Parents who cooperated to nurture

their children to maturity were more likely to have their genes passed along to posterity than were parents who didn't.

Adult bonds of love are most satisfying and enduring when marked by a similarity of interests and values, a sharing of emotional and material support, and intimate self-disclosure (see Chapter 13). Couples who seal their love with commitment—via (in one Vermont study) marriage for heterosexual couples and civil unions for homosexual couples—more often endure (Balsam et al., 2008). Marriage bonds are especially likely to last when couples marry after age 20 and are well educated. Compared with their counterparts of 50 years ago, people in Western countries *are* better educated and marrying later. Yet, ironically, they are nearly twice as likely to divorce. (Both Canada and the United States now have about one divorce for every two marriages, and in Europe, divorce is only slightly less common.) The divorce rate partly reflects women's lessened economic dependence and men's and women's rising expectations. We now hope not only for an enduring bond, but also for a mate who is a wage earner, caregiver, intimate friend, and warm and responsive lover.

Might test driving life together in a "trial marriage" minimize divorce risk? In one Gallup survey of American twenty-somethings, 62 percent thought it would (Whitehead & Popenoe, 2001). In reality, in Europe, Canada, and the United States, those who cohabit before marriage have had *higher* rates of divorce and marital dysfunction than those who did not cohabit (Jose et al., 2009). The risk appears greatest for those cohabiting prior to engagement (Goodwin et al., 2010; Rhoades et al., 2009).

American children born to cohabiting parents are about five times more likely to experience their parents' separation than are children born to married parents (Osborne et al., 2007). Two factors contribute. First, cohabiters tend to be initially less committed to the ideal of enduring marriage. Second, they become even less marriage supporting while cohabiting.

Nonetheless, the institution of marriage endures. Worldwide, reports the United Nations, 9 in 10 heterosexual adults marry. And marriage is a predictor of happiness, sexual satisfaction, income, and physical and mental health (Scott et al., 2010). National Opinion Research Center surveys of nearly 50,000 Americans since 1972 reveal that 40 percent of married adults, though only 23 percent of unmarried adults, have reported being "very happy." Lesbian couples, too, report greater well-being than those who are alone (Peplau & Fingerhut, 2007; Wayment & Peplau, 1995). Moreover, neighborhoods with high marriage rates typically have low rates of social pathologies such as crime, delinquency, and emotional disorders among children (Myers & Scanzoni, 2005).

Marriages that last are not always devoid of conflict. Some couples fight but also shower each other with affection. Other couples never raise their voices yet also seldom praise each other or nuzzle. Both styles can last. After observing the interactions of 2000 couples, John Gottman (1994) reported one indicator of marital success: at least a five-to-one ratio of positive to negative interactions. Stable marriages provide five times more instances of smiling, touching, complimenting, and laughing than of sarcasm, criticism, and insults. So, if you want to predict which newlyweds will stay together, don't pay attention to how passionately they are in love. The couples who make it are more often those who refrain from putting down their partners. To prevent a cancerous negativity, successful couples learn to fight fair (to state feelings without insulting) and to steer conflict away from chaos with comments like "I know it's not your fault" or "I'll just be quiet for a moment and listen."

Often, love bears children. For most people, this most enduring of life changes is a happy event. "I feel an overwhelming love for my children unlike anything I feel for anyone else," said 93 percent of American mothers in a national survey (Erickson & Aird, 2005). Many fathers feel the same. A few weeks after the birth of my first child I was suddenly struck by a realization: "So *this* is how my parents felt about me?"

When children begin to absorb time, money, and emotional energy, satisfaction with the marriage itself may decline (Doss et al., 2009). This is especially likely among employed women who, more than they expected, carry the traditional burden of doing the chores at home. Putting effort into creating an equitable relationship can thus pay double dividends: a more satisfying marriage, which breeds better parent-child relations (Erel & Burman, 1995).



Lisa B./Corbis

Love Intimacy, attachment, commitment—love by whatever name—is central to healthy and happy adulthood.

What do you think? Does marriage correlate with happiness because marital support and intimacy breed happiness, because happy people more often marry and stay married, or both?

"Our love for children is so unlike any other human emotion. I fell in love with my babies so quickly and profoundly, almost completely independently of their particular qualities. And yet 20 years later I was (more or less) happy to see them go—I had to be happy to see them go. We are totally devoted to them when they are little and yet the most we can expect in return when they grow up is that they regard us with bemused and tolerant affection."

Developmental psychologist Alison Gopnik, "The Supreme Infant," 2010



bluehand/Shutterstock

If you have left home, did your parents suffer the “empty nest syndrome”—a feeling of distress focusing on a loss of purpose and relationship? Did they mourn the lost joy of listening for you in the wee hours of Saturday morning? Or did they seem to discover a new freedom, relaxation, and (if together) renewed satisfaction with their own relationship?

Although love bears children, children eventually leave home. This departure is a significant and sometimes difficult event. For most people, however, an empty nest is a happy place (Adelmann et al., 1989; Gorchoff et al., 2008). Many parents experience a “postlaunch honeymoon,” especially if they maintain close relationships with their children (White & Edwards, 1990). As Daniel Gilbert (2006) has said, “The only known symptom of ‘empty nest syndrome’ is increased smiling.”

Work For many adults, the answer to “Who are you?” depends a great deal on the answer to “What do you do?” For women and men, choosing a career path is difficult, especially during bad economic times. Even in the best of times, few students in their first two years of college or university can predict their later careers.

In the end, happiness is about having work that fits your interests and provides you with a sense of competence and accomplishment. It is having a close, supportive companion who cheers your accomplishments (Gable et al., 2006). And for some, it includes having children who love you and whom you love and feel proud of.

RETRIEVE IT

- Freud defined the healthy adult as one who is able to _____ and to _____.

ANSWERS: love; work

“When you were born, you cried and the world rejoiced. Live your life in a manner so that when you die the world cries and you rejoice.”

Native American proverb

Well-Being Across the Life Span



4-19: Do self-confidence and life satisfaction vary with life stages?

To live is to grow older. This moment marks the oldest you have ever been and the youngest you will henceforth be. That means we all can look back with satisfaction or regret, and forward with hope or dread. When asked what they would have done differently if they could relive their lives, people’s most common answer has been “Taken my education more seriously and worked harder at it” (Kinnier & Metha, 1989; Roese & Summerville, 2005). Other regrets—“I should have told my father I loved him,” “I regret that I never went to Europe”—have also focused less on mistakes made than on the things one *failed* to do (Gilovich & Medvec, 1995).

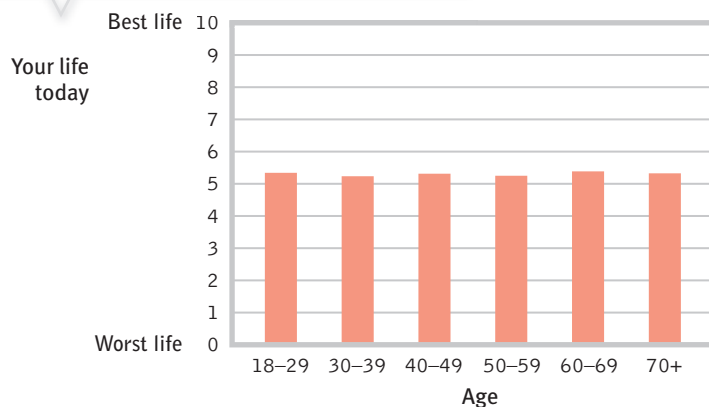
From the teens to midlife, people typically experience a strengthening sense of identity, confidence, and self-esteem (Huang, 2010; Robins & Trzesniewski, 2005). In later life, challenges arise: Income shrinks. Work is often taken away. The body deteriorates. Recall fades. Energy wanes. Family members and friends die or move away. The great enemy, death, looms ever closer. And for those in the terminal decline phase, life satisfaction does decline as death approaches (Gerstorf et al., 2008).

Small wonder that most presume that happiness declines in later life (Lacey et al., 2006). But worldwide, as Gallup researchers discovered, most find that the over-65 years are not notably unhappy (**FIGURE 4.24**). If anything, positive feelings, supported

by enhanced emotional control, grow after midlife and negative feelings subside (Stone et al., 2010; Urry & Gross, 2010). Older adults increasingly use words that convey positive emotions (Pennebaker & Stone, 2003), and they attend less and less to negative information. Compared with younger adults, for example, they are slower to perceive negative faces and more attentive to positive news (Carstensen & Mikels, 2005; Scheibe & Carstensen, 2010). Older adults also have fewer problems in their social relationships (Fingerman & Charles, 2010), and they experience less intense anger, stress, and worry (Stone et al., 2010).

The aging brain may help nurture these positive feelings. Brain scans of older adults show that the amygdala, a neural processing center for emotions, responds less actively to negative events (but

FIGURE 4.24
Age and life satisfaction The Gallup Organization asked 142,682 people worldwide to rate their lives on a ladder, from 0 (“the worst possible life”) to 10 (“the best possible life”). Age gave no clue to life satisfaction (Crabtree, 2010).



not to positive events), and it interacts less with the hippocampus, a brain memory-processing center (Mather et al., 2004; St. Jacques et al., 2009; Williams et al., 2006). Brain-wave reactions to negative images also diminish with age (Kisley et al., 2007).

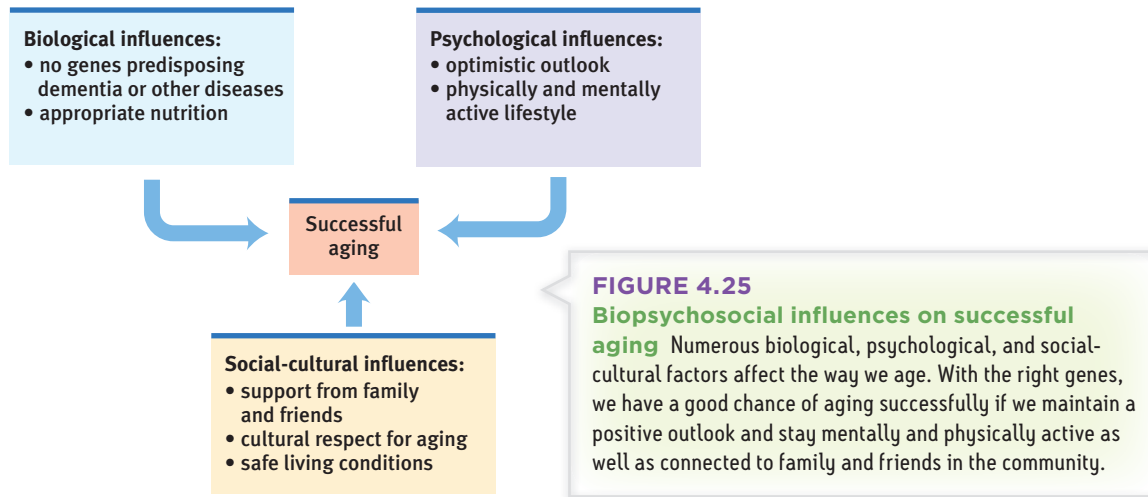
Moreover, at all ages, the bad feelings we associate with negative events fade faster than do the good feelings we associate with positive events (Walker et al., 2003). This contributes to most older people’s sense that life, on balance, has been mostly good. Given that growing older is an outcome of living (an outcome most prefer to early dying), the positivity of later life is comforting. Thanks to biological, psychological, and social-cultural influences, more and more people flourish into later life (FIGURE 4.25).

“At 20 we worry about what others think of us. At 40 we don’t care what others think of us. At 60 we discover they haven’t been thinking about us at all.”

Anonymous

“The best thing about being 100 is *no peer pressure.*”

Lewis W. Kuester, 2005, on turning 100



RETRIEVE IT

• What are some of the most significant challenges and rewards of growing old?

ANSWERS: Challenges: decline of muscular strength, reaction times, stamina, sensor keenness, cardiac output, and immune system functioning. Rewards: positive feelings tend to grow, negative emotions are less intense, and anger, stress, worry, and social-relationship problems decrease.

Death and Dying



4-20: A loved one’s death triggers what range of reactions?

Warning: If you begin reading the next paragraph, you will die.

But of course, if you hadn’t read this, you would still die in due time. Death is our inevitable end. Most of us will also suffer and cope with the deaths of relatives and friends. Usually, the most difficult separation is from a spouse—a loss suffered by five times more women than men. When, as usually happens, death comes at an expected late-life time, grieving may be relatively short-lived.

Grief is especially severe when a loved one’s death comes suddenly and before its expected time on the social clock. The sudden illness or accident claiming a 45-year-old life partner or a child may trigger a year or more of memory-laden mourning that eventually subsides to a mild depression (Lehman et al., 1987).

For some, however, the loss is unbearable. One Danish long-term study of more than 1 million people found that about 17,000 of them had suffered the death of a child under 18. In the five years following that death, 3 percent of them had a first psychiatric hospitalization. This rate was 67 percent higher than the rate recorded for parents who had not lost a child (Li et al., 2005).

“Love—why, I’ll tell you what love is: It’s you at 75 and her at 71, each of you listening for the other’s step in the next room, each afraid that a sudden silence, a sudden cry, could mean a lifetime’s talk is over.”

Brian Moore, The Luck of Ginger Coffey, 1960

“Consider, friend, as you pass by, as you are now, so once was I. As I am now, you too shall be. Prepare, therefore, to follow me.”

Scottish tombstone epitaph

“At 70, I would say the advantage is that you take life more calmly. You know that ‘this, too, shall pass!’”

Eleanor Roosevelt, 1954

Even so, reactions to a loved one’s death range more widely than most suppose. Some cultures encourage public weeping and wailing; others hide grief. Within any culture, individuals differ. Given similar losses, some people grieve hard and long, others less so (Ott et al., 2007). Contrary to popular misconceptions, however,

- terminally ill and bereaved people do not go through identical predictable stages, such as denial before anger (Friedman & James, 2008; Nolen-Hoeksema & Larson, 1999). A Yale study following 233 bereaved individuals through time did, however, find that yearning for the loved one reached a high point four months after the loss, with anger peaking, on average, about a month later (Maciejewski et al., 2007).
- those who express the strongest grief immediately do not purge their grief more quickly (Bonanno & Kaltman, 1999; Wortman & Silver, 1989).
- bereavement therapy and self-help groups offer support, but there is similar healing power in the passing of time, the support of friends, and the act of giving support and help to others (Baddeley & Singer, 2009; Brown et al., 2008; Neimeyer & Carrier, 2009). Grieving spouses who talk often with others or receive grief counseling adjust about as well as those who grieve more privately (Bonanno, 2004; Stroebe et al., 2005).

We can be grateful for the waning of death-denying attitudes. Facing death with dignity and openness helps people complete the life cycle with a sense of life’s meaningfulness and unity—the sense that their existence has been good and that life and death are parts of an ongoing cycle. Although death may be unwelcome, life itself can be affirmed even at death. This is especially so for people who review their lives not with despair but with what Erik Erikson called a sense of *integrity*—a feeling that one’s life has been meaningful and worthwhile.

Reflections on Stability and Change

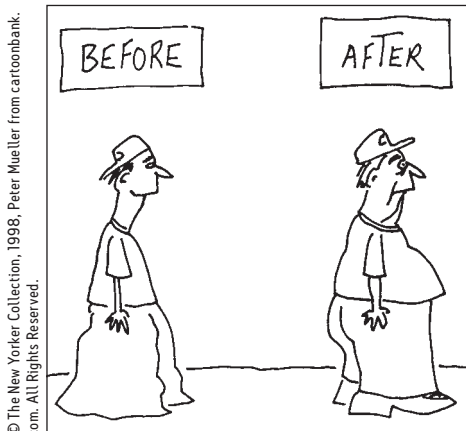
It’s time to reflect on the third big developmental issue: As we follow lives through time, do we find more evidence for stability or change? If reunited with a long-lost grade-school friend, do we instantly realize that “it’s the same old Andy”? Or do people we befriend during one period of life seem like strangers at a later period? (At least one acquaintance of mine would choose the second option. He failed to recognize a former classmate at his 40-year college reunion. The aghast classmate eventually pointed out that she was his long-ago first wife.)

Research reveals that we experience both stability and change. As we have seen, some of our characteristics, such as temperament, are very stable:

- One study followed 1000 New Zealanders through time, beginning at age 3. Those who had scored low in conscientiousness and self-control as preschoolers were more vulnerable to ill health, substance abuse, arrest, and single parenthood as 32-year-olds (Moffitt et al., 2011).
- Another research team interviewed adults who, 40 years earlier, had their talkativeness, impulsiveness, and humility rated by their elementary school teachers (Nave et al., 2010). To a striking extent, their traits persisted.

“As at 7, so at 70,” says a Jewish proverb. The widest smilers in childhood and college photos are, years later, the ones most likely to enjoy enduring marriages (Hertenstein et al., 2009). While 1 in 4 of the weakest college smilers eventually divorced, only 1 in 20 of the widest smilers did so. As people grow older, personality gradually stabilizes (Ferguson, 2010; Hopwood et al., 2011; Kandler et al., 2010). The struggles of the present may be laying a foundation for a happier tomorrow.

We cannot, however, predict all of our eventual traits based on our early years of life (Kagan et al., 1978, 1998). Some traits, such as social attitudes, are much less stable than temperament (Moss & Susman, 1980). Older children and adolescents learn new ways of coping. Although delinquent children have elevated rates of later work problems, substance abuse, and crime, many confused and troubled children blossom into mature,



As adults grow older, there is continuity of self.

successful adults (Moffitt et al., 2002; Roberts et al., 2001; Thomas & Chess, 1986). Happily for them, life is a process of becoming.

In some ways, we *all* change with age. Most shy, fearful toddlers begin opening up by age 4, and most people become more conscientious, stable, agreeable, and self-confident in the years after adolescence (Lucas & Donnellan, 2009; Roberts et al., 2003, 2006, 2008; Shaw et al., 2010). Many irresponsible 18-year-olds have matured into 40-year-old business or cultural leaders. (If you are the former, you aren't done yet.) Such changes can occur without changing a person's position *relative to others* of the same age. The hard-driving young adult may mellow by later life, yet still be a relatively driven senior citizen.

Life requires *both* stability and change. Stability provides our identity. It enables us to depend on others and be concerned about the healthy development of the children in our lives. Our trust in our ability to change gives us our hope for a brighter future. It motivates our concerns about present influences and lets us adapt and grow with experience.



Tom Prokop/Shutterstock

Photodisc/Getty Images

Smiles predict marital stability In one study of 306 college alums, 1 in 4 with yearbook expressions like the one on the left later divorced, as did only 1 in 20 with smiles like the one on the right (Hertenstein et al., 2009).

RETRIEVE IT

- What findings in psychology support the idea of stability in personality across the life span? What findings challenge these ideas?

ANSWER: Some traits, such as temperament, do exhibit remarkable stability across many years. But we do change in other ways, such as in our social attitudes, especially during life's early years.

CHAPTER REVIEW

Developing Through the Life Span

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Developmental Psychology's Major Issues

- 4-1:** What three issues have engaged developmental psychologists?

Prenatal Development and the Newborn

- 4-2:** What is the course of prenatal development, and how do teratogens affect that development?
- 4-3:** What are some newborn abilities, and how do researchers explore infants' mental abilities?

Infancy and Childhood

- 4-4:** During infancy and childhood, how do the brain and motor skills develop?
- 4-5:** From the perspectives of Piaget, Vygotsky, and today's researchers, how does a child's mind develop?
- 4-6:** How do parent-infant attachment bonds form?
- 4-7:** How have psychologists studied attachment differences, and what have they learned?
- 4-8:** How does childhood neglect or abuse affect children's attachments?
- 4-9:** How does day care affect children?
- 4-10:** What are three parenting styles, and how do children's traits relate to them?



Adolescence

- 4-11:** How is adolescence defined, and how do physical changes affect developing teens?
- 4-12:** How did Piaget, Kohlberg, and later researchers describe adolescent cognitive and moral development?
- 4-13:** What are the social tasks and challenges of adolescence?
- 4-14:** How do parents and peers influence adolescents?
- 4-15:** What is emerging adulthood?

Adulthood

- 4-16:** What physical changes occur during middle and late adulthood?
- 4-17:** How does memory change with age?
- 4-18:** What themes and influences mark our social journey from early adulthood to death?
- 4-19:** Do self-confidence and life satisfaction vary with life stages?
- 4-20:** A loved one's death triggers what range of reactions?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

developmental psychology, p. 118

zygote, p. 119

embryo, p. 119

fetus, p. 119

teratogens, p. 120

fetal alcohol syndrome (FAS), p. 120

habituation, p. 121

maturation, p. 121

critical period, p. 123

cognition, p. 124

schema, p. 125

assimilation, p. 125

accommodation, p. 125

sensorimotor stage, p. 126

object permanence, p. 126

preoperational stage, p. 127

conservation, p. 127

egocentrism, p. 128

theory of mind, p. 128

concrete operational stage, p. 128

formal operational stage, p. 129

autism, p. 130

stranger anxiety, p. 132

attachment, p. 132

imprinting, p. 133

temperament, p. 134

basic trust, p. 135

adolescence, p. 140

puberty, p. 140

identity, p. 144

social identity, p. 144

intimacy, p. 145

emerging adulthood, p. 149

menopause, p. 151

cross-sectional study, p. 153

longitudinal study, p. 153

social clock, p. 154

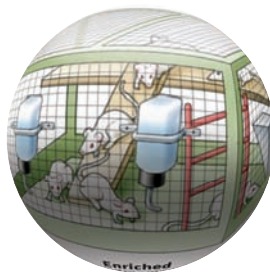
EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- The three major issues that interest developmental psychologists are nature/nurture, stability/change, and _____/_____.
- Body organs first begin to form and function during the period of the _____; within 6 months, during the period of the _____, the organs are sufficiently functional to allow a chance of survival.
 - zygote; embryo
 - zygote; fetus
 - embryo; fetus
 - placenta; fetus
- Chemicals that pass through the placenta's screen and may harm an embryo or fetus are called _____.
- Stroke a newborn's cheek and the infant will root for a nipple. This illustrates
 - a reflex.
 - nurture.
 - differentiation.
 - continuity.
- Between ages 3 and 6, the human brain experiences the greatest growth in the _____ lobes, which we use for rational planning, and which continue developing at least into adolescence.
- Which of the following is true of motor-skill development?
 - It is determined solely by genetic factors.
 - The sequence, but not the timing, is universal.
 - The timing, but not the sequence, is universal.
 - It is determined solely by environmental factors.
- Why can't we consciously recall how we learned to walk when we were infants?

8. Use Piaget's first three stages of cognitive development to explain why young children are not just miniature adults in the way they think.
9. Although Piaget's stage theory continues to inform our understanding of children's thinking, many researchers believe that
- Piaget's "stages" begin earlier and development is more continuous than he realized.
 - children do not progress as rapidly as Piaget predicted.
 - few children really progress to the concrete operational stage.
 - there is no way of testing much of Piaget's theoretical work.
10. An 8-month-old infant who reacts to a new babysitter by crying and clinging to his father's shoulder is showing _____.
11. In a series of experiments, the Harlows found that monkeys raised with artificial mothers tended, when afraid, to cling to their cloth mother, rather than to a wire mother holding the feeding bottle. Why was this finding important?
12. From the very first weeks of life, infants differ in their characteristic emotional reactions, with some infants being intense and anxious, while others are easygoing and relaxed. These differences are usually explained as differences in _____.
13. Adolescence is marked by the onset of
- an identity crisis.
 - puberty.
 - separation anxiety.
 - parent-child conflict.
14. According to Piaget, a person who can think logically about abstractions is in the _____ stage.
15. In Erikson's stages, the primary task during adolescence is
- attaining formal operations.
 - forging an identity.
 - developing a sense of intimacy with another person.
 - living independent of parents.
16. Some developmental psychologists now refer to the period that occurs in some Western cultures from age 18 to the mid-twenties and beyond (up to the time of social independence) as _____.
17. Developmental researchers who emphasize learning and experience are supporting _____; those who emphasize biological maturation are supporting _____.
- nature; nurture
 - continuity; stages
 - stability; change
 - randomness; predictability
18. By age 65, a person would be most likely to experience a cognitive decline in the ability to
- recall and list all the important terms and concepts in a chapter.
 - select the correct definition in a multiple-choice question.
 - recall their own birth date.
 - practice a well-learned skill, such as knitting.
19. How do cross-sectional and longitudinal studies differ?
20. Freud defined the healthy adult as one who is able to love and work. Erikson agreed, observing that the adult struggles to attain intimacy and _____.
21. Contrary to what many people assume,
- older people are much happier than adolescents.
 - men in their forties express much greater dissatisfaction with life than do women of the same age.
 - people of all ages report similar levels of happiness.
 - those whose children have recently left home—the empty nesters—have the lowest level of happiness of all groups.
22. Although development is lifelong, there is stability of personality over time. For example,
- most personality traits emerge in infancy and persist throughout life.
 - temperament tends to remain stable throughout life.
 - few people change significantly after adolescence.
 - people tend to undergo greater personality changes as they age.

Find answers to these questions in Appendix E, in the back of the book.



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GENDER DEVELOPMENT

How Are We Alike? How Do We Differ?

The Nature of Gender: Our Biology

The Nurture of Gender: Our Culture

HUMAN SEXUALITY

The Physiology of Sex

The Psychology of Sex

CLOSE-UP: The Sexualization of Girls

SEXUAL ORIENTATION

Environment and Sexual Orientation

Biology and Sexual Orientation

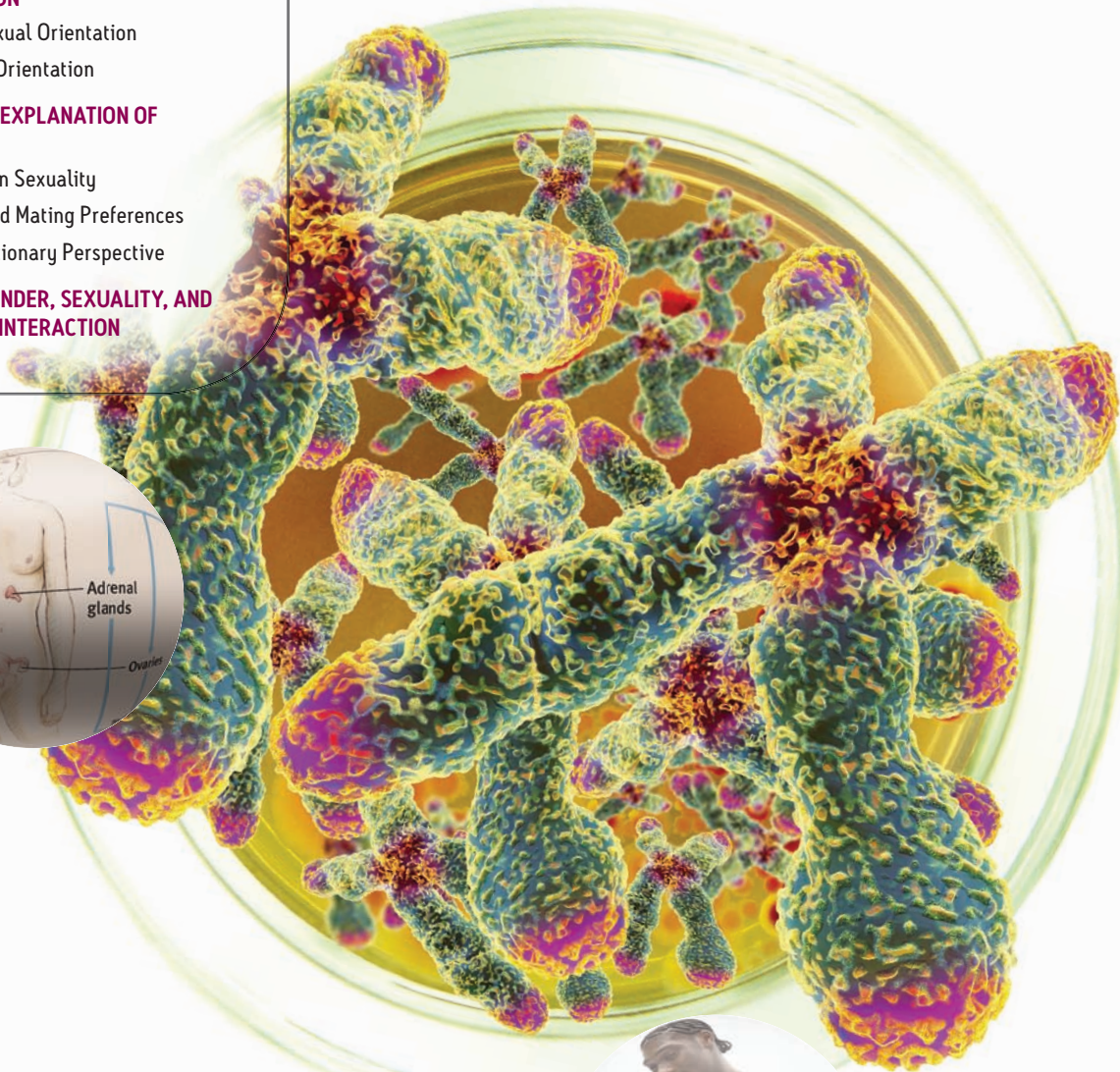
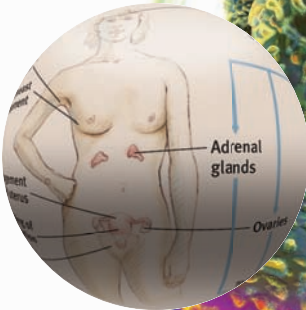
AN EVOLUTIONARY EXPLANATION OF HUMAN SEXUALITY

Gender Differences in Sexuality

Natural Selection and Mating Preferences

Critiquing the Evolutionary Perspective

REFLECTIONS ON GENDER, SEXUALITY, AND NATURE-NURTURE INTERACTION



Gender and Sexuality



In 1972, as the young chair of our psychology department, I was proud to make the announcement: We had concluded our search for a new colleague. We had found just who we were looking for—a bright, warm, enthusiastic woman about to receive her Ph.D. in developmental psychology. The vote was unanimous. Alas, our elderly chancellor rejected our recommendation. “As a mother of a preschooler,” he said, “she should be home with her child, *not* working full time.” No amount of pleading or arguing (for example, that it might be possible to parent a child while employed) could change his mind. So, with a heavy heart, I drove to her city to explain, face to face, my embarrassment in being able to offer her only a temporary position.

In this case, all’s well that ends well. She accepted a temporary position and quickly became a beloved, tenured colleague who went on to found our college’s women’s studies program. But today, she and I marvel at the swift transformation in our culture’s thinking about gender. In a thin slice of history, our ideas about the “proper” behavior for women and men have undergone an extreme makeover. Both women and men are now recognized as “fully capable of effectively carrying out organizational roles at all levels” (Wood & Eagly, 2002). Women’s employment in formerly male occupations and men’s employment in formerly female occupations have increased. And as this was happening, our views of what is “masculine” and what is “feminine” have also changed, as have our ideas about what we seek in a mate (Twenge, 1997).

In this chapter, we’ll look at some of the ways nature and nurture interact to form us as males and females. We’ll see what researchers tell us about how much males and females are alike, and how and why they differ. Along the way, we’ll take a close look at human sexuality. As part of that close look, we’ll see how evolutionary psychologists explain our sexuality.

Let’s start by considering what gender is and how it develops.



Pink and blue baby outfits offer another example of how cultural norms vary and change. “The generally accepted rule is pink for the boy and blue for the girl,” declared the publication *Earnshaw’s Infants’ Department* in June 1918 (Maglaty, 2011). “The reason is that pink being a more decided and stronger color is more suitable for the boy, while blue, which is more delicate and dainty, is prettier for the girls.”

Gender Development

As we will see in Chapter 9, we humans share an irresistible urge to organize our worlds into simple categories. Among the ways we classify people—as tall or short, fat or slim, smart or dull—one stands out: Before or at your birth, everyone wanted to know, “Boy or girl?” From that time on, your sex (your biological status, defined by your chromosomes and anatomy) helped define your **gender**, the socially constructed roles and characteristics by which your culture defines *male* and *female*.

How Are We Alike? How Do We Differ?



5-1: What are some gender similarities and differences in aggression, social power, and social connectedness?

Having faced similar adaptive challenges, we are in most ways alike. Tell me whether you are male or female and you give me virtually no clues to your vocabulary, intelligence, and happiness, or to the mechanisms by which you see, hear, learn, and remember. Your “opposite” sex is, in reality, your very similar sex. At conception, you received 23 chromosomes from your mother and 23 from your father. Of those 46 chromosomes, 45 are unisex—the same for males and females. (Later in this chapter we’ll return to that forty-sixth chromosome.)

But males and females do differ, and differences command attention—stimulating more than 18,000 studies (Ellis et al., 2008). Some much-talked-about gender differences are actually quite modest, as Janet Shibley Hyde (2005) illustrated by graphically representing male and female self-esteem scores across many studies (**FIGURE 5.1**). Other differences are more striking. Compared with the average man, the average woman enters puberty 2 years sooner, and her life span is 5 years longer. She carries 70 percent more fat, has 40 percent less muscle, and is 5 inches shorter. She expresses emotions more freely, can smell fainter odors, and is offered help more often. She can become sexually re-aroused soon after orgasm. She is also doubly vulnerable to depression and anxiety, and her risk of developing an eating disorder is 10 times greater than the average man’s. Yet, he is some 4 times more likely to commit suicide or develop alcohol dependence. He is also more likely to be diagnosed with autism, color-blindness, attention-deficit hyperactivity disorder as a child, and antisocial personality disorder as an adult. Choose your gender and pick your vulnerability.

Gender differences appear throughout this book. For now, let’s consider some gender differences in aggression, social power, and social connectedness.

Gender and Aggression

In surveys, men admit to more **aggression** than women do. This aggression gender gap pertains to harmful physical aggression, rather than indirect or verbal relational aggression such as ostracism or spreading rumors. As John Archer (2004, 2006, 2009) has noted, based on statistical digests of dozen of studies, women may be slightly more likely to commit acts of relational aggression, such as passing along malicious gossip. The gap appears in everyday life at various ages and in various cultures, especially cultures with gender inequality (Archer, 2009).

Men’s tendency to behave more aggressively can be seen in experiments where they deliver what they believe are more painful electric shocks (Card et al., 2008).

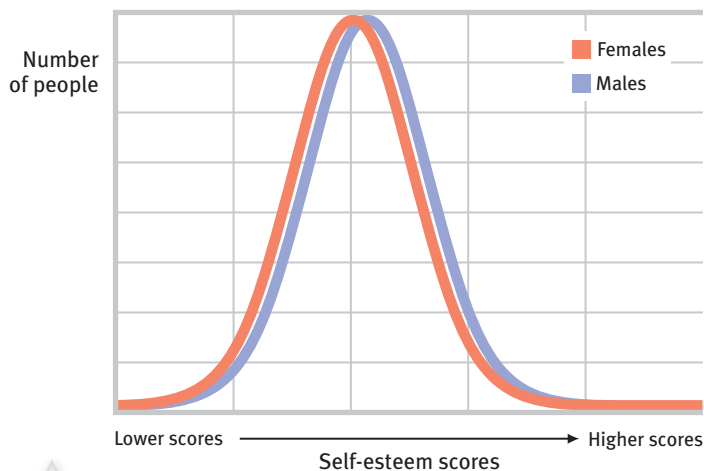


FIGURE 5.1

Much ado about a small difference in self-esteem

These two normal distributions differ by the approximate magnitude of the gender difference in self-esteem, averaged over all available samples (Hyde, 2005). Moreover, such comparisons illustrate differences between the *average* woman and man. The variation among individual women greatly exceeds this difference, as it also does among individual men.

Violent crime rates illustrate the gender difference even more strikingly. The male-to-female arrest ratio for murder, for example, is 9 to 1 in the United States and 8 to 1 in Canada (FBI, 2009; Statistics Canada, 2010). Throughout the world, fighting, warring, and hunting are primarily men's activities (Wood & Eagly, 2002, 2007). Men also express more support for war. The Iraq war, for example, was consistently supported more by American men than by American women (Newport et al., 2007).



Deadly relational aggression

This documentary film (www.RatsAndBullies.com) tells the sad tale of 14-year-old Dawn-Marie Wesley, who committed suicide after suffering months of relational aggression by school bullies.

Gender and Social Power

Close your eyes and imagine two adults standing side by side. The one on the left is dominant, forceful, and independent. The one on the right is submissive, nurturing, and socially connected.

Did you see the person on the left as a man, and the one on the right as a woman? If so, you are not alone.

Around the world, from Nigeria to New Zealand, people perceive such power differences between men and women (Williams & Best, 1990). Indeed, in most societies men *do* place more importance on power and achievement and *are* socially dominant (Schwartz & Rubel-Lifschitz, 2009). When groups form, whether as juries or companies, leadership tends to go to males (Colarelli et al., 2006). When salaries are paid, those in traditionally male occupations receive more. And when political leaders are elected, they usually are men, who held 80 percent of the seats in the world's governing parliaments in 2011 (IPU, 2011). If perceived to be hungry for political power (thus violating gender norms), women more than men suffer voter backlash (Okimoto & Brescoll, 2010). Men's power hunger is more expected and accepted.

As leaders, men tend to be more *directive*, even autocratic. Women tend to be more *democratic*, more welcoming of subordinates' input in decision making (Eagly & Carli, 2007; van Engen & Willemsen, 2004). When people interact, men are more likely to utter opinions, women to express support (Aries, 1987; Wood, 1987). In everyday behavior, men tend to act as powerful people often do: They are more likely to talk assertively, interrupt, initiate touches, and stare. And they smile and apologize less (Leaper & Ayres, 2007; Major et al., 1990; Schumann & Ross, 2010). Such behaviors help sustain social power inequities.

Gender and Social Connectedness

Females are more *interdependent* than males, and this difference surfaces early. In children's play, boys typically form large groups. Their games tend to be active and competitive, with little intimate discussion (Rose & Rudolph, 2006). Studies have found that girls usually play in smaller groups, often with one friend. Their play is less competitive and more imitative of social relationships (Maccoby, 1990; Roberts, 1991).

As adults, women take more pleasure in talking face to face, and they more often use conversation to explore relationships. Men enjoy doing activities side by side and tend to use conversation to communicate solutions (Tannen, 1990; Wright, 1989). The communication difference is apparent in student e-mails: In one New Zealand study, people could correctly guess the author's gender two-thirds of the time (Thomson & Murachver, 2001).

Gender differences also appear in phone-based communication. In the United States, the average teen girl sends and receives 80 texts daily; the average boy 30 (Lenhart, 2010). In France, women have made 63 percent of phone calls and, when talking to a woman, stayed connected longer (7.2 minutes) than have men when talking to other men (4.6 minutes) (Smoreda & Licoppe, 2000).

Women's 2011 representation in national parliaments ranged from 11 percent in the Arab States to 42 percent in Scandinavia (IPU, 2011).

gender the socially constructed roles and characteristics by which a culture defines *male* and *female*.

aggression physical or verbal behavior intended to hurt someone.

Every man for himself, or tend and befriend? Gender differences in the way we interact with others begin to appear at a very young age.



Getty Images/Gallo Images



© Ocean/Corbis

Women worldwide have oriented their interests and vocations more to people and less to things (Eagly, 2009; Lippa, 2005, 2006, 2008). One analysis of more than a half-million people's responses to various interest inventories revealed that "men prefer working with things and women prefer working with people" (Su et al., 2009). On entering college, American men are seven times more likely than women to express interest in computer science, and they contribute 87 percent of Wikipedia articles (Cohen, 2011; Pryor et al., 2011). In the workplace, women have been less driven by money and status and more often opted for reduced work hours (Pinker, 2008). In the home, they have been five times more likely than men to claim primary responsibility for taking care of children (*Time*, 2009).

Women's emphasis on caring helps explain another interesting finding: Although 69 percent of people have said they have a close relationship with their father, 90 percent said they feel close to their mother (Hugick, 1989). When wanting understanding and someone with whom to share worries and hurts, both men and women usually turn to women, and both have reported their friendships with women to be more intimate, enjoyable, and nurturing (Rubin, 1985; Sapadin, 1988). And when coping with their own stress, women more than men turn to others for support—they *tend and befriend* (Tamres et al., 2002; Taylor, 2002).

Gender differences in social connectedness, power, and other traits peak in late adolescence and early adulthood—the very years most commonly studied (also the years of dating and mating). As teenagers, girls become progressively less assertive and more flirtatious; boys become more domineering and unexpressive. Following the birth of a first child, parents (women especially) become more traditional in their gender-related attitudes and behavior (Ferriman et al., 2009; Katz-Wise et al., 2010). But studies have shown that by age 50, parenthood-related gender differences subside. Men become more empathic and less domineering, and women—especially those working outside the home—become more assertive and self-confident (Kasen et al., 2006; Maccoby, 1998).

What explains our diversity? How much does biology bend the genders? To what extent are we shaped by our cultures? A biopsychosocial view suggests both are important, thanks to the interplay among our biological dispositions, our developmental experiences, and our current situations (Eagly, 2009).

"In the long years liker must they grow;
The man be more of woman, she of man."

Alfred Lord Tennyson,
The Princess, 1847

RETRIEVE IT

- _____ (Men/Women) are more likely to commit relational aggression, and _____ (men/women) are more likely to commit physical aggression.
- Worldwide, _____ (men/women) have tended to express more personal and professional interest in people and less interest in things.

ANSWERS: Women; men

ANSWER: women

The Nature of Gender: Our Biology



5-2: How is our biological sex determined, and how do sex hormones influence prenatal and adolescent development?

In domains where we face similar challenges—regulating heat with sweat, preferring foods that nourish, growing calluses where the skin meets friction—men and women are similar. Even when describing the ideal mate, both prize traits such as “kind,” “honest,” and “intelligent.” But in mating-related domains, evolutionary psychologists contend, guys act like guys whether they are elephants or elephant seals, rural peasants or corporate presidents (Geary, 2010). Our biology may influence our gender differences in two ways: genetically, by our differing *sex chromosomes*, and physiologically, from our differing concentrations of *sex hormones*.

Prenatal Sexual Development

As noted earlier, males and females are variations on a single form—of the 46 chromosomes, 45 are unisex. So great is this similarity that until seven weeks after conception, you were anatomically indistinguishable from someone of the other sex. Then your genes activated your biological sex. Male or female, your sex was determined by your father’s contribution to your twenty-third pair of chromosomes, the two sex chromosomes. You received an **X chromosome** from your mother. From your father, you received the one chromosome that is not unisex—either another X chromosome, making you a girl, or a **Y chromosome**, making you a boy.

The Y chromosome includes a single gene which, about seven weeks after conception, throws a master switch triggering the testes to develop and to produce the principal male hormone, **testosterone**. This hormone starts the development of external male sex organs. Females also have testosterone, but less of it.

Another key period for sexual differentiation falls during the fourth and fifth prenatal months. During this period, sex hormones bathe the fetal brain and influence its wiring. Different patterns for males and females develop under the influence of the male’s greater testosterone and the female’s ovarian hormones (Hines, 2004; Udry, 2000).

Adolescent Sexual Development

Pronounced physical differences emerge during adolescence, when boys and girls enter **puberty** and mature sexually. A surge of hormones triggers a two-year period of rapid physical development, usually beginning at about age 11 in girls and at about age 13 in boys. A year or two before that, however, boys and girls often feel the first stirrings of sexual attraction (McClintock & Herdt, 1996).

About the time of puberty, boys’ growth propels them to greater height than their female counterparts (**FIGURE 5.2** on the next page). During this growth spurt, the **primary sex characteristics**—the reproductive organs and external genitalia—develop dramatically. So do **secondary sex characteristics**, the nonreproductive traits such as breasts and hips in girls, facial hair and deepened voice in boys, and pubic and underarm hair in both sexes (**FIGURE 5.3** on the next page).

In various countries, girls are developing breasts earlier (sometimes before age 10) and reaching puberty earlier than in the past. This phenomenon is variously attributed to increased body fat, increased hormone-mimicking chemicals, and increased stress related to family disruption (Biro et al., 2010).

Puberty’s landmarks are the first ejaculation in boys (*spermarche*), usually by about age 14, and the first menstrual period in girls (**menarche**—meh-NAR-key), usually within a year of age 12½ (Anderson et al., 2003). Menarche appears to occur a few months earlier, on average, for girls who have experienced stresses related to father absence, sexual abuse, or insecure attachments (Belsky et al., 2010; Vigil et al., 2005; Zabin et al., 2005).



Courtesy of Nick Downes.

X chromosome the sex chromosome found in both men and women. Females have two X chromosomes; males have one. An X chromosome from each parent produces a female child.

Y chromosome the sex chromosome found only in males. When paired with an X chromosome from the mother, it produces a male child.

testosterone the most important of the male sex hormones. Both males and females have it, but the additional testosterone in males stimulates the growth of the male sex organs in the fetus and the development of the male sex characteristics during puberty.

puberty the period of sexual maturation, during which a person becomes capable of reproducing.

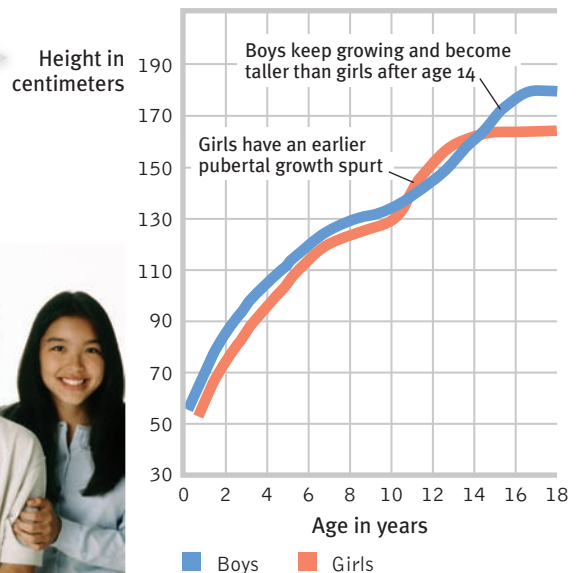
primary sex characteristics the body structures (ovaries, testes, and external genitalia) that make sexual reproduction possible.

secondary sex characteristics nonreproductive sexual traits, such as female breasts and hips, male voice quality, and body hair.

menarche [meh-NAR-key] the first menstrual period.

FIGURE 5.2

Height differences Throughout childhood, boys and girls are similar in height. At puberty, girls surge ahead briefly, but then boys overtake them at about age 14. (Data from Tanner, 1978.) Recent studies suggest that sexual development and growth spurts are beginning somewhat earlier than was the case a half-century ago (Herman-Giddens et al., 2001).



Girls who have been prepared for menarche usually experience it as a positive life transition. Studies have shown that nearly all adult women recall their first menstrual period and remember experiencing a mixture of feelings—pride, excitement, embarrassment, and apprehension (Greif & Ulman, 1982; Woods et al., 1983). Most men have similarly recalled their first ejaculation, which usually occurs as a nocturnal emission (Fuller & Downs, 1990).

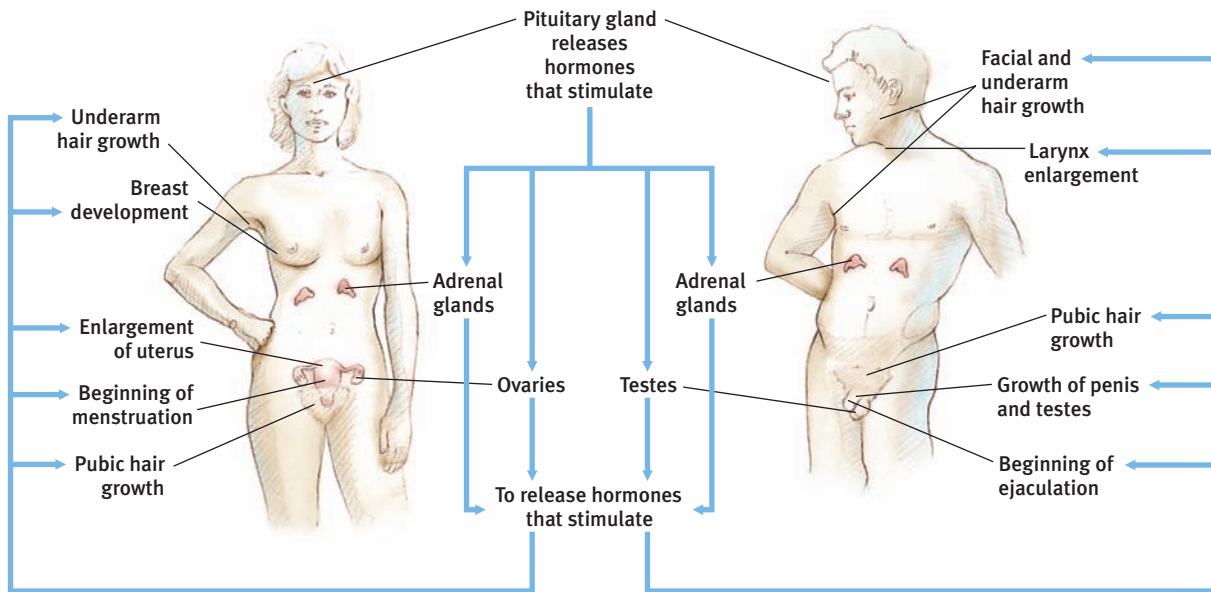


FIGURE 5.3

Body changes at puberty At about age 11 in girls and age 13 in boys, a surge of hormones triggers a variety of physical changes.

RETRIEVE IT

- Adolescence is marked by the onset of _____.

ANSWER: puberty

Variations on Sexual Development

Sometimes nature blurs the biological line between males and females. Atypical hormone exposure or sensitivity may cause atypical fetal development. *Intersex* individuals are born with intermediate or unusual combinations of male and female physical features. Genetic males, for example, may be born with normal male hormones and testes but without a penis or with a very small one.

Until recently, pediatricians and other medical experts often recommended surgery to create a female identity for these children. One study reviewed 14 cases of boys who had undergone early sex-reassignment surgery and had been raised as girls. Of those cases, 6 had later declared themselves as males, 5 were living as females, and 3 had an unclear gender identity (Reiner & Gearhart, 2004).

Although not born with an intersex condition, a little boy who lost his penis during a botched circumcision became a famous case illustrating the problems involved in sex-reassignment surgery. His parents followed a psychiatrist's advice to raise him as a girl rather than as a damaged boy. Alas, "Brenda" Reimer was not like most other girls. "She" didn't like dolls. She tore her dresses with rough-and-tumble play. At puberty she wanted no part of kissing boys. Finally, Brenda's parents explained what had happened, whereupon this young person immediately rejected the assigned female identity. He cut his hair and chose a male name, David. He eventually married a woman and became a stepfather. And, sadly, he later committed suicide (Colapinto, 2000).

The bottom line: "Sex matters," concluded the National Academy of Sciences (2001). In combination with the environment, sex-related genes and physiology "result in behavioral and cognitive differences between males and females." Nature and nurture work together.



Reuters/Michael Dalder

Gender in the spotlight

Dramatic improvements in South African track star Caster Semenya's race times prompted the International Association of Athletics Federations to undertake sex testing in 2009.

Semenya was reported to be intersex—with physical characteristics of both males and females—though she was officially cleared to continue competing as a woman. Semenya declared, "God made me the way I am and I accept myself. I am who I am" (*YOU*, 10 September 2009).

The Nurture of Gender: Our Culture



5-3: How do gender roles and gender typing influence gender development?

For most people, their biological sex and their gender are tightly intertwined. What biology initiates, culture accentuates.

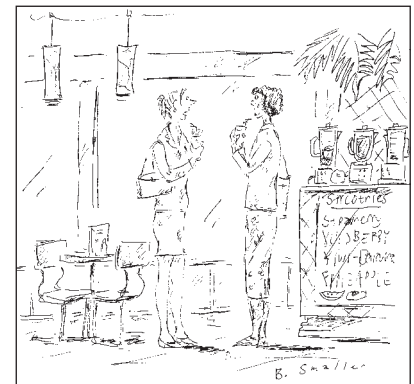
Gender Roles

You may recall from Chapter 1 that *culture* is everything shared by a group and transmitted across generations. We can see culture's shaping power in **gender roles**—the social expectations that guide men's and women's behavior. (In psychology, as in the theater, a **role** refers to a cluster of prescribed actions, the behaviors we expect of those who occupy a particular social position.)

Gender roles vary over time and place. In North America, men were traditionally expected to initiate dates, drive the car, and pick up the check. Women were expected to decorate the home, buy and care for the children's clothes, and select the wedding gifts. Up through the 1990s, Mom (about 90 percent of the time in two-parent U.S. families) stayed home with a sick child, arranged for the babysitter, and called the doctor (MacCoby, 1995). Even in recent years, compared with employed women, employed men in the United States have spent about an hour and a half more on the job and about one hour less on daily household activities and caregiving (Amato et al., 2007; Bureau of Labor Statistics, 2004; Fisher et al., 2006). Ditto Australia, where, compared with men, women have devoted 54 percent more time to unpaid household work and 71 percent more time to child care (Trewin, 2001).

Other societies have different expectations. In nomadic societies of food-gathering people, there is little division of labor by sex. Boys and girls receive much the same upbringing. In agricultural societies, where women work in the nearby fields and men roam while herding livestock, children have typically been socialized into more distinct gender roles (Segall et al., 1990; Van Leeuwen, 1978).

Among industrialized countries, gender roles and attitudes vary widely. Australia and the Scandinavian countries offer the greatest gender equity, Middle Eastern and North African countries the least (Social Watch, 2006). And consider: Would you agree that "when jobs are scarce, men should have more rights to a job?" In the United States, Britain, and Spain, about one in eight adults agree. In Nigeria, Pakistan, and India, about four in five do (Pew, 2010). We are one species, but my how we differ.



"Sex brought us together,
but gender drove us apart."

© The New Yorker Collection, 2001. Barbara Smaller from cartoonbank.com. All Rights Reserved.

gender role a set of expected behaviors for males or for females.

role a set of expectations (norms) about a social position, defining how those in the position ought to behave.



The gendered tsunami In Sri Lanka, Indonesia, and India, the gendered division of labor helps explain the excess of female deaths from the 2004 tsunami. In some villages, 80 percent of those killed were women, who were mostly at home while the men were more likely to be at sea fishing or doing out-of-the-home chores (Oxfam, 2005).

The social learning of gender Children observe and imitate parental models.



To see how gender role attitudes vary over time, consider women's voting rights. At the opening of the twentieth century, only one country—New Zealand—granted women the right to vote (Briscoe, 1997). By the late 1960s and early 1970s, women had become a force in the voting booth and the workplace in many countries. Nearly 50 percent of employed Americans are now women, as are 54 percent of college graduates, up from 36 percent in just four decades (Fry & Cohn, 2010). In today's postindustrial economy, the jobs expected to grow the most in the years ahead are the ones women have gravitated toward—those that require not size and strength but social intelligence, open communication, and the ability to sit still and focus (Rosin, 2010). These are big gender changes in but a thin slice of history.

Gender roles can smooth social relations, avoiding irritating discussions about whose job it is to get the car fixed and who should buy the birthday presents. But these quick and easy assumptions come at a cost: If we deviate from conventions, we may feel anxious.

How Do We Learn to Be Male or Female?

Gender identity is a person's sense of being male or female. **Social learning theory** assumes that children acquire this identity by observing and imitating others' gender-linked behaviors and by being rewarded or punished for acting in certain ways themselves (“Nicole, you're such a good mommy to your dolls”; “Big boys don't cry, Alex.”). Some critics have objected, saying that parental modeling and rewarding of male–female differences aren't enough to explain **gender typing**, the way some children seem more attuned than others to traditional male or female roles (Lytton & Romney, 1991). In fact, even in families that discourage traditional gender typing, children organize themselves into “boy worlds” and “girl worlds,” each guided by rules for what boys and girls do.

Cognition (thinking) also matters. In your own childhood you formed *schemas*, or concepts that helped you make sense of your world. One of these was your *gender schema*, your framework for organizing boy–girl characteristics (Bem, 1987, 1993). This gender schema then became a lens through which you viewed your experiences.

Gender schemas form early in life, and social learning helps form them. Before age 1, you began to discriminate male and female voices and faces (Martin et al., 2002). After age 2, language forced you to begin organizing your world on the basis of gender. English, for example, uses the pronouns *he* and *she*; other languages classify objects as masculine (“*le train*”) or feminine (“*la table*”).

Young children are “gender detectives” (Martin & Ruble, 2004). Once they grasp that two sorts of people exist—and that they are of one sort—they search for clues about gender, and they find them in language, dress, toys, and songs. Girls, they may decide, are the ones with long hair. Having divided the human world in half, 3-year-olds will then like their own kind better and seek them out for play. And having compared themselves with their concept of gender, they will adjust their behavior accordingly. (“I am male—thus, masculine, strong, aggressive,” or “I am female—therefore, feminine, sweet, and helpful.”) These rigid boy–girl stereotypes peak at about age 5 or 6. If the new neighbor is a boy, a 6-year-old girl may assume he just cannot share her interests. For young children, gender looms large.

For some people, comparing themselves with their culture's concepts of gender produces feelings of confusion and discord. **Transgender** people's *gender identity* (their sense of being male or female) or *gender expression* (their communication of gender identity through behavior or appearance) differs from

that typical of their birth sex (APA, 2010). A person may feel like a man in a woman's body, or a woman in a man's body. These include *transsexual* people, who live, or wish to live, as members of the gender opposite to their birth sex, often aided by medical treatment that supports gender reassignment. Note that gender identity is distinct from *sexual orientation* (the direction of one's sexual attraction). Transgender people may be heterosexual, homosexual, bisexual, or asexual.

Some transgender persons express their gender identity by dressing as a person of the other biological sex typically would. Most cross-dressers are biological males, the majority of whom feel an attraction to females (APA, 2010).

RETRIEVE IT

- What are gender roles, and what do their variations tell us about our human capacity for learning and adaptation?

ANSWER: Gender roles are sets of expected behaviors for females or for males. Gender roles vary widely in different cultures, which is proof that we are very capable of learning and adapting to the social demands of different environments.

Human Sexuality

As you've probably noticed, we can hardly talk about gender without talking about our sexuality. For all but the tiny fraction of us considered *asexual*, dating and mating become top priority from puberty on. Physiological and psychological influences affect our sexual feelings and behaviors.

The Physiology of Sex

Sex is not like hunger, because it is not an actual *need*. (Without it, we may feel like dying, but we will not.) Yet sex is part of life. Had this not been so for all your ancestors, you would not be reading this book. Sexual motivation is nature's clever way of making people procreate, thus enabling our species' survival. When two people feel an attraction, they hardly stop to think of themselves as guided by their genes. As the pleasure we take in eating is nature's method of getting our body nourishment, so the desires and pleasures of sex are our genes' way of preserving and spreading themselves. Life is sexually transmitted.

Hormones and Sexual Behavior



5-4: How do hormones influence human sexual motivation?

Among the forces driving sexual behavior are the *sex hormones*. The main male sex hormone, as we saw earlier, is *testosterone*. The main female sex hormones are the **estrogens**, such as estradiol. Sex hormones influence us at many points in the life span:

- During the prenatal period, they direct our development as males or females.
- During puberty, a sex hormone surge ushers us into adolescence.
- After puberty and well into the late adult years, sex hormones activate sexual behavior.

In most mammals, nature neatly synchronizes sex with fertility. Females become sexually receptive ("in heat") when their estrogens peak at ovulation. In experiments, researchers can cause female animals to become receptive by injecting them with estrogens. Male hormone levels are more constant, and hormone injection does not so easily manipulate the sexual behavior of male animals (Feder, 1984). Nevertheless, male rats that have had their testes (which manufacture testosterone) surgically removed will gradually lose much of their interest in receptive females. They gradually regain it if injected with testosterone.

"The more I was treated as a woman, the more woman I became."

Jan Morris, male-to-female transsexual



Kimberly A. C. Wilson/The Oregonian

The transgender mayor When Stu Rasmussen was elected Silverton, Oregon's mayor, he was a guy in pants. When reelected, he was openly transgender and wore a dress and makeup to his installation.

In a British survey of 18,876 people, 1 percent were seemingly asexual, having "never felt sexually attracted to anyone at all" (Bogaert, 2004, 2006b).

"It is a near-universal experience, the invisible clause on one's birth certificate stipulating that one will, upon reaching maturity, feel the urge to engage in activities often associated with the issuance of more birth certificates."

Science writer Natalie Angier, 2007

gender identity our sense of being male or female.

social learning theory the theory that we learn social behavior by observing and imitating and by being rewarded or punished.

gender typing the acquisition of a traditional masculine or feminine role.

transgender an umbrella term describing people whose gender identity or expression differs from that associated with their birth sex.

estrogens sex hormones, such as estradiol, secreted in greater amounts by females than by males and contributing to female sex characteristics. In nonhuman female mammals, estrogen levels peak during ovulation, promoting sexual receptivity.

Hormones do influence human sexual behavior, but in a looser way. Among women with mates, sexual desire rises slightly at ovulation (Pillsworth et al., 2004). One study invited partnered women not at risk for pregnancy to keep a diary of their sexual activity. (These women were either using intrauterine devices or had undergone surgery to prevent pregnancy.) On the days around ovulation, intercourse was 24 percent more frequent (Wilcox et al., 2004).

Other studies find that around ovulation, women fantasize more about sex with desirable partners, wear more sexually attractive clothing, and have slightly higher voice pitch (Bryant & Haselton, 2009; Pillsworth & Haselton, 2006; Sheldon et al., 2006). After sniffing a T-shirt worn by a woman, men display higher testosterone levels if she was ovulating rather than nonovulating (Miller & Maner, 2010, 2011). In a study of 5300 strip-club lap dancers, their hourly tips almost doubled on the days near ovulation, compared with days during menstruation (Miller et al., 2007).

Women more than other mammalian females are responsive to their testosterone level (van Anders & Dunn, 2009). You may recall that women have testosterone, though at lower levels than are found in men. If a woman's natural testosterone level drops, as happens with removal of the ovaries or adrenal glands, her sexual interest may wane. But as controlled experiments with hundreds of surgically or naturally menopausal women have demonstrated, testosterone-replacement therapy can often restore diminished sexual activity, arousal, and desire (Braunstein et al., 2005; Buster et al., 2005; Petersen & Hyde, 2011).

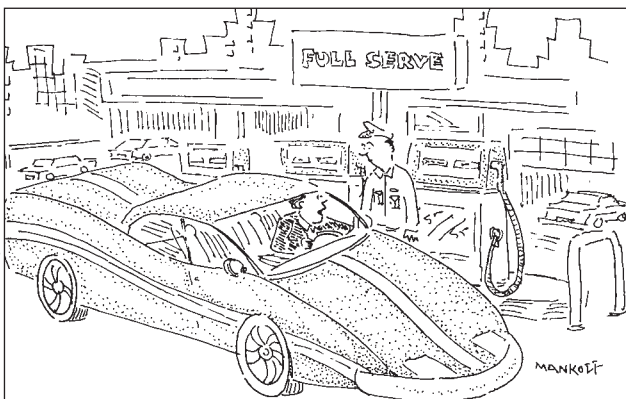
In human males with abnormally low testosterone levels, testosterone-replacement therapy often increases sexual desire and also energy and vitality (Yates, 2000). But normal fluctuations in testosterone levels, from man to man and hour to hour, have little effect on sexual drive (Byrne, 1982). Indeed, male hormones sometimes vary in *response* to sexual stimulation. In one study, Australian skateboarders' testosterone surged in the presence of an attractive female, contributing to riskier moves and more crash landings (Ronay & von Hippel, 2010). Thus, sexual arousal can be a *cause* as well as a consequence of increased testosterone levels. At the other end of the mating spectrum, studies in both North America and China have found that married fathers tend to have lower testosterone levels than do bachelors and married men without children (Gray et al., 2006).

Large hormonal surges or declines do affect men and women's desire. These shifts tend to occur at two predictable points in the life span, and sometimes at an unpredictable third point:

1. *As we have seen, a surge in sex hormones triggers the development of sex characteristics during puberty.* Interest in dating and sexual stimulation usually increases at this time. If the hormonal surge is precluded—as it was during the 1600s and 1700s for prepubertal boys who were castrated to preserve their soprano voices for Italian opera—sex characteristics and sexual desire do not develop normally (Peschel & Peschel, 1987).
2. *In later life, estrogen levels fall, and women experience menopause (Chapter 4).* As sex hormone levels decline, the frequency of sexual fantasies and intercourse declines as well (Leitenberg & Henning, 1995).

3. *For some, surgery or drugs may cause hormonal shifts.* When adult men were castrated, sex drive typically fell as testosterone levels declined sharply (Hucker & Bain, 1990). Male sex offenders who were taking Depo-Provera, a drug that reduces testosterone levels to that of a prepubertal boy, have similarly lost much of their sexual urge (Bilefsky, 2009; Money et al., 1983).

To summarize: We might compare human sex hormones, especially testosterone, to the fuel in a car. Without fuel, a car will not run. But if the fuel level is minimally adequate, adding more fuel to the gas tank won't change how the car runs. The analogy is imperfect, because hormones and sexual motivation interact. However, it correctly suggests that biology is a necessary but not sufficient explanation of human sexual behavior. The hormonal fuel is essential, but so are the psychological stimuli that turn on the engine, keep it running, and shift it into high gear.



"Fill'er up with testosterone."

RETRIEVE IT

- The primary male sex hormone is _____. The primary female sex hormones are the _____.

ANSWERS: testosterone; estrogens

The Sexual Response Cycle



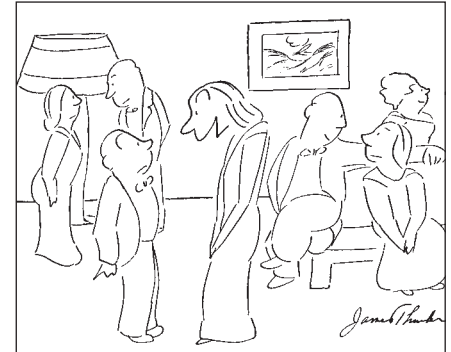
5-5: What is the human sexual response cycle, and how do sexual dysfunctions and paraphilias differ?

In the 1960s, gynecologist-obstetrician William Masters and his collaborator Virginia Johnson (1966) made headlines by recording the physiological responses of volunteers who came to their lab to masturbate or have intercourse. With the help of 382 female and 312 male volunteers—a somewhat atypical sample, consisting only of people able and willing to display arousal and orgasm while scientists observed—Masters and Johnson monitored or filmed more than 10,000 sexual “cycles.” Their description of the **sexual response cycle** identified four stages:

1. **Excitement:** The genital areas become engorged with blood, causing a woman’s clitoris and a man’s penis to swell. A woman’s vagina expands and secretes lubricant; her breasts and nipples may enlarge.
2. **Plateau:** Excitement peaks as breathing, pulse, and blood pressure rates continue to increase. A man’s penis becomes fully engorged and some fluid—frequently containing enough live sperm to enable conception—may appear at its tip. A woman’s vaginal secretion continues to increase, and her clitoris retracts. Orgasm feels imminent.
3. **Orgasm:** Muscle contractions appear all over the body and are accompanied by further increases in breathing, pulse, and blood pressure rates. A woman’s arousal and orgasm facilitate conception: They help propel semen from the penis, position the uterus to receive sperm, and draw the sperm further inward, increasing retention of deposited sperm (Furlow & Thornhill, 1996). The pleasurable feeling of sexual release apparently is much the same for both sexes. One panel of experts could not reliably distinguish between descriptions of orgasm written by men and those written by women (Vance & Wagner, 1976). In another study, PET scans showed that the same subcortical brain regions were active in men and women during orgasm (Holstege et al., 2003a,b). And when people passionately in love undergo fMRI scans while viewing photos of their beloved or of a stranger, men’s and women’s brain responses to their partner are pretty similar (Fisher et al., 2002).
4. **Resolution:** The body gradually returns to its unaroused state as the genital blood vessels release their accumulated blood. This happens relatively quickly if orgasm has occurred, relatively slowly otherwise. (It’s like the nasal tickle that goes away rapidly if you have sneezed, slowly otherwise.) Men then enter a **refractory period** that lasts from a few minutes to a day or more, during which they are incapable of another orgasm. A woman’s much shorter refractory period may enable her to have another orgasm if restimulated during or soon after resolution.

Sexual Dysfunctions and Paraphilias

Masters and Johnson sought not only to describe the human sexual response cycle but also to understand and treat the inability to complete it. **Sexual dysfunctions** are problems that consistently impair sexual arousal or functioning. Some involve sexual motivation, especially lack of sexual energy and arousability. For men, others include *erectile dysfunction* (inability to have or maintain an erection) and *premature ejaculation*. For women, the problem may be pain or *orgasmic dysfunction* (distress over infrequently or never experiencing orgasm). In separate surveys of some 3000 Boston women and 32,000 other American women, about 4 in 10 reported a sexual problem, such as



“I love the idea of there being two sexes, don’t you?”

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A nonsmoking 50-year-old male has about a 1-in-a-million chance of a heart attack during any hour. This increases to merely 2-in-a-million in the two hours during and following sex (with no increase for those who exercise regularly). Compared with risks associated with heavy exertion or anger (see Chapter 11), this risk seems not worth losing sleep (or sex) over (Jackson, 2009; Muller et al., 1996).

sexual response cycle the four stages of sexual responding described by Masters and Johnson—excitement, plateau, orgasm, and resolution.

refractory period a resting period after orgasm, during which a man cannot achieve another orgasm.

sexual dysfunction a problem that consistently impairs sexual arousal or functioning.

orgasmic dysfunction or low desire, but only about 1 in 8 reported that this caused personal distress (Lutfey et al., 2009; Shifren et al., 2008). Most women who have experienced sexual distress have related it to their emotional relationship with the partner during sex (Bancroft et al., 2003).

Therapy can help men and women with sexual dysfunction. In behaviorally oriented therapy, for example, men learn ways to control their urge to ejaculate, and women are trained to bring themselves to orgasm. Starting with the introduction of Viagra in 1998, erectile dysfunction has been routinely treated by taking a pill.

In the more troubling *paraphilias*, a person's sexual arousal is related to socially unacceptable behavior. The American Psychiatric Association classifies such behavior as disordered if a person's sexual urges, fantasies, or behaviors involve nonhuman objects; the suffering of self or others; and/or nonconsenting persons. Examples of paraphilias include *exhibitionism*, *fetishism*, and *pedophilia*.

Sexually Transmitted Infections



5-6: How can sexually transmitted infections be prevented?

Rates of *sexually transmitted infections* (STIs; also called *STDs* for *sexually transmitted diseases*) are rising, and two-thirds of the new infections have occurred in people under 25 (CASA, 2004). Teenage girls, because of their not yet fully mature biological development and lower levels of protective antibodies, are especially vulnerable (Dehne & Riedner, 2005; Guttmacher, 1994). A Centers for Disease Control study of sexually experienced 14- to 19-year-old U.S. females found 39.5 percent had STIs (Forhan et al., 2008).

To comprehend the mathematics of infection transmission, imagine this scenario. Over the course of a year, Pat has sex with 9 people, each of whom over the same period has sex with 9 other people, who in turn have sex with 9 others. How many “phantom” sex partners (past partners of partners) will Pat have? The actual number—511—is more than five times the estimate given by the average student (Brannon & Brock, 1993).

Condoms offer only limited protection against certain skin-to-skin STIs, such as herpes, but they do reduce other risks (Medical Institute, 1994; NIH, 2001). The effects were clear when Thailand promoted 100 percent condom use by commercial sex workers. Over a four-year period, as condom use soared from 14 to 94 percent, the annual number of bacterial STIs plummeted from 410,406 to 27,362 (WHO, 2000).

Across the available studies, condoms also have been 80 percent effective in preventing transmission of *HIV* (*human immunodeficiency virus*—the virus that causes **AIDS**) from an infected partner (Weller & Davis-Beaty, 2002; WHO, 2003). Although AIDS can be transmitted by other means, such as needle sharing during drug use, its sexual transmission is most common. Women's AIDS rates are increasing fastest, partly because the virus is passed from man to woman much more often than from woman to man. A man's semen can carry more of the virus than can a woman's vaginal and cervical secretions. The HIV-infected semen can also linger for days in a woman's vagina and cervix, increasing the time of exposure (Allen & Setlow, 1991; WHO, 2004).

Most U.S. AIDS cases have been people in midlife and younger—ages 25 to 44 (U.S. Centers for Disease Control and Prevention, 2011). Given AIDS' long incubation period, this means that many of these young people were infected as teens. In 2009, the death of 1.8 million AIDS victims worldwide left behind countless grief-stricken partners and millions of orphaned children (UNAIDS, 2010). Sub-Saharan Africa is home to two-thirds of those infected with HIV, and medical treatment and care for the dying are sapping the region's social resources.

Many people assume that oral sex falls in the category of “safe sex,” but recent studies show a significant link between oral sex and transmission of STIs, such as the *human papilloma virus* (HPV). Risks rise with the number of sexual partners (Gillison et al., 2012). Most HPVs can now be prevented with a vaccination administered before sexual contact.

AIDS (acquired immune deficiency syndrome) a life-threatening, sexually transmitted infection caused by the *human immunodeficiency virus* (HIV). AIDS depletes the immune system, leaving the person vulnerable to infections.

RETRIEVE IT

- The inability to complete the sexual response cycle may be considered a _____. Exhibitionism would be considered a _____.
ANSWERS: sexual dysfunction; paraphilia
- From a biological perspective, AIDS is passed more readily from women to men than from men to women. True or false?
ANSWER: False. AIDS is transmitted more easily and more often from men to women.

The Psychology of Sex



5-7: How do external and imagined stimuli contribute to sexual arousal?

Biological factors powerfully influence our sexual motivation and behavior. Yet the wide variations over time, across place, and among individuals document the great influence of psychological factors as well (FIGURE 5.4). Thus, despite the shared biology that underlies sexual motivation, the 281 expressed reasons for having sex (at last count) ranged widely—from “to get closer to God” to “to get my boyfriend to shut up” (Buss, 2008; Meston & Buss, 2007).

External Stimuli

Men and women become aroused when they see, hear, or read erotic material (Heiman, 1975; Stockton & Murnen, 1992). In 132 experiments, men’s feelings of sexual arousal have much more closely mirrored their (more obvious) genital response than have women’s (Chivers et al., 2010).

People may find sexual arousal either pleasing or disturbing. (Those who wish to control their arousal often limit their exposure to such materials, just as those wishing to control hunger limit their exposure to tempting cues.) With repeated exposure, the emotional response to any erotic stimulus often lessens, or *habituates*. During the 1920s, when Western women’s rising hemlines first reached the knee, an exposed leg was a mildly erotic stimulus.

Can exposure to sexually explicit material have adverse effects? Research has indicated that it can. Depictions of women being sexually coerced—and liking it—have increased viewers’ acceptance of the false idea that women enjoy rape, and have increased male viewers’ willingness to hurt women (Malamuth & Check, 1981; Zillmann, 1989). Viewing images of sexually attractive women and men may also lead people to devalue their own partners and relationships. After male collegians viewed TV or magazine

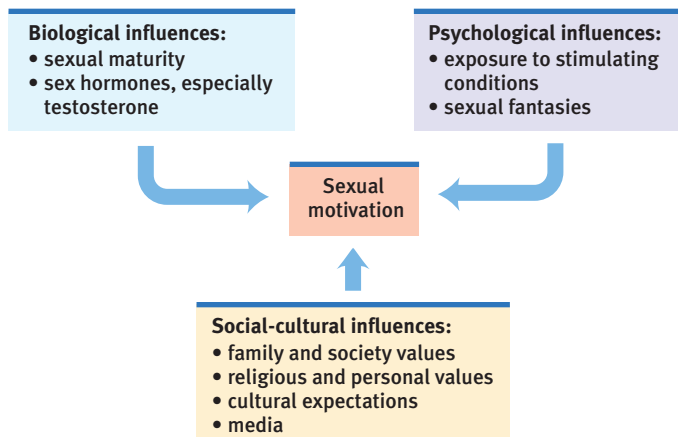


FIGURE 5.4
Levels of analysis for sexual motivation Our sexual motivation is influenced by biological factors, but psychological and social-cultural factors play an even bigger role.

depictions of sexually attractive women, they often found an average woman, or their own girlfriend or wife, less attractive (Kenrick & Gutierrez, 1980; Kenrick et al., 1989; Weaver et al., 1984). Viewing X-rated sex films has similarly tended to diminish people's satisfaction with their own sexual partner (Zillmann, 1989). Perhaps reading or watching erotica creates expectations that few men and women can fulfill.

Imagined Stimuli

The brain, it has been said, is our most significant sex organ. The stimuli inside our heads—our imagination—can influence sexual arousal and desire. People who, because of a spinal-cord injury, have no genital sensation can still feel sexual desire (Willmuth, 1987).

Wide-awake people become sexually aroused not only by memories of prior sexual activities but also by fantasies. About 95 percent of both men and women have said they have sexual fantasies. Men (whether gay or straight) fantasize about sex more often, more physically, and less romantically. They also prefer less personal and faster-paced sexual content in books and videos (Leitenberg & Henning, 1995). Fantasizing about sex does *not* indicate a sexual problem or dissatisfaction. If anything, sexually active people have more sexual fantasies.

RETRIEVE IT

- What factors influence our sexual motivation and behavior?

ANSWER: Influences include biological factors such as sexual maturity and sex hormones, psychological factors such as environmental stimuli and fantasies, and social-cultural factors such as the values and expectations absorbed from family and the surrounding culture.

Teen Pregnancy



5-8: What factors influence teenagers' sexual behaviors and use of contraceptives?

Compared with European teens, American teens have a higher rate of STIs and also of teen pregnancy (Call et al., 2002; Sullivan/Anderson, 2009). What environmental factors contribute to teen pregnancy?

Minimal communication about birth control Many teenagers are uncomfortable discussing contraception with their parents, partners, and peers. Teens who talk freely with parents, and who are in an exclusive relationship with a partner with whom they communicate openly, are more likely to use contraceptives (Aspy et al., 2007; Milan & Kilmann, 1987).

Guilt related to sexual activity In another survey, 72 percent of sexually active 12- to 17-year-old American girls said they regretted having had sex (Reuters, 2000). Sexual inhibitions or ambivalence can restrain sexual activity, but if passion overwhelms intentions they may also reduce attempts at birth control (Gerrard & Luus, 1995; MacDonald & Hynie, 2008).

Alcohol use Sexually active teens are typically alcohol-using teens (Zimmer-Gembeck & Helfand, 2008), and those who use alcohol prior to sex are less likely to use condoms (Kotchick et al., 2001). By depressing the brain centers that control judgment, inhibition, and self-awareness, alcohol disarms normal restraints, a phenomenon well known to sexually coercive males.

Mass media norms of unprotected promiscuity Media help write the “social scripts” that affect our perceptions and actions. So what sexual scripts do today's media write on our minds? An average hour of prime-time television on the three major U.S. networks has contained 15 sexual acts, words, and innuendos. The partners were usually unmarried, with no prior romantic relationship, and few communicated any concern for birth control or STIs (Brown et al., 2002; Kunkel, 2001; Sapolsky & Tabarlet, 1991). The more

“Condoms should be used on every conceivable occasion.”

Anonymous

sexual content adolescents view (even when controlling for other predictors of early sexual activity), the more likely they are to perceive their peers as sexually active, to develop sexually permissive attitudes, and to experience early intercourse (Escobar-Chaves et al., 2005; Martino et al., 2005; Ward & Friedman, 2006). (See Close-Up: The Sexualization of Girls.)

The National Longitudinal Study of Adolescent Health among 12,000 teens found several factors that predicted several sexual restraint:

- *High intelligence* Teens with high rather than average intelligence test scores more often delayed sex, partly because they appreciated possible negative consequences and were more focused on future achievement than on here-and-now pleasures (Halpern et al., 2000).
- *Religious engagement* Actively religious teens have more often reserved sexual activity for adulthood (Lucero et al., 2008).
- *Father presence* In studies that followed hundreds of New Zealand and U.S. girls from age 5 to 18, a father's absence was linked to sexual activity before age 16 and to teen pregnancy (Ellis et al., 2003). These associations held even after adjusting for other adverse influences, such as poverty. Close family attachments—families that eat together and where parents know their teens' activities and friends—also predicted later sexual initiation (Coley et al., 2008).
- *Participation in service learning programs* Several experiments have found that teens volunteering as tutors or teachers' aides, or participating in community projects, had lower pregnancy rates than were found among comparable teens randomly assigned to control conditions (Kirby, 2002; O'Donnell et al., 2002). Researchers are unsure why. Does service learning promote a sense of personal competence, control, and responsibility? Does it encourage more future-oriented thinking? Or does it simply reduce opportunities for unprotected sex?

We have considered some of the research on the biological and psychological aspects of human sexuality. It's important to remember, though, that scientific research on human sexuality does not aim to define the personal meaning of sex in our own lives. We could know every available fact about sex—that the initial spasms of male and female orgasm



Eidos Scipps Howard Photo Service/Newscom

Keeping abreast of hypersexuality
An analysis of the 60 top-selling video games found 489 characters, 86 percent of whom were males (like most of the game players). The female characters were much more likely than the male characters to be “hypersexualized”—partially nude or revealingly clothed, with large breasts and tiny waists (Downs & Smith, 2010).

CLOSE UP:

The Sexualization of Girls

As you have surely noticed, TV, the Internet, music videos and lyrics, movies, magazines, sports media, and advertising often portray women and even girls as sexual objects. The frequent result, according to both an American Psychological Association (APA, 2007) task force and the Scottish Parliament (2010), is harm to their self-image, and unhealthy sexual development.

Sexualization occurs when girls

- are led to value themselves in terms of their sexual appeal.
- compare themselves to narrowly defined beauty standards.

- see themselves as sexual beings for others' use.

In experiments, the APA task force reported, being made self-conscious about one's body, such as by wearing a swimsuit, disrupts thinking when doing math computations or logical reasoning. Sexualization also contributes to eating disorders and depression, and to unrealistic expectations regarding sexuality.

Mindful of today's sexualizing media, the APA has some suggestions for countering these

messages. Parents, teachers, and others can teach girls “to value themselves for who they are rather than how they look.” They can teach boys “to value girls as friends, sisters, and girlfriends, rather than as sexual objects.” And they can help girls and boys develop “media literacy skills” that enable them to recognize and resist the message that women are sexual objects and that a thin, sexy look is all that matters.



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Sharing love For most adults, a sexual relationship fulfills not only a biological motive but also a social need for intimacy.



Image Source/Getty Images

come at 0.8-second intervals, that the female nipples expand 10 millimeters at the peak of sexual arousal, that systolic blood pressure rises some 60 points and respiration rate to 40 breaths per minute—but fail to understand the human significance of sexual intimacy.

Surely one significance of sexual intimacy is its expression of our profoundly social nature. One recent study asked 2035 married people when they started having sex (while controlling for education, religious engagement, and relationship length). Those whose relationship first developed to a deep commitment reported greater relationship satisfaction and stability—and better sex (Busby et al., 2010). Sex is a socially significant act. Men and women can achieve orgasm alone, yet most people find greater satisfaction—and experience a much greater surge in the *prolactin* hormone associated with sexual satisfaction and satiety—after intercourse and orgasm with their loved one (Brody & Tillmann, 2006). Sex at its human best is life uniting and love renewing.

In the remaining pages of this chapter, we'll consider two special topics: *sexual orientation* (the direction of our sexual interests), and evolutionary psychology's explanation of our sexual motivation.

RETRIEVE IT

- Which THREE of the following five factors contribute to unplanned teen pregnancies?
 - a. Alcohol use
 - b. Higher intelligence level
 - c. Ignorance
 - d. Mass media models
 - e. Increased communication about options

ANSWERS: a, c, d

Sexual Orientation



5-9: What has research taught us about sexual orientation?

We express the *direction* of our sexual interest in our **sexual orientation**—our enduring sexual attraction toward members of our own sex (*homosexual orientation*), the other sex (*heterosexual orientation*), or both sexes (*bisexual orientation*). As far as we know, all cultures in all times have been predominantly heterosexual (Bullough, 1990). Some cultures have condemned same-sex relations. (In Kenya and Nigeria, 98 percent have thought homosexuality is “never justified” [Pew, 2006].) Others have accepted same-sex unions. But in both cases, heterosexuality prevails and homosexuality endures.

How many people are exclusively homosexual? About 10 percent, as the popular press has often assumed? Nearly 25 percent, as average Americans estimated in a 2011 Gallup survey (Morales, 2011)? Not according to more than a dozen national surveys that have explored sexual orientation in Europe and the United States, using methods protecting the respondents' anonymity. The most accurate figure seems to be about 3 percent of men and 1 or 2 percent of women (Chandra et al., 2011; Herbenick et al., 2010a). Fewer than 1 percent of survey respondents—for example, only 12 people out of 7076 Dutch adults in one survey (Sandfort et al., 2001)—have reported being actively bisexual. A larger number of adults—13 percent of women and 5 percent of men in a U.S. National Center for Health Statistics survey—report some same-sex sexual contact during their lives (Chandra et al., 2011). And still more have had an occasional homosexual fantasy.

What does it feel like to be the “odd man (or woman) out” in a heterosexual culture? If you are heterosexual, one way to understand is to imagine how you would feel if you were socially isolated for openly admitting or displaying your feelings toward someone of the other sex. How would you react if you overheard people making crude jokes about heterosexual people, or if most movies, TV shows, and advertisements portrayed (or implied) homosexuality? And how would you answer if your family members were pleading with you to change your heterosexual lifestyle and to enter into a homosexual marriage?

sexual orientation an enduring sexual attraction toward members of either one's own sex (homosexual orientation), the other sex (heterosexual orientation), or both sexes (bisexual orientation).

Facing such reactions, homosexual people often struggle with their sexual orientation. They may at first try to ignore or deny their desires, hoping they will go away. But they don't. Some may try to change, through psychotherapy, willpower, or prayer. But the feelings typically persist, as do those of heterosexual people—who are similarly incapable of becoming homosexual (Haldeman, 1994, 2002; Myers & Scanzoni, 2005).

Most of today's psychologists therefore view sexual orientation as neither willfully chosen nor willfully changed. "Efforts to change sexual orientation are unlikely to be successful and involve some risk of harm," declared a 2009 American Psychological Association report. In 1973, the American Psychiatric Association dropped homosexuality from its list of "mental illnesses." In 1993, the World Health Organization did the same, as did Japan's and China's psychiatric associations in 1995 and 2001. Some have noted that rates of depression and attempted suicide are higher among gays and lesbians. Many psychologists believe, however, that these symptoms may result from experiences with bullying, harassment, and discrimination (Sandfort et al., 2001; Warner et al., 2004). "Homosexuality, in and of itself, is not associated with mental disorders or emotional or social problems," declared the American Psychological Association (2007).

Thus, sexual orientation in some ways is like handedness: Most people are one way, some the other. A very few are ambidextrous. Regardless, the way one is endures.

This conclusion is most strongly established for men. Compared with men's sexual orientation, women's tends to be less strongly felt and may be more variable (Chivers, 2005; Diamond, 2008; Peplau & Garnets, 2000). Men's lesser *erotic plasticity* (sexual variability) is apparent in many ways (Baumeister, 2000). Adult women's sexual drive and interests are more flexible and varying than are adult men's. Women, more than men, for example, prefer to alternate periods of high sexual activity with periods of almost none. They are also somewhat more likely than men to feel and act on bisexual attractions (Mosher et al., 2005).

Environment and Sexual Orientation

So, our sexual orientation is something we do not choose and (especially for males) seemingly cannot change. Where, then, do these preferences come from? Let's look first at possible environmental influences on sexual orientation. To see if you can anticipate the conclusions that have emerged from hundreds of studies, try answering *Yes* or *No* to these questions:

1. Is homosexuality linked with problems in a child's relationships with parents, such as with a domineering mother and an ineffectual father, or a possessive mother and a hostile father?
2. Does homosexuality involve a fear or hatred of people of the other sex, leading individuals to direct their desires toward members of their own sex?
3. Is sexual orientation linked with levels of sex hormones currently in the blood?
4. As children, were most homosexuals molested, seduced, or otherwise sexually victimized by an adult homosexual?

The answer to all these questions has been *No* (Storms, 1983). In a search for possible environmental influences on sexual orientation, Kinsey Institute investigators interviewed nearly 1000 homosexuals and 500 heterosexuals. They assessed nearly every imaginable psychological cause of homosexuality—parental relationships, childhood sexual experiences, peer relationships, and dating experiences (Bell et al., 1981; Hammersmith, 1982). Their findings: Homosexuals were



AP Photo/Stephen J. Carrera



STAN HONDA/AFP/Getty Images

Driven to suicide In 2010, Rutgers University student Tyler Clementi jumped off this bridge after his intimate encounter with another man reportedly became known. Reports then surfaced of other gay teens who had reacted in a similarly tragic fashion after being taunted.

Note that the scientific question is not "What causes homosexuality?" (or "What causes heterosexuality?") but "What causes differing sexual orientations?" In pursuit of answers, psychological science compares the backgrounds and physiology of people whose sexual orientations *differ*.

Personal values affect sexual orientation less than they affect other forms of sexual behavior

Compared with people who rarely attend religious services, for example, those who attend regularly are one-third as likely to have lived together before marriage, and they report having had many fewer sex partners. But (if male) they are just as likely to be homosexual (Smith, 1998).

no more likely than heterosexuals to have been smothered by maternal love or neglected by their father. And consider this: If “distant fathers” were more likely to produce homosexual sons, then shouldn’t boys growing up in father-absent homes more often be gay? (They are not.) And shouldn’t the rising number of such homes have led to a noticeable increase in the gay population? (It has not.) Most children raised by gay or lesbian parents grow up straight and well-adjusted (Gartrell & Bos, 2010).

A bottom line has emerged from a half-century’s theory and research: If there are environmental factors that influence sexual orientation, we do not yet know what they are.

Biology and Sexual Orientation

The lack of evidence for environmental causes of homosexuality has motivated researchers to explore possible biological influences. They have considered

- evidence of homosexuality in other species,
- gay-straight brain differences,
- genetics, and
- prenatal hormones.



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Juliet and Juliet Boston’s beloved swan couple, “Romeo and Juliet,” were discovered actually to be, as are many other animal partners, a same-sex pair.

Same-Sex Attraction in Other Species

In Boston’s Public Gardens, caretakers have solved the mystery of why a much-loved swan couple’s eggs never hatch. Both swans are female. In New York City’s Central Park Zoo, penguins Silo and Roy spent several years as devoted same-sex partners. At least occasional same-sex relations have been observed in several hundred species (Bagemihl, 1999). Grizzlies, gorillas, monkeys, flamingos, and owls are all on the long list. Among rams, for example, some 7 to 10 percent (to sheep-breeding ranchers, the “duds”) display same-sex attraction by shunning ewes and seeking to mount other males (Perkins & Fitzgerald, 1997). Some degree of homosexual behavior seems a natural part of the animal world.

Gay-Straight Brain Differences

Researcher Simon LeVay (1991) studied sections of the hypothalamus (a brain structure linked to emotion) taken from deceased heterosexual and homosexual people. As a gay man, LeVay wanted to do “something connected with my gay identity.” To avoid biasing the results, he did a *blind study*, without knowing which donors were gay or straight. After nine months of peering through his microscope at a hypothalamus cell cluster that seemed to come in different sizes, he consulted the donor records. The cell cluster was reliably larger in heterosexual men than in women and homosexual men. “I was almost in a state of shock,” LeVay said (1994). “I took a walk by myself on the cliffs over the ocean. I sat for half an hour just thinking what this might mean.”

It should not surprise us that brains differ with sexual orientation. Remember, *everything psychological is simultaneously biological*. But when did the brain difference begin? At conception? During childhood or adolescence? Did experience produce the difference? Or was it genes or prenatal hormones (or genes via prenatal hormones)?

LeVay does not view this cell cluster as an “on-off button” for sexual orientation. Rather, he believes it is an important part of a brain pathway that is active during sexual behavior. He agrees that sexual behavior patterns could influence the brain’s anatomy. (Neural pathways in our brain do grow stronger with use.) In fish, birds, rats, and humans, brain structures vary with experience—including sexual experience (Breedlove, 1997). But LeVay believes it more likely that brain anatomy influences sexual orientation. His hunch seems confirmed by the discovery of a similar difference found between the 7 to 10 percent of male sheep that display same-sex attraction and the 90+ percent attracted

to females (Larkin et al., 2002; Roselli et al., 2002, 2004). Moreover, such differences seem to develop soon after birth, perhaps even before birth (Rahman & Wilson, 2003).

Since LeVay's discovery, other researchers have reported additional gay-straight brain activity differences. One is an area of the hypothalamus that governs sexual arousal (Savic et al., 2005). When straight women were given a whiff of a scent derived from men's sweat (which contains traces of male hormones), this area became active. Gay men's brains responded similarly to the men's scent. Straight men's brains did not. They showed the arousal response only to a female hormone sample. In a similar study, lesbians' responses differed from those of straight women (Kranz & Ishai, 2006; Martins et al., 2005).

Genetic Influences

Three lines of evidence suggest a genetic influence on sexual orientation.

Family Studies “Homosexuality does appear to run in families,” noted Brian Mustanski and Michael Bailey (2003). Researchers have speculated about possible reasons why “gay genes” might persist in the human gene pool, given that same-sex couples cannot naturally reproduce. One possible answer is kin selection. Recall from Chapter 2 the evolutionary psychology reminder that many of our genes also reside in our biological relatives. Perhaps, then, gay people's genes live on through their supporting the survival and reproductive success of their nieces, nephews, and other relatives (who also carry many of the same genes). Gay men make generous uncles, suggests one study of Samoans (Vasey & VanderLaan, 2010).

An alternative “fertile females” theory suggests that maternal genetics may also be at work (Bocklandt et al., 2006). Homosexual men tend to have more homosexual relatives on their mother's side than on their father's (Camperio-Ciani et al., 2004, 2009; Zietsch et al., 2008). And the relatives on the mother's side also produce more offspring than do the maternal relatives of heterosexual men. Perhaps the genes that dispose women to be strongly attracted to men, and therefore to have more children, also dispose some men to be attracted to men (LeVay, 2011).

Twin Studies Twin studies indicate that genes influence sexual orientation. Identical twins (who have identical genes) are somewhat more likely than fraternal twins (whose genes are not identical) to share a homosexual orientation (Alanko et al., 2010; Långström et al., 2008, 2010). However, because sexual orientation differs in many identical twin pairs (especially female twins), other factors must also play a role.

Fruit Fly Studies Laboratory experiments on fruit flies have altered a single gene and changed the flies' sexual orientation and behavior (Dickson, 2005). During courtship, females acted like males (pursuing other females) and males acted like females (Demir & Dickson, 2005). With humans, it's likely that multiple genes, possibly in interaction with other influences, shape sexual orientation. In search of such genetic markers, one study financed by the U.S. National Institutes of Health is analyzing the genes of more than 1000 gay brothers.

Prenatal Influences

Twins share not only genes, but also a prenatal environment. Two sets of findings indicate that the prenatal environment matters.

First, in humans, a critical period for brain development seems to fall between the middle of the second and fifth months after conception (Ellis & Ames, 1987; Gladue, 1990; Meyer-Bahlburg, 1995). Exposure to the hormone levels typically experienced by female fetuses during this period may predispose a person (female or male) to be attracted to males in later life. When pregnant sheep were injected with testosterone during a similar critical period, their female offspring later showed homosexual behavior (Money, 1987).

“Gay men simply don't have the brain cells to be attracted to women.”

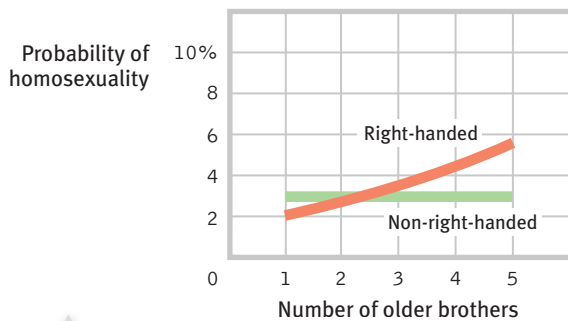
Simon LeVay, The Sexual Brain, 1993

“Studies indicate that male homosexuality is more likely to be transmitted from the mother's side of the family.”

Robert Plomin, John DeFries, Gerald McClearn, and Michael Rutter, Behavioral Genetics, 1997

“Modern scientific research indicates that sexual orientation is . . . partly determined by genetics, but more specifically by hormonal activity in the womb.”

Glenn Wilson and Qazi Rahman, Born Gay: The Psychobiology of Sex Orientation, 2005

**FIGURE 5.5****The fraternal birth-order effect**

Researcher Ray Blanchard (2008) offered these approximate curves depicting a man's likelihood of homosexuality as a function of his number of older brothers. This correlation has been found in several studies, but only among right-handed men (as about 9 in 10 men are).

Second, the mother's immune system may play a role in the development of sexual orientation. Men who have older brothers are somewhat more likely to be gay—about one-third more likely for each additional older brother (Blanchard, 1997, 2008; Bogaert, 2003). If the odds of homosexuality are roughly 2 percent among first sons, they would rise to nearly 3 percent among second sons, 4 percent for third sons, and so on for each additional older brother (see **FIGURE 5.5**). The reason for this curious effect—called the *older-brother* or *fraternal birth-order effect*—is unclear. But the explanation does seem biological. The effect does not occur among adopted brothers (Bogaert, 2006). Researchers suspect the mother's immune system may have a defensive response to substances produced by male fetuses. After each pregnancy with a male fetus, the maternal antibodies may become stronger and may prevent the fetal brain from developing in a typical male pattern.

Gay-Straight Trait Differences

On several traits, gays and lesbians appear to fall midway between straight females and males (**TABLE 5.1**; see also LeVay, 2011; Rahman & Koerting, 2008). Gay men tend to be shorter and lighter than straight men—a difference that appears even at birth. Women in same-sex marriages were mostly heavier than average at birth (Bogaert, 2010; Frisch & Zdravkovic, 2010). Data from 20 studies have also revealed handedness differences: Homosexual participants were 39 percent more likely to not be right-handed (Blanchard, 2008; Lalumière et al., 2000).

Table 5.1**Biological Correlates of Sexual Orientation****Gay-straight trait differences**

Sexual orientation is part of a package of traits. Studies—some in need of replication—indicate that homosexuals and heterosexuals differ in the following biological and behavioral traits:

- spatial abilities
- fingerprint ridge counts
- auditory system development
- handedness
- occupational preferences
- relative finger lengths
- gender nonconformity
- age of onset of puberty in males
- male body size
- sleep length
- physical aggression
- walking style

On average (the evidence is strongest for males), results for gays and lesbians fall between those of straight men and straight women. Three biological influences—brain, genetic, and prenatal—may contribute to these differences.

Brain differences

- One hypothalamic cell cluster is smaller in women and gay men than in straight men.
- Anterior commissure is larger in gay men than in straight men.
- Gay men's hypothalamus reacts as do straight women's to the smell of sex-related hormones.

Genetic influences

- Shared sexual orientation is higher among identical twins than among fraternal twins.
- Sexual attraction in fruit flies can be genetically manipulated.
- Male homosexuality often appears to be transmitted from the mother's side of the family.

Prenatal influences

- Altered prenatal hormone exposure may lead to homosexuality in humans and other animals.
- Men with several older biological brothers are more likely to be gay, possibly due to a maternal immune-system reaction.

Gay-straight spatial abilities also differ. On mental rotation tasks such as the one illustrated in **FIGURE 5.6**, straight men tend to outscore straight women but the scores of gays and lesbians fall between those of straight men and women (Rahman et al., 2003). But straight women and gays both outperform straight men at remembering objects' spatial locations in tasks like those found in memory games (Hassan & Rahman, 2007).

The consistency of the brain, genetic, and prenatal findings has swung the pendulum toward a biological explanation of sexual orientation (LeVay, 2011; Rahman & Koerting, 2008). Although “much remains to be discovered,” concludes Simon LeVay (2011, p. xvii), “the same processes that are involved in the biological development of our bodies and brains as male or female are also involved in the development of sexual orientation.”

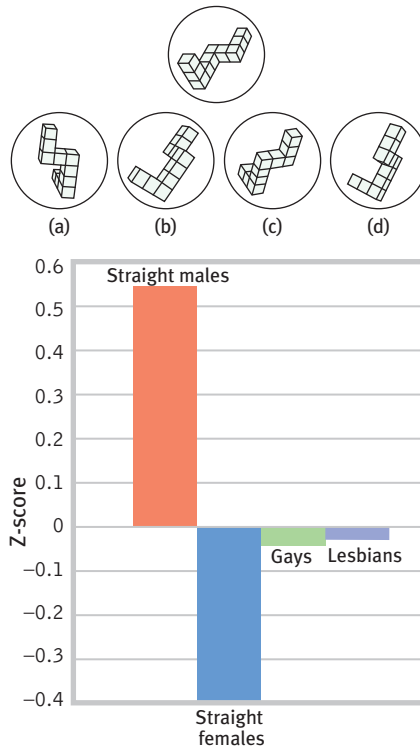


FIGURE 5.6

Spatial abilities and sexual orientation Which of the four figures can be rotated to match the target figure at the top? Straight males tend to find this an easier task than do straight females, with gays and lesbians intermediate. (From Rahman et al., 2003, with 60 people tested in each group.)

Answer: Figures a and d.

“There is no sound scientific evidence that sexual orientation can be changed.”

UK Royal College of Psychiatrists, 2009

RETRIEVE IT

- Which THREE of the following five factors have researchers found to have an effect on sexual orientation?
 - a. A domineering mother
 - b. Size of certain cell clusters in the hypothalamus
 - c. Prenatal hormone exposure
 - d. A distant or ineffectual father
 - e. For men, having multiple older biological brothers

ANSWERS: b, c, e

An Evolutionary Explanation of Human Sexuality



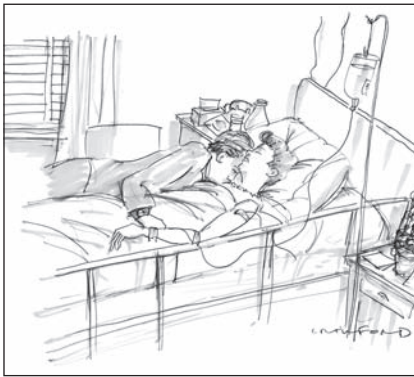
5-10: How might an evolutionary psychologist explain gender differences in sexuality and mating preferences?

Having faced many similar challenges throughout history, men and women have adapted in similar ways. Whether male or female, we eat the same foods, avoid the same predators, and perceive, learn, and remember similarly. It is only in those domains where we have faced differing adaptive challenges—most obviously in behaviors related to reproduction—that we differ, say evolutionary psychologists.

Gender Differences in Sexuality

And differ we do. Consider women's and men's sex drives. Who desires more frequent sex? Thinks more about sex? Masturbates more often? Sacrifices more to gain sex? Initiates more sex—worldwide? The answers—*Men, men, men, men, and men* (Baumeister et al., 2001). No surprise, then, that in one BBC survey of more than 200,000 people in 53

The New Yorker Collection, 2003. Michael Crawford from cartoonbank.com. All Rights Reserved.



“Not tonight, hon, I have a concussion.”

“It’s not that gay men are oversexed; they are simply men whose male desires bounce off other male desires rather than off female desires.”

Steven Pinker, *How the Mind Works*, 1997

The New Yorker Collection, 2010. Ariet Molvig, from cartoonbank.com. All Rights Reserved.



nations, men everywhere more strongly agreed that “I have a strong sex drive” and “It doesn’t take much to get me sexually excited” (Lippa, 2008).

And there are other gender differences in sexuality (Hyde, 2005; Petersen & Hyde, 2010; Regan & Atkins, 2007). In a survey of 289,452 entering U.S. college students, 58 percent of men but only 34 percent of women agreed that “if two people really like each other, it’s all right for them to have sex even if they’ve known each other for a very short time” (Pryor et al., 2005). “I can imagine myself being comfortable and enjoying ‘casual’ sex with different partners,” agreed 48 percent of men and 12 percent of women in a survey of 4901 Australians (Bailey et al., 2000). Thus, university men in one study preferred casual hook-ups, while women preferred planned dating (Bradshaw et al., 2010). Casual, impulsive sex has been most frequent among males with traditional masculine attitudes (Pleck et al., 1993).

In surveys, gay men (like straight men) report more interest in uncommitted sex, more responsiveness to visual sexual stimuli, and more concern with their partner’s physical attractiveness than do lesbian women (Bailey et al., 1994; Doyle, 2005; Schmitt, 2007).

In another survey of U.S. 18- to 59-year-olds, 48 percent of the women but only 25 percent of the men cited affection as a reason for first intercourse. And how often do they think about sex? “Every day” or “Several times a day,” acknowledged 19 percent of the women and 54 percent of the men (Laumann et al., 1994). Ditto for the sexual thoughts of Canadians: “Several times a day,” agreed 11 percent of women and 46 percent of men (Fischtein et al., 2007).

Natural Selection and Mating Preferences

Evolutionary psychologists use natural selection to explain why—worldwide—women’s approach to sex is usually more *relational*, and men’s more *recreational* (Schmitt, 2005, 2007). Our natural yearnings are our genes’ way of reproducing themselves. “Humans are living fossils—collections of mechanisms produced by prior selection pressures,” said evolutionary psychologist David Buss (1995).

The explanation goes like this: Most women incubate and nurse one infant at a time. Men, however, can spread their genes by mating with many females. In our ancestral history, men most often sent their genes into the future by pairing widely, women by pairing wisely. Thus, heterosexual women prefer stick-around dads over likely cads. They are attracted to men who seem mature, dominant, bold, and affluent, with a potential for long-term mating and investment in their joint offspring (Gangestad & Simpson, 2000; Singh, 1995). In one study of hundreds of Welsh pedestrians, men rated a woman as equally attractive whether pictured at the wheel of a humble Ford Fiesta or a swanky Bentley. Women, however, found the man more attractive if he was in the luxury car (Dunn & Searle, 2010). From an evolutionary perspective, such attributes connote a man’s capacity to support and protect a family (Buss, 1996, 2009; Geary, 1998).

For heterosexual men, some desired traits, such as a woman’s youthful appearance, cross place and time (Buss, 1994). Evolutionary psychologists say that men who were drawn to healthy, fertile-appearing women—women with smooth skin and a youthful shape suggesting many childbearing years to come—stood a better chance of sending their genes into the future. And sure enough, men feel most attracted to women whose waists (thanks to their genes or their surgeons) are roughly a third narrower than their hips—a sign of future fertility (Perilloux et al., 2010).

Moreover, just as evolutionary psychology predicts, men are most attracted to women whose ages in the ancestral past (when ovulation began later than today) would have been associated with peak fertility (Kenrick et al., 2009). Thus, teen boys are most excited by a woman several years older than themselves, mid-twenties men



MGP/Getty Images

prefer women around their own age, and older men prefer younger women. This pattern consistently appears across European singles ads, Indian marital ads, and marriage records from North and South America, Africa, and the Philippines (Singh, 1993; Singh & Randall, 2007).

There is a principle at work here, say evolutionary psychologists: Nature selects behaviors that increase the likelihood of sending one's genes into the future. As mobile gene machines, we are designed to prefer whatever worked for our ancestors in their environments. They were predisposed to act in ways that would leave grandchildren. Had they not been, we wouldn't be here. And as carriers of their genetic legacy, we are similarly predisposed.



Valerie Hache/AFP/Getty Images

The mating game Evolutionary psychologists are not surprised that older men, and not just Harrison Ford, 70 (pictured here with his wife, Calista Flockhart, 48), often prefer younger women whose features suggest fertility.

Critiquing the Evolutionary Perspective



5-11: What are the key criticisms of evolutionary explanations of human sexuality, and how do evolutionary psychologists respond?

Without disputing nature's selection of traits that enhance gene survival, critics see some problems with evolutionary psychology's explanation of our mating preferences. One is that evolutionary psychology starts with an effect (such as the gender sexuality difference) and works backwards to propose an explanation. They invite us to imagine a different result and reason backwards. If men were uniformly loyal to their mates, might we not reason that the children of these committed, supportive fathers would more often survive to pass on their father's genes? Might not this bond with one woman also increase their otherwise slim odds of conceiving a child, while also preventing her from mating with competing men? Might not a ritualized bond—a marriage—also spare women from chronic male harassment? Such suggestions are, in fact, evolutionary explanations for why humans tend to pair off monogamously (Gray & Anderson, 2010). One can hardly lose at hindsight explanation, which is, said paleontologist Stephen Jay Gould (1997), mere “speculation [and] guesswork in the cocktail party mode.”

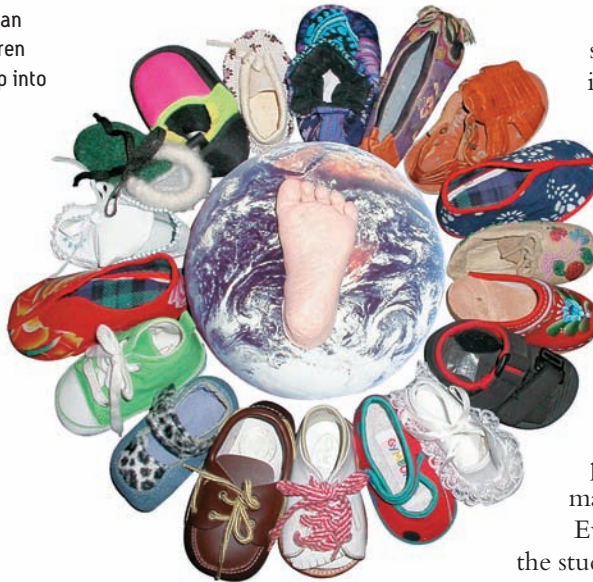
Some also worry about the social consequences of evolutionary psychology's approach. Does it suggest that genes are destiny? Does it mean that any effort to remake society is useless (Rose, 1999)? Does it undercut moral responsibility (Buller, 2005, 2009)? Could it be used to rationalize “high-status men marrying a series of young, fertile women” (Looy, 2001)?

Others argue that evolutionary explanations blur the line between genetic legacy and social-cultural tradition. Cultural expectations also shape socialization. If men are socialized to value lifelong commitment, they may sexually bond with one partner. If women are socialized to accept casual sex, they may willingly have sex with many partners.

Cultural expectations can bend the genders. Show Alice Eagly and Wendy Wood (1999; Eagly, 2009) a culture with gender inequality—where men are providers and women are homemakers—and they will show you a culture where men strongly desire youth and domestic skill in their potential mates, and where women seek status and earning potential in their mates. Show Eagly and Wood a culture with gender equality, and they will show you a culture with smaller gender differences in mate preferences.

Much of who we are is *not* hard-wired, agree evolutionary psychologists. “Evolution forcefully rejects a genetic determinism,” insists one research team (Confer et al., 2010). Evolutionary psychologists remind us that men and women, having faced similar adaptive problems, are far more alike than different, and that humans have a great capacity for learning and social progress. Indeed, natural selection has prepared us to flexibly adjust and respond to varied environments, to adapt and survive, whether we live in igloos or tree houses.

Culture matters As this exhibit at San Diego’s Museum of Man illustrates, children learn their culture. A baby’s foot can step into any culture.



San Diego Museum of Man, photograph by Rose Tyson

Evolutionary psychologists acknowledge struggling to explain some traits and behaviors such as same-sex attraction and suicide (Confer et al., 2010). But they ask us to remember evolutionary psychology’s testable predictions. Evolutionary psychologists predict, and have confirmed, that we tend to favor others to the extent that they share our genes or can later return our favors. They predict, and have confirmed, that human memory should be well-suited to retaining survival-relevant information (such as food locations, for which females exhibit superiority). They predict, and have confirmed, various other male and female mating strategies.

Evolutionary psychologists also remind us that the study of how we *came to be* need not dictate how we *ought to be*. Understanding our tendencies sometimes helps us overcome them.

RETRIEVE IT

- How do evolutionary psychologists explain gender differences in sexuality?

ANSWER: Evolutionary psychologists theorize that women have inherited their ancestors’ tendencies to be more cautious sexually, because of the challenges associated with incubating and nurturing offspring. Men have inherited an inclination to be more casual about sex, because their act of fathering requires a smaller investment.

- What are the three main criticisms of the evolutionary explanation of human sexuality?

ANSWER: (1) It starts with an effect and works backwards to propose an explanation. (2) Unethical and immoral men could use such explanations to rationalize their behavior toward women. (3) This explanation may overlook the effects of cultural expectations and socialization.

Reflections on Gender, Sexuality, and Nature–Nurture Interaction

Our ancestral history helped form us as a species. Where there is variation, natural selection, and heredity, there will be evolution. Our genes form us. This is a great truth about human nature.

But our culture and experiences also form us. If their genes and hormones predispose males to be more physically aggressive than females, culture may magnify this gender difference by encouraging males to be macho and females to be the kinder, gentler sex. If men are encouraged toward roles that demand physical power, and women toward more nurturing roles, each may act accordingly. By exhibiting the actions expected of those who fill such roles, they will shape their own traits. Presidents in time become more presidential, servants more servile. Gender roles similarly shape us.

Today, in many cultures, gender roles are converging. Brute strength is becoming increasingly irrelevant to power and status (think Bill Gates and Hillary Clinton). From 1960 into the next century, women soared from 6 percent to 50 percent of U.S. medical students (AMA, 2010). In the mid-1960s, U.S. married women devoted *seven times* as many hours to housework as did their husbands; by 2003 this gap had shrunk to two times as many (Bianchi et al., 2000, 2006). Such swift changes signal that biology does not fix gender roles.

If nature and nurture jointly form us, are we “nothing but” the product of nature and nurture? Are we rigidly determined?

We *are* the product of nature and nurture, but we are also an open system. Genes are all pervasive but not all powerful; people may defy their genetic bent to reproduce by electing celibacy. Culture, too, is all pervasive but not all powerful; people may defy peer pressures and do the opposite of the expected. To excuse our failings by blaming our nature and nurture is what philosopher-novelist Jean-Paul Sartre called “bad faith”—attributing responsibility for one’s fate to bad genes or bad influences.

In reality, we are both the creatures and the creators of our worlds. So many things about us—including our gender identity and mating behaviors—are the products of our genes and environments. Yet the future-shaping stream of causation runs through our present choices: Our decisions today design our environments tomorrow. Mind matters. The human environment is not like the weather—something that just happens. We are its architects. Our hopes, goals, and expectations influence our future. And that is what enables cultures to vary and to change.

CHAPTER REVIEW

Gender and Sexuality

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Gender Development

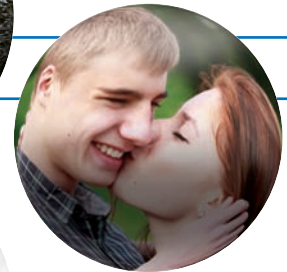
- 5-1:** What are some gender similarities and differences in aggression, social power, and social connectedness?
- 5-2:** How is our biological sex determined, and how do sex hormones influence prenatal and adolescent development?
- 5-3:** How do gender roles and gender typing influence gender development?

Human Sexuality

- 5-4:** How do hormones influence human sexual motivation?
- 5-5:** What is the human sexual response cycle, and how do sexual dysfunctions and paraphilias differ?
- 5-6:** How can sexually transmitted infections be prevented?
- 5-7:** How do external and imagined stimuli contribute to sexual arousal?
- 5-8:** What factors influence teenagers’ sexual behaviors and use of contraceptives?

Sexual Orientation

- 5-9:** What has research taught us about sexual orientation?



An Evolutionary Explanation of Human Sexuality

5-10: How might an evolutionary psychologist explain gender differences in sexuality and mating preferences?

5-11: What are the key criticisms of evolutionary explanations of human sexuality, and how do evolutionary psychologists respond?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

gender, p. 164

aggression, p. 164

X chromosome, p. 167

Y chromosome, p. 167

testosterone, p. 167

puberty, p. 167

primary sex characteristics, p. 167

secondary sex characteristics, p. 167

menarche [meh-NAR-key], p. 167

gender role, p. 169

role, p. 169

gender identity, p. 170

social learning theory, p. 170

gender typing, p. 170

transgender, p. 170

estrogens, p. 171

sexual response cycle, p. 173

refractory period, p. 173

sexual dysfunction, p. 173

AIDS (acquired immune deficiency syndrome), p. 174

sexual orientation, p. 178

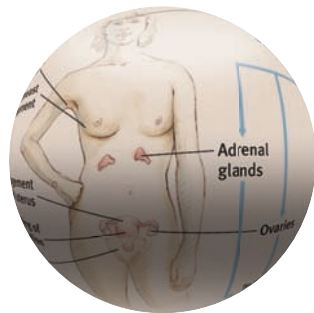
EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Females and males are very similar to each other. But one way they differ is that
 - women are more physically aggressive than men.
 - men are more democratic than women in their leadership roles.
 - girls tend to play in small groups, while boys tend to play in large groups.
 - women are more likely to commit suicide.
- The fertilized egg will develop into a boy if it receives a _____ chromosome from its father.
- Primary sex characteristics relate to _____; secondary sex characteristics refer to _____.
 - ejaculation; menarche
 - breasts and facial hair; ovaries and testes
 - emotional maturity; hormone surges
 - reproductive organs; nonreproductive traits
- On average, girls begin puberty at about the age of _____, boys at about the age of _____.
- Those born with sexual anatomy that differs from "standard" male or female babies may be considered _____.
 - Gender role* refers to our
 - sense of being male or female.
 - expectations about the way males and females should behave.
 - biological sex.
 - unisex characteristics.
- When children have developed a _____, _____, they have a sense of being male or female.
- A striking effect of hormonal changes on human sexual behavior is the
 - end of sexual desire in men over 60.
 - sharp rise in sexual interest at puberty.
 - decrease in women's sexual desire at the time of ovulation.
 - increase in testosterone levels in castrated males.
- In describing the sexual response cycle, Masters and Johnson noted that
 - a plateau phase follows orgasm.
 - men experience a refractory period during which they cannot experience orgasm.
 - the feeling that accompanies orgasm is stronger in men than in women.
 - testosterone is released equally in women and men.

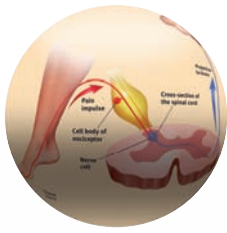
10. What is the difference between sexual dysfunctions and paraphilias?
11. The use of condoms during sex _____ (does/doesn't) reduce the risk of getting HIV and _____ (does/doesn't) fully protect against skin-to-skin STIs.
12. An example of an external stimulus that might influence sexual behavior is
- blood level of testosterone.
 - the onset of puberty.
 - a sexually explicit film.
 - an erotic fantasy or dream.
13. Factors contributing to unplanned teen pregnancies include
- low levels of testosterone during adolescence.
 - higher intelligence level.
 - too much communication.
 - alcohol use.
14. Evolutionary psychologists are most likely to focus on
- how we differ from one another.
 - the social consequences of sexual behaviors.
 - natural selection of the fittest adaptations.
 - cultural expectations about the “right” ways for men and women to behave.
15. Which factors have researchers thus far found to be *unrelated* to the development of our sexual orientation?

Find answers to these questions in Appendix E, in the back of the book.



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more of the
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BASIC PRINCIPLES OF SENSATION AND PERCEPTION

Transduction

Thresholds

THINKING CRITICALLY ABOUT: Can Subliminal Messages Control Our Behavior?

Sensory Adaptation

Perceptual Set

Context Effects

Motivation and Emotion

VISION

The Stimulus Input: Light Energy

The Eye

Visual Information Processing

Color Vision

Visual Organization

Visual Interpretation

HEARING

The Stimulus Input: Sound Waves

The Ear

THE OTHER SENSES

Touch

Pain

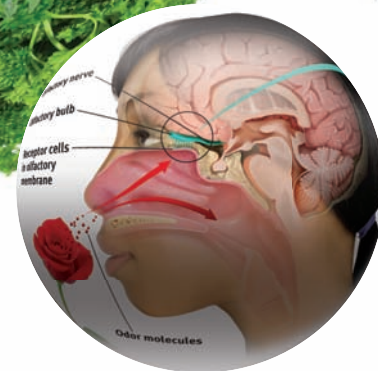
Taste

Smell

Body Position and Movement

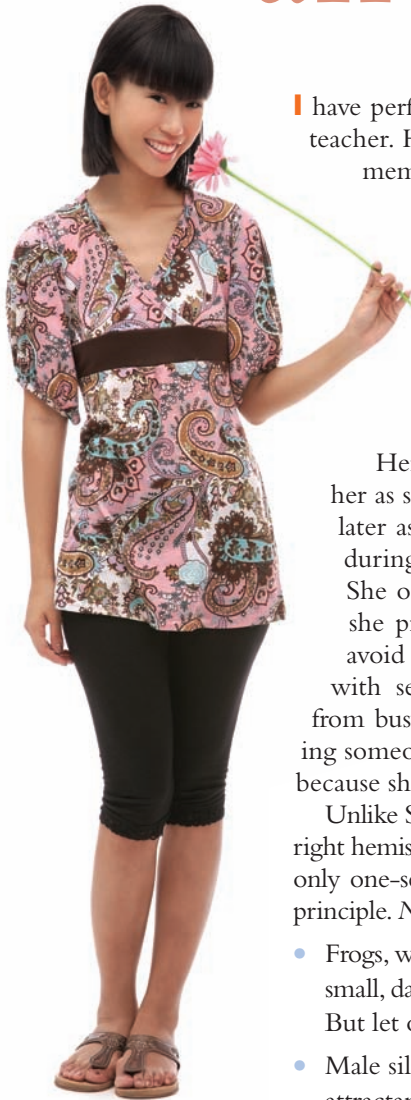
SENSORY INTERACTION

THINKING CRITICALLY ABOUT: ESP—
Perception Without Sensation?





Sensation and Perception



I have perfect vision,” explains my colleague, Heather Sellers, an acclaimed writer and teacher. Her vision may be fine, but there is a problem with her perception. In her memoir, *You Don’t Look Like Anyone I Know*, Sellers (2010) tells of awkward moments resulting from her lifelong *prosopagnosia*—face blindness.

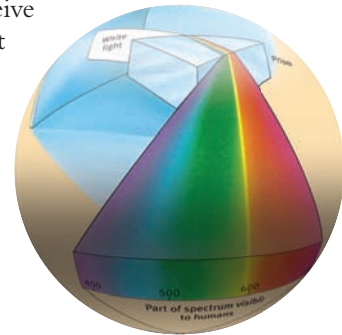
In college, on a date at the Spaghetti Station, I returned from the bathroom and plunked myself down in the wrong booth, facing the wrong man. I remained unaware he was not my date even as my date (a stranger to me) accosted Wrong Booth Guy, and then stormed out of the Station. . . . I do not recognize myself in photos or videos. I can’t recognize my step-sons in the soccer pick-up line; I failed to determine which husband was mine at a party, in the mall, at the market.

Her inability to recognize faces means that people sometimes perceive her as snobby or aloof. “Why did you walk past me?” a neighbor might later ask. Similar to those of us with hearing loss who fake hearing during trite social conversation, Sellers sometimes fakes recognition. She often smiles at people she passes, in case she knows them. Or she pretends to know the person with whom she is talking. (To avoid the stress associated with such perception failures, people with serious hearing loss or with *prosopagnosia* often shy away from busy social situations.) But there is an upside: When encountering someone who previously irritated her, she typically won’t feel ill will, because she doesn’t recognize the person.

Unlike Sellers, most of us have a functioning area on the underside of our brain’s right hemisphere that helps us recognize a familiar human face as soon as we detect it—in only one-seventh of a second (Jacques & Rossion, 2006). This ability illustrates a broader principle. *Nature’s sensory gifts enable each animal to obtain essential information.* Some examples:

- Frogs, which feed on flying insects, have cells in their eyes that fire only in response to small, dark, moving objects. A frog could starve to death knee-deep in motionless flies. But let one zoom by and the frog’s “bug detector” cells snap awake.
- Male silkworm moths’ odor receptors can detect one-billionth of an ounce of sex attractant per second released by a female one mile away. That is why there continue to be silkworms.
- Human ears are most sensitive to sound frequencies that include human voices, especially a baby’s cry.

In this chapter, we’ll look more closely at what psychologists have learned about how we sense and perceive the world around us. We begin with some basic principles.



“Time’s fun when you’re having flies.”

Kermit the Frog

Basic Principles of Sensation and Perception



6-1: What are *sensation* and *perception*? What do we mean by *bottom-up processing* and *top-down processing*?

Sellers’ curious mix of “perfect vision” and face blindness illustrates the distinction between *sensation* and *perception*. When she looks at a friend, her **sensation** is normal: Her sensory receptors detect the same information yours would, and her nervous system transmits that information to her brain. And her **perception**—the processes by which her brain organizes and interprets sensory input—is *almost* normal. Thus, she may recognize people from their hair, gait, voice, or particular physique, just not their face. Her experience is much like the struggle you or I would have trying to recognize a specific penguin.

In our everyday experiences, sensation and perception blend into one continuous process. In this chapter, we slow down that process to study its parts. In real life, our sensory and perceptual processes work together to help us decipher the world around us.

- Our **bottom-up processing** starts at the sensory receptors and works up to higher levels of processing.
- Our **top-down processing** constructs perceptions from the sensory input by drawing on our experience and expectations.

As our brain absorbs the information in **FIGURE 6.1**, bottom-up processing enables our sensory systems to detect the lines, angles, and colors that form the flower and leaves. Using top-down processing we interpret what our senses detect.

But *how* do we do it? How do we create meaning from the blizzard of sensory stimuli bombarding our bodies 24 hours a day? Meanwhile, in a silent, cushioned, inner world, our brain floats in utter darkness. By itself, it sees nothing. It hears nothing. It feels nothing. *So, how does the world out there get in?* To phrase the question scientifically: How do we construct our representations of the external world? How do a campfire’s flicker, crackle, and smoky scent activate neural connections? And how, from this living neurochemistry, do we create our conscious experience of the fire’s motion and temperature, its aroma and beauty? In search of answers to such questions, let’s look at some processes that cut across all our sensory systems.



FIGURE 6.1

What’s going on here? Our sensory and perceptual processes work together to help us sort out the complex images, including the hidden couple in Sandro Del-Prete’s drawing, *The Flowering of Love*.

sensation the process by which our sensory receptors and nervous system receive and represent stimulus energies from our environment.

perception the process of organizing and interpreting sensory information, enabling us to recognize meaningful objects and events.

bottom-up processing analysis that begins with the sensory receptors and works up to the brain’s integration of sensory information.

top-down processing information processing guided by higher-level mental processes, as when we construct perceptions drawing on our experience and expectations.

transduction conversion of one form of energy into another. In sensation, the transforming of stimulus energies, such as sights, sounds, and smells, into neural impulses our brain can interpret.

Transduction



6-2: What three steps are basic to all our sensory systems?

Every second of every day, our sensory systems perform an amazing feat: They convert one form of energy into another. Vision processes light energy. Hearing processes sound waves. All our senses

- *receive* sensory stimulation, often using specialized receptor cells.
- *transform* that stimulation into neural impulses.
- *deliver* the neural information to our brain.

The process of converting one form of energy into another that your brain can use is called **transduction**. Later in this chapter, we’ll focus on individual sensory systems. How do we see? Hear? Feel pain? Taste? Smell? Keep our balance? In each case, we’ll consider these three steps—receiving, transforming, and delivering the information to the brain.

First, though, let’s explore some strengths and weaknesses in our ability to detect and interpret stimuli in the vast sea of energy around us.

RETRIEVE IT

- What is the rough distinction between sensation and perception?

ANSWER: Sensation is the bottom-up process by which the physical sensory system receives and represents stimuli. Perception is the top-down mental process of organizing and interpreting sensory input.

Thresholds



6-3: What are the *absolute* and *difference thresholds*, and do stimuli below the absolute threshold have any influence on us?

At this moment, you and I are being struck by X-rays and radio waves, ultraviolet and infrared light, and sound waves of very high and very low frequencies. To all of these we are blind and deaf. Other animals with differing needs detect a world that lies beyond our experience. Migrating birds stay on course aided by an internal magnetic compass. Bats and dolphins locate prey using sonar, bouncing echoing sound off objects. Bees navigate on cloudy days by detecting invisible (to us) polarized light.

The shades on our own senses are open just a crack, allowing us a restricted awareness of this vast sea of energy. But for our needs, this is enough.

Absolute Thresholds

To some kinds of stimuli we are exquisitely sensitive. Standing atop a mountain on an utterly dark, clear night, most of us could see a candle flame atop another mountain 30 miles away. We could feel the wing of a bee falling on our cheek. We could smell a single drop of perfume in a three-room apartment (Galanter, 1962).

German scientist and philosopher Gustav Fechner (1801–1887) studied our awareness of these faint stimuli and called them our **absolute thresholds**—the minimum stimulation necessary to detect a particular light, sound, pressure, taste, or odor 50 percent of the time. To test your absolute threshold for sounds, a hearing specialist would expose each of your ears to varying sound levels (FIGURE 6.2). For each tone, the test would define where half the time you could detect the sound and half the time you could not. That 50–50 point would define your absolute threshold.

Detecting a weak stimulus, or signal, depends not only on the signal’s strength (such as a hearing-test tone) but also on our psychological state—our experience, expectations, motivation, and alertness. **Signal detection theory** predicts when we will detect weak signals (measured as our ratio of “hits” to “false alarms”). Lonely, anxious people at speed-dating events tend to respond with a low threshold and thus can be unselective

absolute threshold the minimum stimulation needed to detect a particular stimulus 50 percent of the time.

signal detection theory a theory predicting how and when we detect the presence of a faint stimulus (*signal*) amid background stimulation (*noise*). Assumes there is no single absolute threshold and that detection depends partly on a person’s experience, expectations, motivation, and alertness.

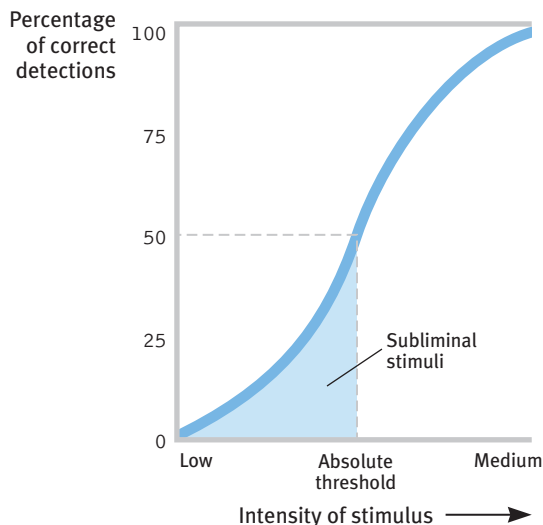


FIGURE 6.2
Absolute threshold
Can I detect this sound? An *absolute threshold* is the intensity at which a person can detect a stimulus half the time. Hearing tests locate these thresholds for various frequency levels.

©PHANIE/Photo Researchers, Inc.



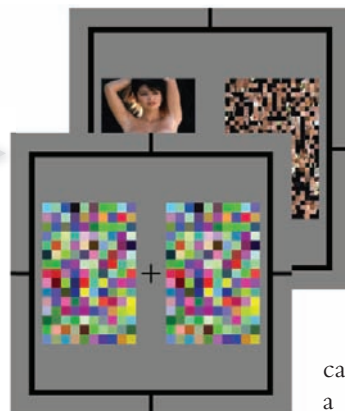
Signal detection

“The heart has its reasons which reason does not know.”

Pascal, *Pensées*, 1670

FIGURE 6.3

The hidden mind After an image of a nude man or woman was flashed to one side or another, then masked before being perceived, people’s attention was unconsciously drawn to images in a way that reflected their sexual orientation (Jiang et al., 2006).



© 2006 by The National Academy of Sciences, USA

in reaching out to potential dates (McClure et al., 2010). Signal detection theorists seek to understand why people respond differently to the same stimuli, and why the same person’s reactions vary as circumstances change.

RETRIEVE IT

- What three factors will make it more likely that you detect the arrival of a text message?

ANSWER: (1) You are expecting a text. (2) It is important that you see the text and respond. (3) You are alert.

Stimuli you cannot detect 50 percent of the time are **subliminal**—below your absolute threshold (see Figure 6.2). Under certain conditions, you can be affected by stimuli so weak that you don’t consciously notice them. An unnoticed image or word can reach your visual cortex and briefly **prime** your response to a later question. In a typical experiment, the image or word is quickly flashed, then replaced by a *masking stimulus* that interrupts the brain’s processing before conscious perception (Van den Bussche et al., 2009). One such experiment illustrates the deep reality of sexual orientation. Researchers asked people to gaze at the center of a screen, and then flashed a photo of a nude person to one side and a scrambled version of the photo to the other side (Jiang et al., 2006). Because the images were immediately masked by a colored checkerboard, the volunteers saw nothing but flashes of color and were unable to guess

where the nude had appeared. Then the researchers flashed a geometric figure to one side or the other, followed by the masking stimulus, and asked the volunteers to give the figure’s angle (**FIGURE 6.3**). Straight men’s answers were more accurate when the geometric figure appeared where a nude *woman* had appeared earlier. Gay men and straight women guessed more accurately when the geometric figure replaced a nude *man*. As other experiments confirm, we can evaluate a stimulus even when we are not consciously aware of it—and even when we are unaware of our evaluation (Ferguson & Zayas, 2009).

How do we feel or respond to what we do not know and cannot describe? An imperceptibly brief stimulus often triggers a weak response that *can* be detected by brain scanning (Blankenburt et al., 2003; Haynes & Rees, 2005, 2006). Only when a stimulus triggers synchronized activity in several brain areas does it reach consciousness (Dehaene, 2009). Once again we see the dual-track mind at work: *Much of our information processing occurs automatically, out of sight, off the radar screen of our conscious mind.*

So can we be controlled by subliminal messages? For more on that question, see Thinking Critically About: Can Subliminal Messages Control Our Behavior?

subliminal below one’s absolute threshold for conscious awareness.

priming the activation, often unconsciously, of certain associations, thus predisposing one’s perception, memory, or response.

difference threshold the minimum difference between two stimuli required for detection 50 percent of the time. We experience the difference threshold as a *just noticeable difference* (or *jnd*).

Weber’s law the principle that, to be perceived as different, two stimuli must differ by a constant minimum percentage (rather than a constant amount).

Difference Thresholds

To function effectively, we need absolute thresholds low enough to allow us to detect important sights, sounds, textures, tastes, and smells. We also need to detect small differences among stimuli. A musician must detect minute discrepancies when tuning an instrument. Parents must detect the sound of their own child’s voice amid other children’s voices. Even after living two years in Scotland, sheep *baa*’s all sound alike to my ears. But not to those of ewes, which I have observed streaking, after shearing, directly to the *baa* of their lamb amid the chorus of other distressed lambs.

The **difference threshold** (or the *just noticeable difference* [*jnd*]) is the minimum difference a person can detect between any two stimuli half the time. That difference threshold



Eric Issele ©/Shutterstock

THINKING CRITICALLY ABOUT:

Can Subliminal Messages Control Our Behavior?

Hoping to penetrate our unconscious, entrepreneurs offer audio and video programs to help us lose weight, stop smoking, or improve our memories. Soothing ocean sounds may mask messages we cannot consciously hear: “I am thin”; “Smoke tastes bad”; or “I do well on tests—I have total recall of information.” Such claims make two assumptions: (1) We can unconsciously sense subliminal (literally, “below threshold”) stimuli. (2) Without our awareness, these stimuli have extraordinary suggestive powers. Can we? Do they?

As we have seen, subliminal *sensation* is a fact. Remember that an “absolute” threshold is merely the point at which we can detect a stimulus *half the time*. At or slightly below this threshold, we will still detect the stimulus some of the time.

But does this mean that claims of subliminal *persuasion* are also facts? The near-consensus among researchers is *No*. The laboratory research reveals a *subtle, fleeting* effect. Priming thirsty people with the subliminal word *thirst* might therefore, for a moment, make a thirst-quenching beverage ad more persuasive (Strahan et al., 2002). Likewise, priming thirsty people with Lipton Ice Tea may increase their choosing the primed brand (Karremans et al., 2006; Veltkamp et al., 2011; Verwijmeren et al., 2011a,b). But the subliminal-message hucksters claim something different: a *powerful, enduring* effect on behavior.

To test whether subliminal recordings have this enduring effect, Anthony Greenwald and his colleagues (1991, 1992) randomly assigned university students to listen daily for five weeks to commercial subliminal messages claiming to improve either self-esteem or memory. But the researchers played a practical joke and switched half the labels. Some students who thought they were receiving affirmations of self-esteem were actually hearing the memory-enhancement message. Others got the self-esteem message but thought their memory was being recharged.

Were the recordings effective? Students’ test scores for self-esteem and memory, taken before and after the five weeks, revealed no effects. Yet the students *perceived* themselves receiving the benefits they *expected*. Those who *thought* they had heard a memory recording *believed* their memories had improved. Those who thought they had heard a self-esteem recording believed their self-esteem had grown. (Reading this research, one hears echoes of the testimonies that ooze from ads for such products. Some customers, having bought what is not supposed to be heard [and having indeed not heard it!] offer testimonials like, “I really know that your recordings were invaluable in reprogramming my mind.”)

Over a decade, Greenwald conducted 16 double-blind experiments evaluating subliminal self-help recordings. His results were



Babs Reingold

Subliminal persuasion? Although subliminally presented stimuli *can* subtly influence people, experiments discount attempts at subliminal advertising and self-improvement. (The playful message here is not actually subliminal—because you can easily perceive it.)

uniform: Not one of the recordings helped more than a placebo (Greenwald, 1992). And placebos, you may remember, work only because we *believe* they will work.

increases with the size of the stimulus. Thus, if you add 1 ounce to a 10-ounce weight, you will detect the difference; add 1 ounce to a 100-ounce weight and you probably will not.

In the nineteenth century, Ernst Weber noted something so simple and so widely applicable that we still refer to it as **Weber’s law**. This law states that for an average person to perceive a difference, two stimuli must differ by a constant *percentage* (not a constant *amount*). The exact percentage varies, depending on the stimulus. Two lights, for example, must differ in intensity by 8 percent. Two objects must differ in weight by 2 percent. And two tones must differ in frequency by only 0.3 percent (Teghtsoonian, 1971).

The LORD is my shepherd;
I shall not want.
He maketh me to lie down
in green pastures:
he leadeth me
beside the still waters.
He restoreth my soul:
he leadeth me
in the paths of righteousness
for his name’s sake.
Yea, though I walk through the valley
of the shadow of death,
I will fear no evil:
for thou art with me;
thy rod and thy staff
they comfort me.
Thou preparest a table before me
in the presence of mine enemies:
thou anointest my head with oil,
my cup runneth over.
Surely goodness and mercy
shall follow me
all the days of my life:
and I will dwell
in the house of the LORD
for ever.

The difference threshold
In this computer-generated copy of the Twenty-third Psalm, each line of the typeface changes imperceptibly. How many lines are required for you to experience a just noticeable difference?

sensory adaptation diminished sensitivity as a consequence of constant stimulation.

perceptual set a mental predisposition to perceive one thing and not another.

RETRIEVE IT

- Using sound as your example, illustrate the distinctions among these concepts: absolute thresholds, subliminal stimulation, and difference thresholds.

ANSWERS: Absolute threshold is the minimum stimulation needed to detect a particular sound (such as an approaching bike on the sidewalk behind us) 50 percent of the time. Subliminal stimulation happens when, without our awareness, our sensory system processes that sound (when it is below our absolute threshold). A difference threshold is the minimum difference needed to distinguish between two sounds.

Sensory Adaptation



6-4: What is the function of sensory adaptation?

Entering your neighbors' living room, you smell a musty odor. You wonder how they can stand it, but within minutes you no longer notice it. **Sensory adaptation** has come to your rescue. When we are constantly exposed to a stimulus that does not change, we become less aware of it because our nerve cells fire less frequently. (To experience sensory adaptation, move your watch up your wrist an inch: You will feel it—but only for a few moments.)

Why, then, if we stare at an object without flinching, does it *not* vanish from sight? Because, unnoticed by us, our eyes are always moving (**FIGURE 6.4**). This continual flitting from one spot to another ensures that stimulation on the eyes' receptors continually changes.

What if we actually could stop our eyes from moving? Would sights seem to vanish, as odors do? To find out, psychologists have devised ingenious instruments that maintain a constant image on the eye's inner surface. Imagine that we have fitted a volunteer, Mary, with one of these instruments—a miniature projector mounted on a contact lens (**FIGURE 6.5a**). When Mary's eye moves, the image from the projector moves as well. So everywhere that Mary looks, the scene is sure to go.

If we project images through this instrument, what will Mary see? At first, she will see the complete image. But within a few seconds, as her sensory system begins to fatigue, things get weird. Bit by bit, the image vanishes, only to reappear and then disappear—often in fragments (**Figure 6.5b**).

Although sensory adaptation reduces our sensitivity to constant stimulation, it offers an important benefit: freedom to focus on *informative* changes in our environment without being distracted by background chatter.

Stinky or heavily perfumed people don't notice their odor because, like you and me, they adapt to what's constant and detect only change. Our sensory receptors are alert to novelty; bore them with repetition and they free our attention for more important things. We will see this principle again and again: *We perceive the world not exactly as it is, but as it is useful for us to perceive it.*

Our sensitivity to changing stimulation helps explain television's attention-grabbing power. Cuts, edits, zooms, pans, sudden noises—all demand attention. The phenomenon is irresistible even to TV researchers. One noted that even during interesting conversations, "I cannot for the life of me stop from periodically glancing over to the screen" (Tannenbaum, 2002).

Sensory adaptation and sensory thresholds are important ingredients in our perceptions of the world around us. Much of what we perceive comes not just from what's "out there" but also from what's behind our eyes and between our ears.

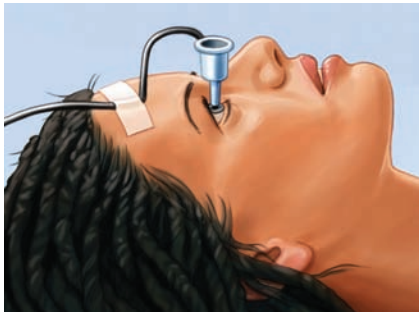
"We need above all to know about changes; no one wants or needs to be reminded 16 hours a day that his shoes are on."

Neuroscientist David Hubel (1979)

FIGURE 6.4

The jumpy eye Our gaze jumps from one spot to another every third of a second or so, as eye-tracking equipment illustrated in this photograph of Edinburgh's Princes Street Gardens (Henderson, 2007). The circles represent visual fixations, and the numbers indicate the time of fixation in milliseconds (300 milliseconds = three-tenths of a second).





(a)

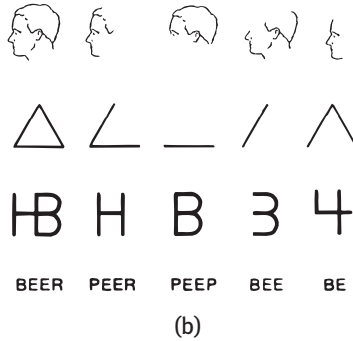


FIGURE 6.5

Sensory adaptation: Now you see it, now you don't! (a) A projector mounted on a contact lens makes the projected image move with the eye. (b) Initially, the person sees the stabilized image, but soon she sees fragments fading and reappearing. (From "Stabilized images on the retina," by R. M. Pritchard. Copyright © 1961 Scientific American, Inc. All rights reserved.)

RETRIEVE IT

- Why is it that after wearing shoes for a while, you cease to notice them (until questions like this draw your attention back to them)?

ANSWER: The shoes provide constant stimulation. Sensory adaptation allows us to focus on changing stimuli.

Perceptual Set



6-5: How do our expectations, contexts, emotions, and motivation influence our perceptions?

As everyone knows, to see is to believe. As we less fully appreciate, to believe is to see. Through experience, we come to expect certain results. Those expectations may give us a **perceptual set**, a set of mental tendencies and assumptions that affects (top-down) what we hear, taste, feel, and see.

Consider: Is the middle image in **FIGURE 6.6** a man playing a saxophone or a woman's face? What we see in such a drawing can be influenced by first looking at either of the two unambiguous versions (Boring, 1930).

Everyday examples of perceptual set abound. In 1972, a British newspaper published unretouched photographs of a "monster" in Scotland's Loch Ness—"the most amazing pictures ever taken," stated the paper. If this information creates in you the same expectations it did in most of the paper's readers, you, too, will see the monster in the photo in **FIGURE 6.7** on the next page. But when a skeptical researcher approached the photos with different expectations, he saw a curved tree trunk—as had others the day the photo was shot (Campbell, 1986). With this different perceptual set, you may now notice that the object is floating motionless, with no ripples in the water around it—hardly what we would expect of a lively monster.



© The New Yorker Collection, 2002, Leo Cullum from cartoonbank.com. All Rights Reserved.

Sara Nader, © 1990 Roger N. Shepard



FIGURE 6.6

Perceptual set Show a friend either the left or right image. Then show the center image and ask, "What do you see?" Whether your friend reports seeing a saxophonist or a woman's face may depend on which of the other two drawings was viewed first. In each of those images, the meaning is clear, and it will establish perceptual expectations.

FIGURE 6.7

Believing is seeing What do you perceive?
Is this Nessie, the Loch Ness monster, or a log?



Frank Searle, photo Adams/Corbis-Sygma

When shown the phrase

*Mary had a
a little lamb*

many people perceive what they
expect, and miss the repeated word.
Did you?

“We hear and apprehend only what we
already half know.”

Henry David Thoreau, Journal, 1860

Perceptual set can also affect what we hear. Consider the kindly airline pilot who, on a takeoff run, looked over at his depressed co-pilot and said, “Cheer up.” Expecting to hear the usual “Gear up,” the co-pilot promptly raised the wheels—before they left the ground (Reason & Mycielska, 1982).

Perceptual set similarly affects taste. One experiment invited bar patrons to sample free beer (Lee et al., 2006). When researchers added a few drops of vinegar to a brand-name beer, the tasters preferred it—unless they had been told they were drinking vinegar-laced beer. Then they expected, and usually experienced, a worse taste. In another experiment, preschool children, by a 6-to-1 margin, thought french fries tasted better when served in a McDonald’s bag rather than a plain white bag (Robinson et al., 2007).

What determines our perceptual set? As Chapter 4 explained, through experience we form concepts, or *schemas*, that organize and interpret unfamiliar information. Our preexisting schemas for male saxophonists and women’s faces, for monsters and tree trunks, all influence how we interpret ambiguous sensations with top-down processing.

In everyday life, stereotypes about gender (another instance of perceptual set) can color perception. Without the obvious cues of pink or blue, people will struggle over whether to call the new baby “he” or “she.” But told an infant is “David,” people (especially children) may perceive “him” as bigger and stronger than if the same infant is called “Diana” (Stern & Karraker, 1989). Some differences, it seems, exist merely in the eyes of their beholders.

Context Effects

A given stimulus may trigger radically different perceptions, partly because of our differing perceptual set, but also because of the immediate context. Some examples:

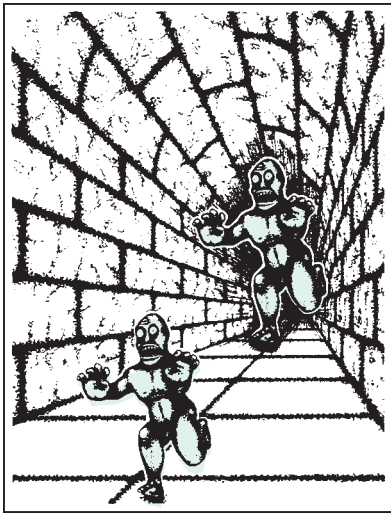
- Imagine hearing a noise interrupted by the words “eel is on the wagon.” Likely, you would actually perceive the first word as *wheel*. Given “eel is on the orange,” you

Culture and context effects What is above the woman’s head? In one study, nearly all the East Africans who were questioned said the woman was balancing a metal box or can on her head and that the family was sitting under a tree. Westerners, for whom head-carrying is less common and corners and boxlike architecture are more common, were more likely to perceive the family as being indoors, with the woman sitting under a window. (Adapted from Gregory & Gombrich, 1973.)



would more likely hear *peel*. This curious phenomenon, discovered by Richard Warren, suggests that the brain can work backward in time to allow a later stimulus to determine how we perceive an earlier one. The context creates an expectation that, top-down, influences our perception (Grossberg, 1995).

- Does the pursuing monster in **FIGURE 6.8** look aggressive? Does the identical pursued one seem frightened? If so, you are experiencing a context effect.
- How tall is the shorter player in **FIGURE 6.9**? Here again, context creates expectations.



From Shepard (1990)

FIGURE 6.8

The interplay between context and emotional perception The context makes the pursuing monster look more aggressive than the pursued. It isn't.



Denis R. J. Geppert, Holland Sentinel.

FIGURE 6.9

Big and "little" The "little guy" shown here is actually a 6'9" former Hope College basketball center who would tower over most of us. But he seemed like a short player when matched in a semi-pro game against the world's tallest basketball player at that time, 7'9" Sun Ming Ming from China.

Motivation and Emotion

Perceptions are also influenced, top-down, by our motivation and emotions.

Desired objects, such as a water bottle when thirsty, seem closer (Balcetis & Dunning, 2010). This perceptual bias energizes our going for it. Our motives also direct our perception of ambiguous images (**FIGURE 6.10**).

When angry, people more often perceive neutral objects as guns (Baumann & DeSteno, 2010). Dennis Proffitt (2006a,b; Schnall et al., 2008) and others have demonstrated the power of emotions with other clever experiments showing that

- walking destinations look farther away to those fatigued by prior exercise.
- a hill looks steeper to those who are wearing a heavy backpack or have just been exposed to sad, heavy classical music rather than light, bouncy music. As with so many of life's challenges, a hill also seems less steep to those with a friend beside them.
- a target seems farther away to those throwing a heavy rather than a light object at it.

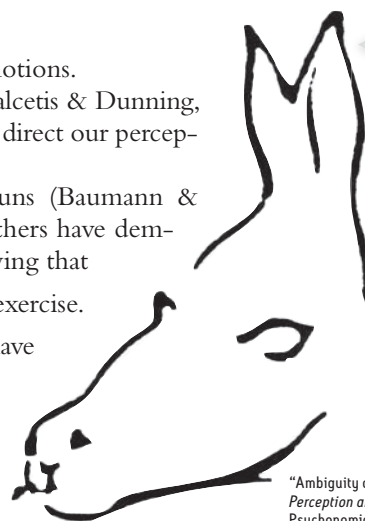


FIGURE 6.10

Ambiguous horse/seal figure If motivated to perceive farm animals, about 7 in 10 people immediately perceived a horse. If motivated to perceive a sea animal, about 7 in 10 perceived a seal (Balcetis & Dunning, 2006).

"Ambiguity of form: Old and new" by G. H. Fisher, 1968, *Perception and Psychophysics*, 4, 189–192. Copyright 1968 by Psychonomic Society, Inc.

“When you’re hitting the ball, it comes at you looking like a grapefruit. When you’re not, it looks like a blackeyed pea.”

Former Major League Baseball player
George Scott

Even a softball appears bigger when you are hitting well, observed Jessica Witt and Proffitt (2005), after asking players to choose a circle the size of the ball they had just hit well or poorly.

Emotions can also color our social perceptions. Spouses who feel loved and appreciated perceive less threat in stressful marital events—“He’s just having a bad day” (Murray et al., 2003). Professional referees, if told a soccer team has a history of aggressive behavior, will assign more penalty cards when watching videotaped fouls (Jones et al., 2002).

RETRIEVE IT

- In the context of sensation and perception, what does it mean to say that “believing is seeing”?

ANSWER: Because of *perceptual set*, our experiences, assumptions, and expectations sculpt our views of reality.

- Does *perceptual set* involve bottom-up or top-down processing? Why?

ANSWER: It involves top-down processing, drawing on our experiences, assumptions, and expectations.

Vision

Our eyes receive light energy and transduce (transform) it into neural messages that our brain then processes into what we consciously see. How does such a taken-for-granted yet remarkable thing happen?

The Stimulus Input: Light Energy



6-6: What is the energy that we see as visible light?

When you look at a bright red tulip, what strikes your eyes is not particles of the color red but pulses of electromagnetic energy that your visual system perceives as red. What we see as visible light is but a thin slice of the whole spectrum of electromagnetic energy, ranging from imperceptibly short gamma waves to the long waves of radio transmission (FIGURE 6.11). Other organisms are sensitive to differing portions of the spectrum. Bees, for instance, cannot see what we perceive as red but can see ultraviolet light.

Two physical characteristics of light help determine our sensory experience. Light’s **wavelength**—the distance from one wave peak to the next (FIGURE 6.12a)—determines its **hue** (the color we experience, such as a tulip’s red petals or green leaves). **Intensity**, the amount of energy in light waves (determined by a wave’s *amplitude*, or height), influences brightness (Figure 6.12b). To understand *how* we transform physical energy into color and meaning, we first need to understand vision’s window, the eye.

wavelength the distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of cosmic rays to the long pulses of radio transmission.

hue the dimension of color that is determined by the wavelength of light; what we know as the color names *blue*, *green*, and so forth.

intensity the amount of energy in a light or sound wave, which we perceive as brightness or loudness, as determined by the wave’s amplitude.

retina the light-sensitive inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information.

accommodation the process by which the eye’s lens changes shape to focus near or far objects on the retina.

The Eye



6-7: How does the eye transform light energy into neural messages, and how do the eye and brain process that information?

Light enters the eye through the *cornea*, which protects the eye and bends light to provide focus (FIGURE 6.13). The light then passes through the *pupil*, a small adjustable opening surrounded by the *iris*, a colored muscle that controls the size of the pupil by dilating or constricting in response to light intensity and even to inner emotions. (When we’re feeling amorous, our telltale dilated pupils and dark eyes subtly signal our interest.) Each iris is so distinctive that an iris-scanning machine can confirm our identity.

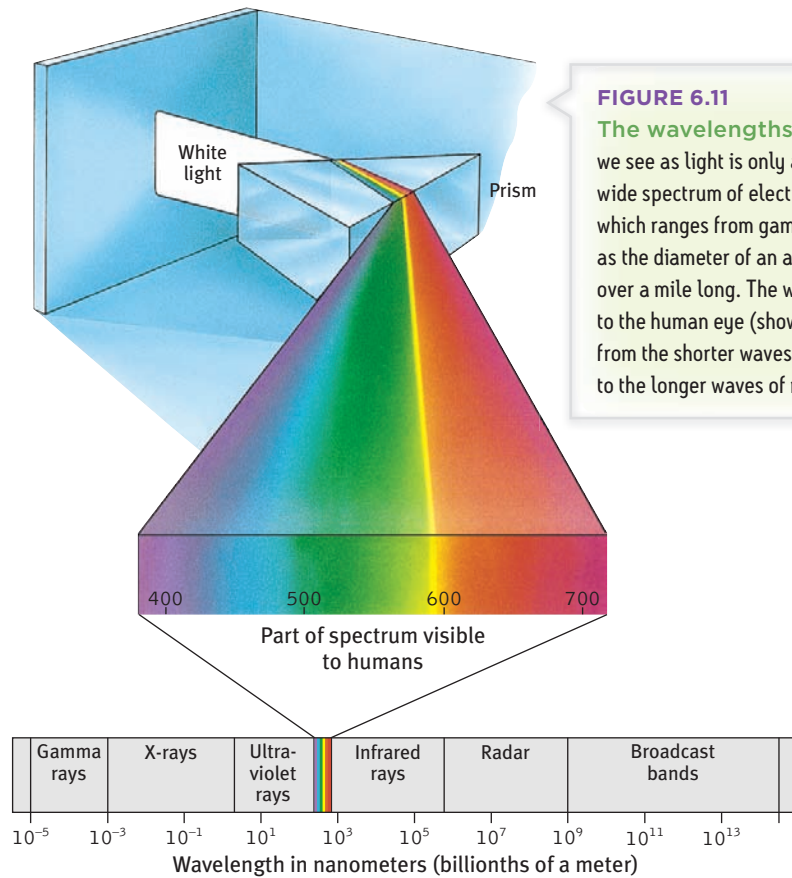
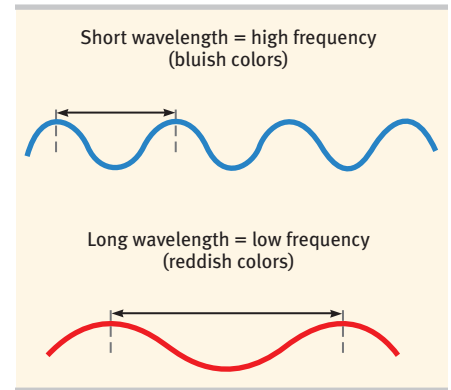
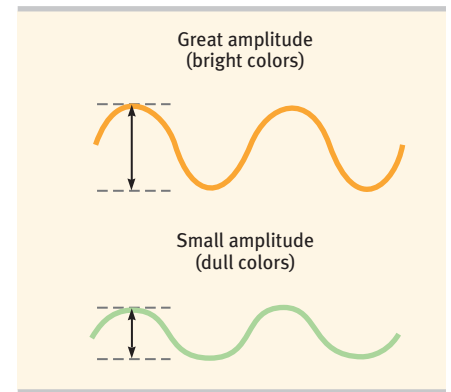


FIGURE 6.11
The wavelengths we see What we see as light is only a tiny slice of a wide spectrum of electromagnetic energy, which ranges from gamma rays as short as the diameter of an atom to radio waves over a mile long. The wavelengths visible to the human eye (shown enlarged) extend from the shorter waves of blue-violet light to the longer waves of red light.



(a)



(b)

FIGURE 6.12
The physical properties of waves (a) Waves vary in wavelength (the distance between successive peaks). Frequency, the number of complete wavelengths that can pass a point in a given time, depends on the wavelength. The shorter the wavelength, the higher the frequency. (b) Waves also vary in amplitude (the height from peak to trough). Wave amplitude determines the intensity of colors.

Behind the pupil is a transparent *lens* that focuses incoming light rays into an image on the **retina**, a multilayered tissue on the eyeball’s sensitive inner surface. The lens focuses the rays by changing its curvature and thickness, in a process called **accommodation**.

For centuries, scientists knew that when an image of a candle passes through a small opening, it casts an inverted mirror image on a dark wall behind. If the image passing through the pupil casts this sort of upside-down image on the retina, as in Figure 6.13, how can we see the world right side up? Eventually, the answer became clear: The retina doesn’t “see” a whole image. Rather, its millions of receptor cells convert particles of light energy into neural impulses and forward those to the brain. *There*, the impulses are reassembled into a perceived, upright-seeming image.

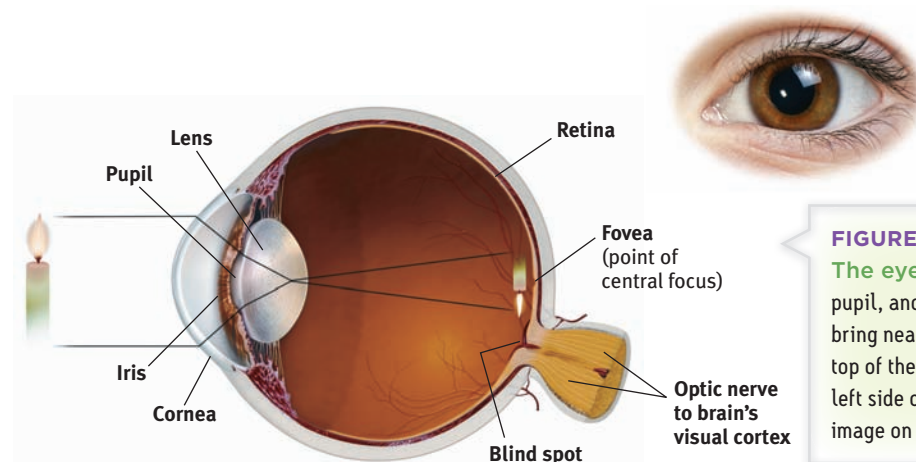
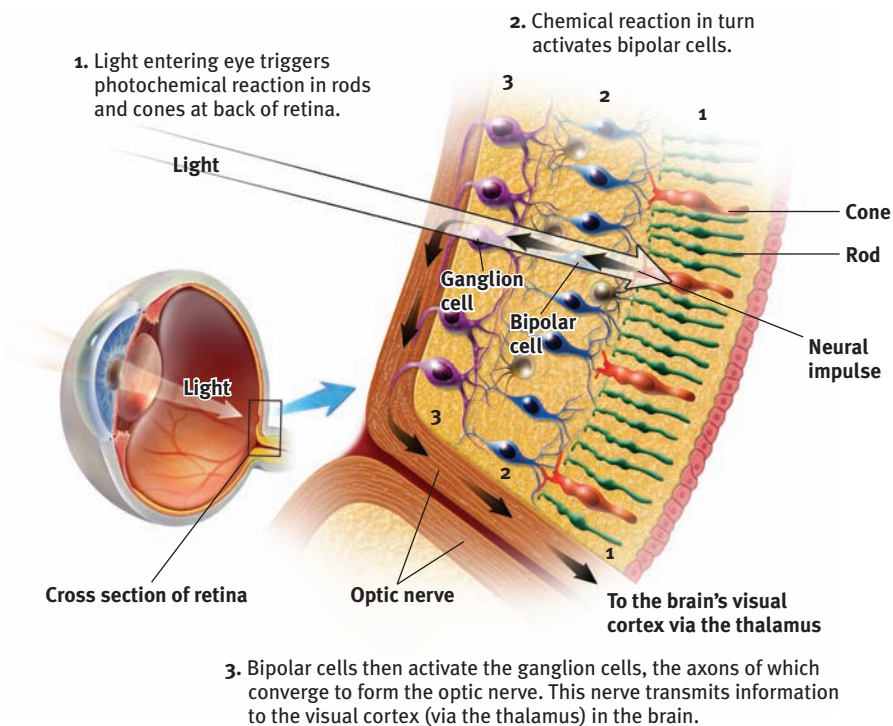


FIGURE 6.13
The eye Light rays reflected from a candle pass through the cornea, pupil, and lens. The curvature and thickness of the lens change to bring nearby or distant objects into focus on the retina. Rays from the top of the candle strike the bottom of the retina, and those from the left side of the candle strike the right side of the retina. The candle’s image on the retina thus appears upside-down and reversed.

FIGURE 6.14
The retina's reaction to light



rods retinal receptors that detect black, white, and gray; necessary for peripheral and twilight vision, when cones don't respond.

cones retinal receptor cells that are concentrated near the center of the retina and that function in daylight or in well-lit conditions. The cones detect fine detail and give rise to color sensations.

optic nerve the nerve that carries neural impulses from the eye to the brain.

blind spot the point at which the optic nerve leaves the eye, creating a "blind" spot because no receptor cells are located there.

fovea the central focal point in the retina, around which the eye's cones cluster.

Visual Information Processing

If you could follow a single light-energy particle to the back of your eye, you would first make your way through the retina's outer layer of cells to its buried receptor cells, the **rods** and **cones** (FIGURE 6.14). There, you would see the light energy trigger chemical changes that would spark neural signals, activating nearby *bipolar cells*. The bipolar cells in turn would activate the neighboring *ganglion cells*, whose axons twine together like the strands of a rope to form the **optic nerve**. That nerve will carry the information to your brain, where your thalamus stands ready to distribute the information. The optic nerve can send nearly 1 million messages at once through its nearly 1 million ganglion fibers. (The auditory nerve, which enables hearing, carries much less information through its mere 30,000 fibers.) We pay a small price for this eye-to-brain highway. Where the optic nerve leaves the eye, there are no receptor cells—creating a **blind spot** (FIGURE 6.15). Close one eye and you won't see a black hole, however. Without seeking your approval, your brain fills in the hole.

RETRIEVE IT

- There are no receptor cells where the optic nerve leaves the eye. This creates a blind spot in your vision. To demonstrate, first close your left eye, look at the spot, and move the page to a distance from your face at which one of the cars disappears (which one do you predict it will be?). Repeat with your right eye closed—and note that now the other car disappears. Can you explain why?

ANSWER: Your blind spot is on the nose side of each retina, which means that objects to your right may fall onto the right eye's blind spot. Objects to your left may fall on the left eye's blind spot. The blind spot does not normally impair your vision, because your eyes are moving and because one eye catches what the other misses.

FIGURE 6.15
The blind spot



Rods and cones differ in where they're found and in what they do (TABLE 6.1). *Cones* cluster in and around the **fovea**, the retina's area of central focus (see Figure 6.13). Many have their own hotline to the brain, which devotes a large area to input from the fovea. These direct connections preserve the cones' precise information, making them better able to detect fine detail.

Rods have no such hotline; they share bipolar cells with other rods, sending combined messages. To experience this rod-cone difference in sensitivity to details, pick a word in this sentence and stare directly at it, focusing its image on the cones in your fovea. Notice that words a few inches off to the side appear blurred? Their image strikes the outer regions of your retina, where rods predominate. Thus, when driving or biking, you can detect a car in your peripheral vision well before perceiving its details.

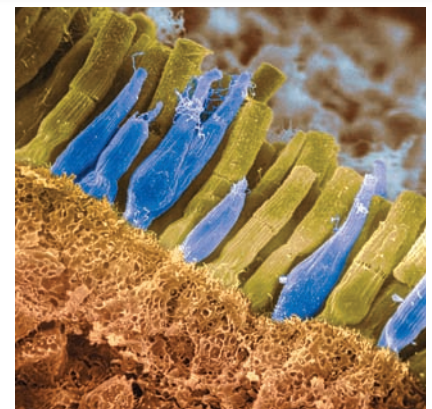
Cones also enable you to perceive color. In dim light they become ineffectual, so you see no colors. Rods, which enable black-and-white vision, remain sensitive in dim light. Several rods will funnel their faint energy output onto a single bipolar cell. Thus, cones and rods each provide a special sensitivity—cones to detail and color, and rods to faint light.

When you enter a darkened theater or turn off the light at night, your eyes adapt. Your pupils dilate to allow more light to reach your retina, but it typically takes 20 minutes or more before your eyes fully adapt. You can demonstrate dark adaptation by closing or covering one eye for up to 20 minutes. Then make the light in the room not quite bright enough to read this book with your open eye. Now open the dark-adapted eye and read (easily). This period of dark adaptation matches the average natural twilight transition between the Sun's setting and darkness. How wonderfully made we are.

Visual information percolates through progressively more abstract levels on its path through the thalamus and on to the visual cortex. At the entry level, the retina's neural layers don't just pass along electrical impulses; they also help to encode and analyze sensory information. The third neural layer in a frog's eye, for example, contains the "bug detector" cells that fire only in response to moving fly-like stimuli. Any given retinal area relays its information to a corresponding location in the visual cortex, in the occipital lobe at the back of your brain (FIGURE 6.16).

Table 6.1
Receptors in the Human Eye: Rod-Shaped Rods and Cone-Shaped Cones

	Cones	Rods
Number	6 million	120 million
Location in retina	Center	Periphery
Sensitivity in dim light	Low	High
Color sensitivity	High	Low
Detail sensitivity	High	Low



Omikron/Photo Researchers, Inc.

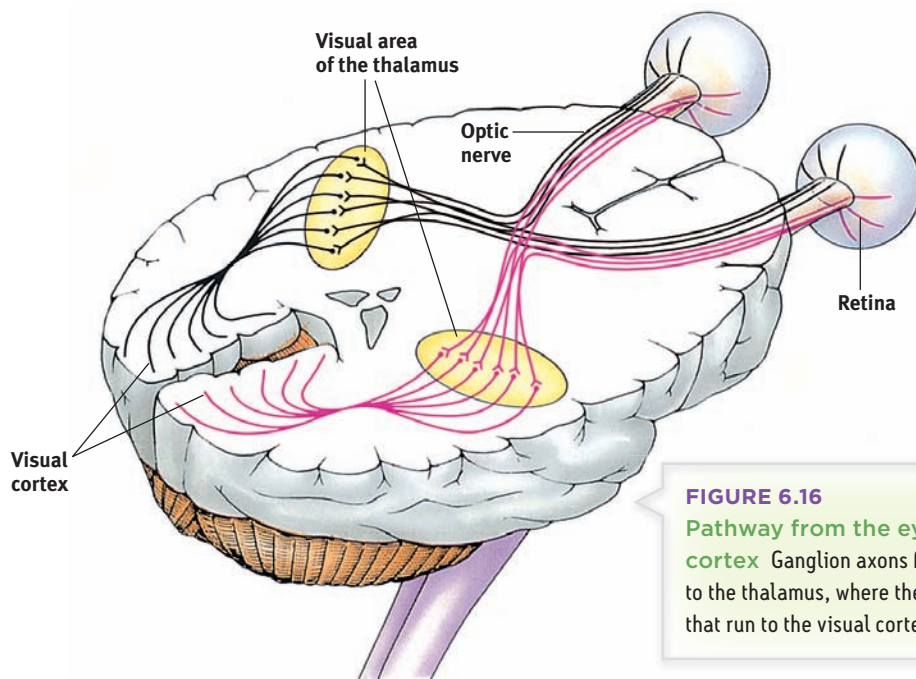


FIGURE 6.16
Pathway from the eyes to the visual cortex. Ganglion axons forming the optic nerve run to the thalamus, where they synapse with neurons that run to the visual cortex.

feature detectors nerve cells in the brain that respond to specific features of the stimulus, such as shape, angle, or movement.

parallel processing the processing of many aspects of a problem simultaneously; the brain's natural mode of information processing for many functions, including vision. Contrasts with the step-by-step (serial) processing of most computers and of conscious problem solving.

The same sensitivity that enables retinal cells to fire messages can lead them to misfire, as you can demonstrate. Turn your eyes to the left, close them, and then gently rub the right side of your right eyelid with your fingertip. Note the patch of light to the left, moving as your finger moves. Why do you see light? Why at the left?

Your retinal cells are so responsive that even pressure triggers them. But your brain interprets their firing as light. Moreover, it interprets the light as coming from the left—the normal direction of light that activates the right side of the retina.

RETRIEVE IT

- Some nocturnal animals, such as toads, mice, rats, and bats, have impressive night vision thanks to having many more _____ (rods/cones) than _____ (rods/cones) in their retinas. These creatures probably have very poor _____ (color/black-and-white) vision.
- Cats are also able to open their _____ much wider than we can, which allows more light into their eyes so they can see better at night.



Kruglov Orda / Shutterstock

ANSWERS: rods; cones; color

ANSWERS: pupils

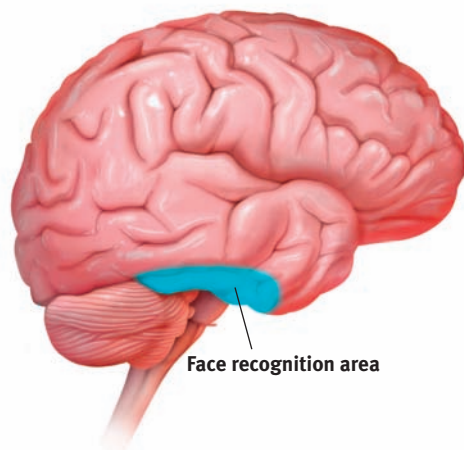


FIGURE 6.17

Face recognition processing In social animals such as humans, a dedicated brain system (shown here in a right-facing brain) assigns considerable neural bandwidth to the crucial task of face recognition.

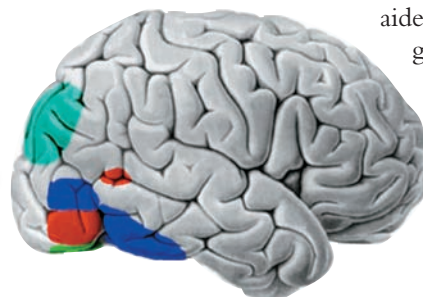
Feature Detection

David Hubel and Torsten Wiesel (1979) received a Nobel Prize for their work on **feature detectors**. These specialized neurons in the occipital lobe's visual cortex receive information from individual ganglion cells in the retina. Feature detector cells derive their name from their ability to respond to a scene's specific visual features—to particular edges, lines, angles, and movements. These cells pass this information to other cortical areas, where teams of cells (*supercell clusters*) respond to more complex patterns. As we noted earlier, one temporal lobe area by your right ear (**FIGURE 6.17**) enables you to perceive faces and, thanks to a specialized neural network, to recognize them from varied viewpoints (Connor, 2010). If this region were damaged, you might recognize other forms and objects, but, like Heather Sellers, not familiar faces. When researchers temporarily disrupt the brain's face-processing areas with magnetic pulses, people cannot recognize faces.

They will, however, be able to recognize houses, because the brain's face perception occurs separately from its object perception (McKone et al., 2007; Pitcher et al., 2007). Thus, functional MRI (fMRI) scans show different brain areas activating when people view varied objects (Downing et al., 2001). Brain activity is so specific (**FIGURE 6.18**) that, with the help of brain scans, “we can tell if a person is looking at a shoe, a chair, or a face, based on the pattern of their brain activity,” noted one researcher (Haxby, 2001).

Research shows that for biologically important objects and events, monkey brains (and surely ours as well) have a “vast visual encyclopedia” distributed as specialized cells (Perrett et al., 1988, 1992, 1994). These cells respond to one type of stimulus, such as a specific gaze, head angle, posture, or body movement. Other supercell clusters integrate this information and fire only when the cues collectively indicate the direction of someone's attention and approach. This instant analysis, which

aided our ancestors' survival, also helps a soccer goalkeeper anticipate the direction of an impending kick, and a driver anticipate a pedestrian's next movement.



■ Faces ■ Chairs
■ Houses ■ Houses and chairs

FIGURE 6.18

The telltale brain Looking at faces, houses, and chairs activates different brain areas in this right-facing brain.



Reuters/Claro Cortes IV (China)

Well-developed supercells In this 2007 World Cup match, Brazil's Marta instantly processed visual information about the positions and movements of Australia's defenders and goalkeeper (Melissa Barbieri) and somehow managed to get the ball around them all and into the net.

Parallel Processing

Our brain achieves these and other remarkable feats by means of **parallel processing**: doing many things at once. To analyze a visual scene, the brain divides it into subdimensions—color, motion, form, depth—and works on each aspect simultaneously (Livingstone & Hubel, 1988). We then construct our perceptions by integrating the separate but parallel work of these different visual teams (**FIGURE 6.19**).

To recognize a face, your brain integrates information projected by your retinas to several visual cortex areas, compares it to stored information, and enables you to recognize the face: *Grandmother!* Scientists are debating whether this stored information is contained in a single cell or distributed over a network. Some supercells—“grandmother cells”—do appear to respond very selectively to 1 or 2 faces in 100 (Bowers, 2009). The whole face recognition process requires tremendous brain power—30 percent of the cortex (10 times the brain area devoted to hearing).

Destroy or disable a neural workstation for a visual subtask, and something peculiar results, as happened to “Mrs. M.” (Hoffman, 1998). Since a stroke damaged areas near the rear of both sides of her brain, she has been unable to perceive movement. People in a room seem “suddenly here or there but I have not seen them moving.” Pouring tea into a cup is a challenge because the fluid appears frozen—she cannot perceive it rising in the cup.

After stroke or surgery damage to the brain's visual cortex, others have experienced *blindsight* (a phenomenon we met in Chapter 3). Shown a series of sticks, they report seeing nothing. Yet when asked to guess whether the sticks are vertical or horizontal, their visual intuition typically offers the correct response. When told, “You got them all right,” they are astounded. There is, it seems, a second “mind”—a parallel processing system—operating unseen. These separate visual systems for perception and action illustrate dual processing—the two-track mind.

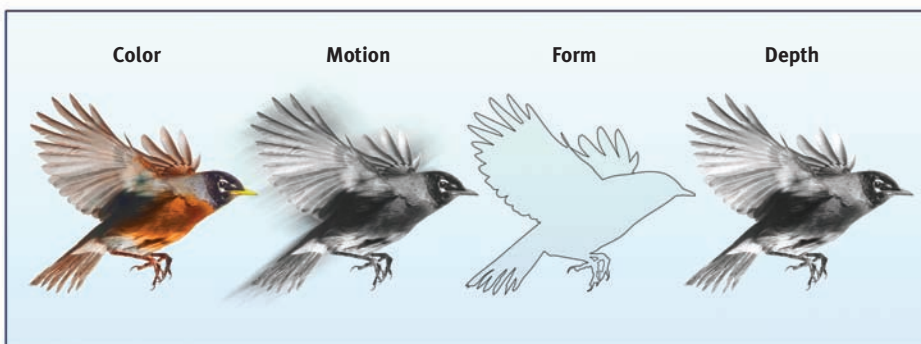


FIGURE 6.19

Parallel processing Studies of patients with brain damage suggest that the brain delegates the work of processing color, motion, form, and depth to different areas. After taking a scene apart, the brain integrates these subdimensions into the perceived image. How does the brain do this? The answer to this question is the Holy Grail of vision research.

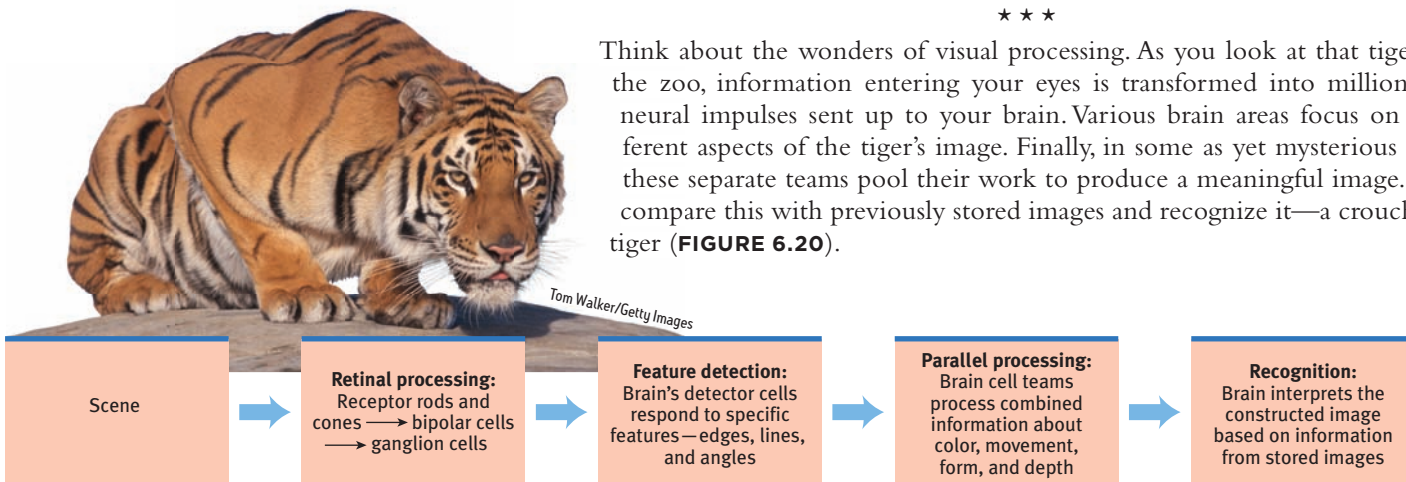


FIGURE 6.20
A simplified summary of visual information processing

“I am . . . wonderfully made.”

King David, Psalm 139:14

Think, too, about what is happening as you read this page. The printed squiggles are transmitted by reflected light rays onto your retina, which triggers a process that sends formless nerve impulses to several areas of your brain, which integrates the information and decodes meaning, thus completing the transfer of information across time and space from my mind to your mind. That all of this happens instantly, effortlessly, and continuously is indeed awesome. As Roger Sperry (1985) observed, the “insights of science give added, not lessened, reasons for awe, respect, and reverence.”

RETRIEVE IT

- What is the rapid sequence of events that occurs when you see and recognize a friend?

ANSWER: Light waves reflect off the person and travel into your eye, where the receptor cells in your retina convert the light waves' energy into neural impulses sent to your brain. Your brain processes the subdivisions of this visual input—including color, depth, movement, and form—separately but simultaneously. It interprets this information based on previously stored information and your expectations into a conscious perception of your friend.

Color Vision



6-8: What theories help us understand color vision?

We talk as though objects possess color: “A tomato is red.” Perhaps you have pondered the old question, “If a tree falls in the forest and no one hears it, does it make a sound?” We can ask the same of color: If no one sees the tomato, is it red?

The answer is *No*. First, the tomato is everything *but* red, because it *rejects* (reflects) the long wavelengths of red. Second, the tomato's color is our mental construction. As Isaac Newton (1704) noted, “The [light] rays are not colored.” Color, like all aspects of vision, resides not in the object but in the theater of our brains, as evidenced by our dreaming in color.

One of vision's most basic and intriguing mysteries is how we see the world in color. How, from the light energy striking the retina, does the brain manufacture our experience of color—and of such a multitude of colors? Our difference threshold for colors is so low that we can discriminate more than 1 million different color variations (Neitz et al., 2001). At least most of us can. For about 1 person in 50, vision is color deficient—and that person is usually male, because the defect is genetically sex linked.

Modern detective work on the mystery of color vision began in the nineteenth century, when Hermann von Helmholtz built on the insights of an English physicist, Thomas Young. Knowing that any color can be created by combining the light waves of three

“Only mind has sight and hearing; all things else are deaf and blind.”

Epicharmus, Fragments, 550 B.C.E.

primary colors—red, green, and blue—Young and von Helmholtz inferred that the eye must have three corresponding types of color receptors. Years later, researchers measured the response of various cones to different color stimuli and confirmed the **Young-Helmholtz trichromatic (three-color) theory**, which implies that the receptors do their color magic in teams of three. Indeed, the retina has three types of color receptors, each especially sensitive to one of three colors. And those colors are, in fact, red, green, and blue. When we stimulate combinations of these cones, we see other colors. For example, there are no receptors especially sensitive to yellow. We see yellow when mixing red and green light, which stimulates both red-sensitive and green-sensitive cones.

Most people with color-deficient vision are not actually “colorblind.” They simply lack functioning red- or green-sensitive cones, or sometimes both. Their vision—perhaps unknown to them, because their lifelong vision *seems* normal—is monochromatic (one-color) or dichromatic (two-color) instead of trichromatic, making it impossible to distinguish the red and green in **FIGURE 6.21**. Dogs, too, lack receptors for the wavelengths of red, giving them only limited, dichromatic color vision (Neitz et al., 1989).

But how is it that people blind to red and green can often still see yellow? And why does yellow appear to be a pure color and not a mixture of red and green, the way purple is of red and blue? As Ewald Hering soon noted, trichromatic theory leaves some parts of the color vision mystery unsolved.

Hering, a physiologist, had found a clue in *afterimages*. Stare at a green square for a while and then look at a white sheet of paper, and you will see red, green’s *opponent color*. Stare at a yellow square and its opponent color, blue, will appear on the white paper. (To experience this, try the flag demonstration in **FIGURE 6.22**.) Hering surmised that there must be two additional color processes, one responsible for red-versus-green perception, and one for blue-versus-yellow.

Indeed, a century later, researchers also confirmed Hering’s **opponent-process theory**. Three sets of opponent retinal processes—*red-green*, *yellow-blue*, and *white-black*—enable color vision. In the retina and in the thalamus (where impulses from the retina are relayed en route to the visual cortex), some neurons are “turned on” by red but “turned off” by green. Others are turned on by green but off by red (DeValois & DeValois, 1975). Like red and green marbles sent down a narrow tube, “red” and “green” messages cannot both travel at once. Red and green are thus opponents, so we do not experience a reddish green. But red and blue travel in separate channels, so we *can* see a reddish-blue magenta.



James P. Gilman, C.R.A. / Phototake

FIGURE 6.21

Color-deficient vision The bottom photo shows how people with deficient red-green vision would perceive this scene.

Young-Helmholtz trichromatic

(three-color) theory the theory that the retina contains three different color receptors—one most sensitive to red, one to green, one to blue—which, when stimulated in combination, can produce the perception of any color.

opponent-process theory

the theory that opposing retinal processes (red-green, yellow-blue, white-black) enable color vision. For example, some cells are stimulated by green and inhibited by red; others are stimulated by red and inhibited by green.



FIGURE 6.22

Afterimage effect Stare at the center of the flag for a minute and then shift your eyes to the dot in the white space beside it. What do you see? (After tiring your neural response to black, green, and yellow, you should see their opponent colors.) Stare at a white wall and note how the size of the flag grows with the projection distance!

How then do we explain afterimages, such as in the flag demonstration? By staring at green, we tire our green response. When we then stare at white (which contains all colors, including red), only the red part of the green-red pairing will fire normally.

The present solution to the mystery of color vision is therefore roughly this: Color processing occurs in two stages. The retina's red, green, and blue cones respond in varying degrees to different color stimuli, as the Young-Helmholtz trichromatic theory suggested. Their responses are then processed by opponent-process cells, as Hering's theory proposed.

RETRIEVE IT

- What are two key theories of color vision? Are they contradictory or complementary? Explain.

ANSWER: The Young-Helmholtz trichromatic theory shows that the retina contains color receptors for red, green, and blue. The opponent-process theory shows that we have opponent-process cells in the retina and thalamus for red-green, yellow-blue, and white-black. These theories are complementary and outline the two stages of color vision: (1) The retina's receptors for red, green, and blue respond to different color stimuli. (2) The receptors' signals are then processed by the opponent-process cells on their way to the visual cortex in the brain.

Visual Organization



6-9: How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?

It's one thing to understand how we see shapes and colors. But how do we organize and interpret those sights (or sounds or tastes or smells) so that they become meaningful perceptions—a rose in bloom, a familiar face, a sunset?

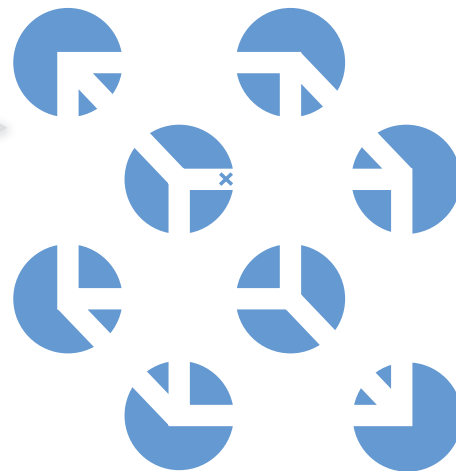


FIGURE 6.23

A Necker cube What do you see: circles with white lines, or a cube? If you stare at the cube, you may notice that it reverses location, moving the tiny X in the center from the front edge to the back. At times, the cube may seem to float in front of the page, with circles behind it. At other times, the circles may become holes in the page through which the cube appears, as though it were floating behind the page. There is far more to perception than meets the eye. (From Bradley et al., 1976.)

Early in the twentieth century, a group of German psychologists noticed that when given a cluster of sensations, people tend to organize them into a **gestalt**, a German word meaning a “form” or a “whole.” For example, look at **FIGURE 6.23**. Note that the individual elements of this figure, called a *Necker cube*, are really nothing but eight blue circles, each containing three converging white lines. When we view these elements all together, however, we see a cube that sometimes reverses direction. This phenomenon nicely illustrates a favorite saying of Gestalt psychologists: In perception, the whole may exceed the sum of its parts.

Over the years, the Gestalt psychologists demonstrated many principles we use to organize our sensations into perceptions. Underlying all of them is a fundamental truth: *Our brain does more than register information about the world.* Perception is not just opening a shutter and letting a picture print itself on the brain. We filter incoming information and construct perceptions. Mind matters.

gestalt an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes.

figure-ground the organization of the visual field into objects (the *figures*) that stand out from their surroundings (the *ground*).

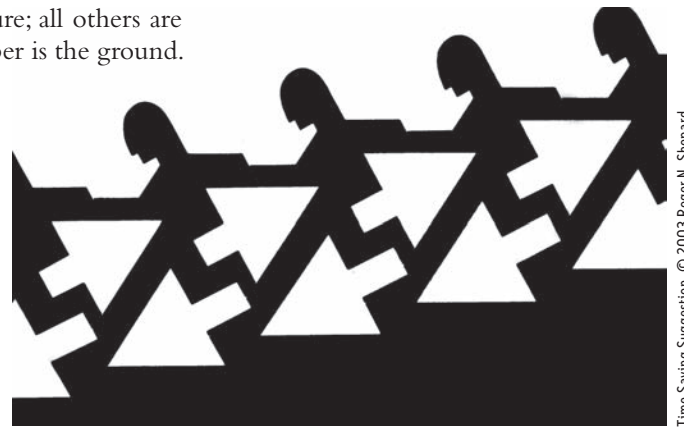
grouping the perceptual tendency to organize stimuli into coherent groups.

Form Perception

Imagine designing a video-computer system that, like your eye-brain system, can recognize faces at a glance. What abilities would it need?

Figure and Ground To start with, the video-computer system would need to separate faces from their backgrounds. Likewise, in our eye-brain system, our first perceptual task is to perceive any object (the *figure*) as distinct from its surroundings (the *ground*).

As you hear voices at a party, the one you attend to becomes the figure; all others are part of the ground. As you read, the words are the figure; the white paper is the ground. Sometimes the same stimulus can trigger more than one perception. In **FIGURE 6.24**, the **figure-ground** relationship continually reverses—but always we organize the stimulus into a figure seen against a ground.



Time Saving Suggestion, © 2003 Roger N. Shepard.

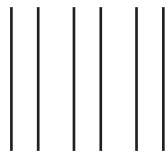
FIGURE 6.24
Reversible figure and ground

Grouping Having discriminated figure from ground, we (and our video-computer system) must also organize the figure into a *meaningful* form. Some basic features of a scene—such as color, movement, and light-dark contrast—we process instantly and automatically (Treisman, 1987). Our minds bring order and form to stimuli by following certain rules for **grouping**. These rules, identified by the Gestalt psychologists and applied even by infants, illustrate how the perceived whole differs from the sum of its parts (Quinn et al., 2002; Rock & Palmer, 1990). Three examples:

Proximity We group nearby figures together. We see not six separate lines, but three sets of two lines.

Continuity We perceive smooth, continuous patterns rather than discontinuous ones. This pattern could be a series of alternating semicircles, but we perceive it as two continuous lines—one wavy, one straight.

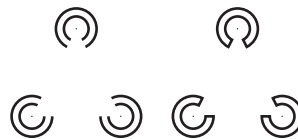
Closure We fill in gaps to create a complete, whole object. Thus we assume that the circles on the left are complete but partially blocked by the (illusory) triangle. Add nothing more than little line segments to close off the circles and your brain stops constructing a triangle.



Proximity



Continuity



Closure

Such principles usually help us construct reality. Sometimes, however, they lead us astray, as when we look at the doghouse in **FIGURE 6.25**.

Photo by Walter Wick. Reprinted from *GAMES Magazine*. © 1983 PCS Games Limited Partnership.



FIGURE 6.25
Grouping principles What's the secret to this impossible doghouse? You probably perceive this doghouse as a gestalt—a whole (though impossible) structure. Actually, your brain imposes this sense of wholeness on the picture. As Figure 6.29 shows, Gestalt grouping principles such as closure and continuity are at work here.

depth perception the ability to see objects in three dimensions although the images that strike the retina are two-dimensional; allows us to judge distance.

visual cliff a laboratory device for testing depth perception in infants and young animals.

binocular cues depth cues, such as retinal disparity, that depend on the use of two eyes.

retinal disparity a binocular cue for perceiving depth: By comparing images from the retinas in the two eyes, the brain computes distance—the greater the disparity (difference) between the two images, the closer the object.

monocular cues depth cues, such as interposition and linear perspective, available to either eye alone.

RETRIEVE IT

- In terms of perception, a band's lead singer would be considered _____ (figure/ground), and the other musicians would be considered _____ (figure/ground).

ANSWERS: figure; ground

- What do we mean when we say that, in perception, “the whole is greater than the sum of its parts”?

ANSWER: Gestalt psychologists used this saying to describe our perceptual tendency to organize clusters of sensations into meaningful forms or coherent groups.

ANSWER: Gestalt psychologists used this saying to describe our perceptual tendency to organize clusters of sensations into meaningful forms or coherent groups.

Depth Perception



6-10: How do we use binocular and monocular cues to perceive the world in three dimensions?

From the two-dimensional images falling on our retinas, we somehow organize three-dimensional perceptions. **Depth perception** enables us to estimate an object's distance from us. At a glance, we can estimate the distance of an oncoming car or the height of a house. Depth perception is partly innate, as Eleanor Gibson and Richard Walk (1960) discovered using a model of a cliff with a drop-off area (which was covered by sturdy glass). Gibson's inspiration for these **visual cliff** experiments occurred while she was picnicking on the rim of the Grand Canyon. She wondered: Would a toddler peering over the rim perceive the dangerous drop-off and draw back?

Back in their Cornell University laboratory, Gibson and Walk placed 6- to 14-month-old infants on the edge of a safe canyon and had the infants' mothers coax them to crawl out onto the glass (**FIGURE 6.26**). Most infants refused to do so, indicating that they could perceive depth.

Had they *learned* to perceive depth? Learning seems to be part of the answer because crawling, no matter when it begins, seems to increase infants' wariness of heights (Campos et al., 1992). Yet, the researchers observed, mobile newborn animals come prepared to perceive depth. Even those with virtually no visual experience—including young kittens, a day-old goat, and newly hatched chicks—will not venture across the visual cliff. Thus, it seems that biological maturation predisposes us to be wary of heights and experience amplifies that fear.

How do we do it? *How* do we transform two differing two-dimensional retinal images into a single three-dimensional perception?

Binocular Cues Try this: With both eyes open, hold two pens or pencils in front of you and touch their tips together. Now do so with one eye closed. With one eye, the task becomes noticeably more difficult, demonstrating the importance of **binocular cues** in judging the distance of nearby objects. Two eyes are better than one.

Because your eyes are about 2½ inches apart, your retinas receive slightly different images of the world. By comparing these two images, your brain can judge how close an object is to you. The greater the **retinal disparity**, or difference between the two images, the closer the object. Try it. Hold your two index fingers, with the tips about half an inch apart, directly in front of your nose, and your retinas will receive quite different views. If you close one eye and then the other, you can see the difference. (You may also create a finger sausage, as in **FIGURE 6.27**.) At a greater distance—say, when you hold your fingers at arm's length—the disparity is smaller.

We could easily build this feature into our video-computer system. Moviemakers can simulate or exaggerate retinal disparity by filming a scene with two cameras placed a few inches apart. Viewers then wear glasses that allow the left eye to see only the image



FIGURE 6.26

Visual cliff Eleanor Gibson and Richard Walk devised this miniature cliff with a glass-covered drop-off to determine whether crawling infants and newborn animals can perceive depth. Even when coaxed, infants are reluctant to venture onto the glass over the cliff.

from the left camera, and the right eye to see only the image from the right camera. The resulting 3-D effect, as 3-D movie fans know, mimics or exaggerates normal retinal disparity. Similarly, twin cameras in airplanes can take photos of terrain for integration into 3-D maps.

Monocular Cues How do we judge whether a person is 10 or 100 meters away? Retinal disparity won't help us here, because there won't be much difference between the images cast on our right and left retinas. At such distances, we depend on **monocular cues** (depth cues available to each eye separately). See **FIGURE 6.28** for some examples.

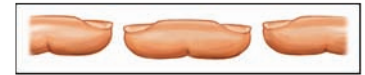
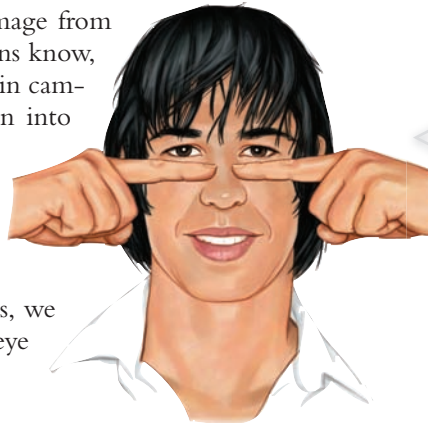


FIGURE 6.27
The floating finger sausage
 Hold your two index fingers about 5 inches in front of your eyes, with their tips half an inch apart. Now look beyond them and note the weird result. Move your fingers out farther and the retinal disparity—and the finger sausage—will shrink.



Image courtesy Shaun P. Vecera, Ph.D., adapted from stimuli that appeared in Vecera et al., 2002

Relative height We perceive objects higher in our field of vision as farther away. Because we assume the lower part of a figure-ground illustration is closer, we perceive it as figure (Vecera et al., 2002). Invert this illustration and the black will become ground, like a night sky.

Relative motion As we move, objects that are actually stable may appear to move. If while riding on a bus you fix your gaze on some point—say, a house—the objects beyond the fixation point will appear to move with you. Objects in front of the point will appear to move backward. The farther an object is from the fixation point, the faster it will seem to move.

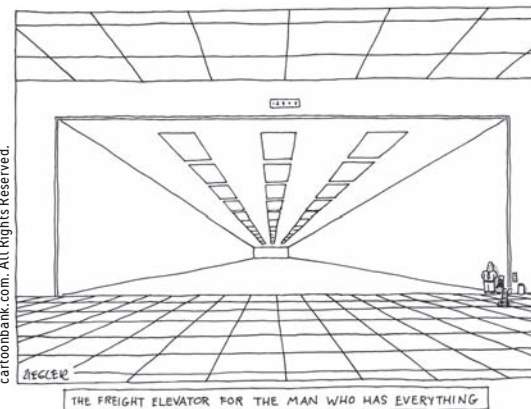


Direction of passenger's motion →



Relative size If we assume two objects are similar in size, most people perceive the one that casts the smaller retinal image as farther away.

Linear perspective Parallel lines appear to meet in the distance. The sharper the angle of convergence, the greater the perceived distance.



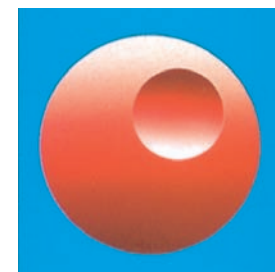
©The New Yorker Collection, 2002. Jack Ziegler from cartoonbank.com. All Rights Reserved.



Rene Magritte, *The Blank Signature*, oil on canvas, National Gallery of Art, Washington. Collection of Mr. and Mrs. Paul Mellon. Photo by Richard Carafelli.

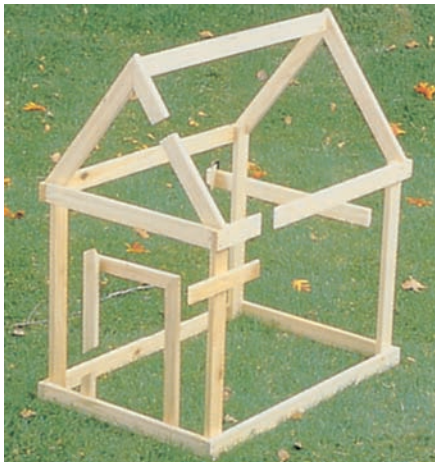
Interposition (overlap) If one object partially blocks our view of another, we perceive it as closer. The depth cues provided by interposition make this an impossible scene.

Light and shadow Shading produces a sense of depth consistent with our assumption that light comes from above. If you invert this illustration, the hollow will become a hill.



From "Perceiving Shape From Shading" by Vityanur S. Ramachandran. Copyright © 1988 by Scientific American, Inc. All Rights Reserved.

FIGURE 6.28
Monocular depth cues

**FIGURE 6.29**

The solution Another view of the impossible doghouse in Figure 6.25 reveals the secrets of this illusion. From the photo angle in Figure 6.25, the grouping principle of closure leads us to perceive the boards as continuous.

“From there to here, from here to there,
funny things are everywhere.”

*Dr. Seuss, One Fish, Two Fish, Red
Fish, Blue Fish, 1960*

FIGURE 6.30

Color depends on context Believe it or not, these three blue disks are identical in color (a). Remove the surrounding context and see what results (b).

perceptual constancy perceiving objects as unchanging (having consistent color, brightness, shape, and size) even as illumination and retinal images change.

color constancy perceiving familiar objects as having consistent color, even if changing illumination alters the wavelengths reflected by the object.

RETRIEVE IT

- How do we normally perceive depth?

ANSWER: We are normally able to perceive depth thanks to the binocular cues that are based on our retinal disparity, and monocular cues including relative height, relative size, interposition, linear perspective, light and shadow, and relative motion.

Perceptual Constancy

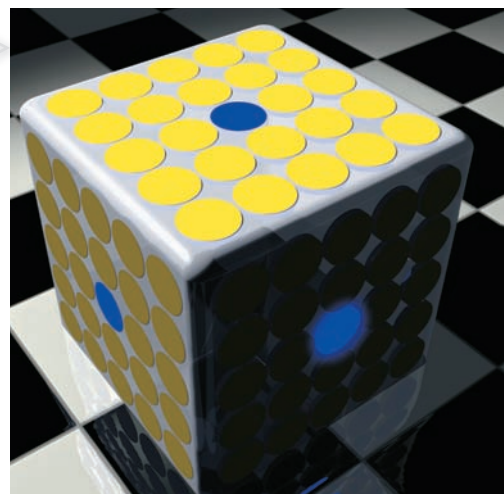
6-11: How do perceptual constancies help us organize our sensations into meaningful perceptions?

So far, we have noted that our video-computer system must perceive objects as we do—as having a distinct form and location. Its next task is to recognize objects without being deceived by changes in their color, brightness, shape, or size—a top-down process called **perceptual constancy**. Regardless of the viewing angle, distance, and illumination, we can identify people and things in less time than it takes to draw a breath, a feat that challenges even advanced computers and has intrigued researchers for decades. This would be a monumental challenge for a video-computer system.

Color and Brightness Constancies Our experience of color depends on an object’s *context*. If you view an isolated tomato through a paper tube, its color would seem to change as the light—and thus the wavelengths reflected from its surface—changed. But if you viewed that tomato as one item in a bowl of fresh vegetables, its color would remain roughly constant as the lighting shifts. This perception of consistent color is known as **color constancy**.

Though we take color constancy for granted, this ability is truly remarkable. A blue poker chip under indoor lighting reflects wavelengths that match those reflected by a sunlit gold chip (Jameson, 1985). Yet bring a bluebird indoors and it won’t look like a goldfinch. The color is not in the bird’s feathers. You and I see color thanks to our brain’s computations of the light reflected by an object *relative to the objects surrounding it*. **FIGURE 6.30** dramatically illustrates the ability of a blue object to appear very different in three different contexts. Yet we have no trouble seeing these disks as blue.

Similarly, *brightness constancy* (also called *lightness constancy*) depends on context. We perceive an object as having a constant brightness even while its illumination varies. This perception of constancy depends on *relative luminance*—the amount of light an object reflects *relative to its surroundings* (**FIGURE 6.31**). White paper reflects 90 percent of the



(a)

R. Beau Lotto at University College, London



(b)

light falling on it; black paper, only 10 percent. Although a black paper viewed in sunlight may reflect 100 times more light than does a white paper viewed indoors, it will still look black (McBurney & Collings, 1984). But if you view sunlit black paper through a narrow tube so nothing else is visible, it may look gray, because in bright sunshine it reflects a fair amount of light. View it without the tube and it is again black, because it reflects much less light than the objects around it.

This principle—that we perceive objects not in isolation but in their environmental context—matters to artists, interior decorators, and clothing designers. Our perception of the color and brightness of a wall or of a streak of paint on a canvas is determined not just by the paint in the can but by the surrounding colors. The take-home lesson: *Comparisons govern our perceptions.*

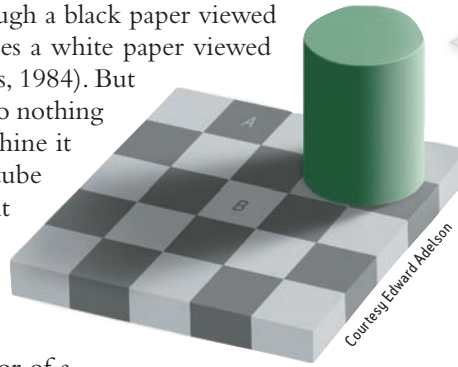


FIGURE 6.31
Relative luminance Squares A and B are identical in color, believe it or not. (If you don't believe me, photocopy the illustration, cut out the squares, and compare.) But we perceive B as lighter, thanks to its surrounding context.

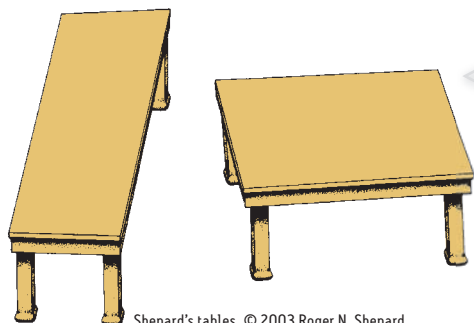
Shape and Size Constancies Sometimes an object whose actual shape cannot change *seems* to change shape with the angle of our view (**FIGURE 6.32**). More often, thanks to *shape constancy*, we perceive the form of familiar objects, such as the door in **FIGURE 6.33**, as constant even while our retinas receive changing images of them. Our brain manages this feat thanks to visual cortex neurons that rapidly learn to associate different views of an object (Li & DiCarlo, 2008).

Thanks to *size constancy*, we perceive objects as having a constant size, even while our distance from them varies. We assume a car is large enough to carry people, even when we see its tiny image from two blocks away. This assumption also illustrates the close connection between perceived *distance* and perceived *size*. Perceiving an object's distance gives us cues to its size. Likewise, knowing its general size—that the object is a car—provides us with cues to its distance.

Even in size-distance judgments, however, we consider an object's context. The monsters in Figure 6.8 cast identical images on our retinas. Using linear perspective as a cue (see Figure 6.28) our brain assumes that the pursuing monster is farther away. We therefore perceive it as larger. It isn't.

This interplay between perceived size and perceived distance helps explain several well-known illusions, including the *Moon illusion*: The Moon looks up to 50 percent larger when near the horizon than when high in the sky. Can you imagine why? For at least 22 centuries, scholars have debated this question (Hershenson, 1989). One reason is that cues to objects' distances make the horizon Moon—like the distant monster in Figure 6.8—appear farther away. If it's farther away, our brain assumes, it must be larger than the Moon high in the night sky (Kaufman & Kaufman, 2000). Take away the distance cue, by looking at the horizon Moon (or each monster) through a paper tube, and the object will immediately shrink.

Size-distance relationships also explain why in **FIGURE 6.34** on the next page the two same-age girls seem so different in size. As the diagram reveals, the girls are actually about the same size, but the room is distorted. Viewed with one eye through a peephole, the Ames room's trapezoidal walls produce the same images you would see in a normal



Shepard's tables, © 2003 Roger N. Shepard.

FIGURE 6.32
Perceiving shape Do the tops of these tables have different dimensions? They appear to. But—believe it or not—they are identical. (Measure and see.) With both tables, we adjust our perceptions relative to our viewing angle.

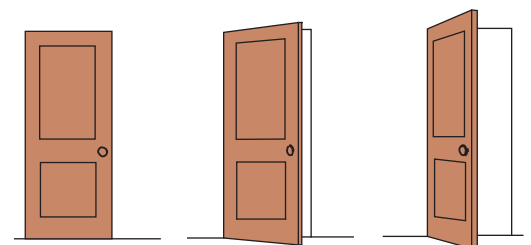
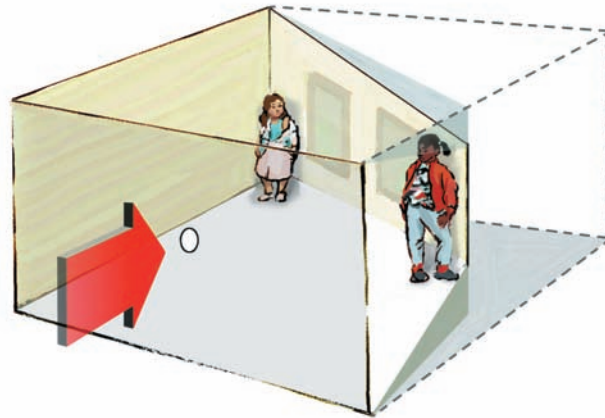


FIGURE 6.33
Shape constancy A door casts an increasingly trapezoidal image on our retinas as it opens, yet we still perceive it as rectangular.



S. Schwartzberg/The Exploratorium

**FIGURE 6.34**

The illusion of the shrinking and growing girls This distorted room, designed by Adelbert Ames, appears to have a normal rectangular shape when viewed through a peephole with one eye. The girl in the right corner appears disproportionately large because we judge her size based on the false assumption that she is the same distance away as the girl in the far corner.

rectangular room viewed with both eyes. Presented with the camera's one-eyed view, your brain makes the reasonable assumption that the room *is* normal and each girl is therefore the same distance from you. Given the different sizes of the girls' images on your retinas, your brain ends up calculating that the girls must be very different in size.

Perceptual illusions reinforce a fundamental lesson: Perception is not merely a projection of the world onto our brain. Rather, our sensations are disassembled into information bits that our brain then reassembles into its own functional model of the external world. During this reassembly process, our assumptions—such as the usual relationship between distance and size—can lead us astray. *Our brain constructs our perceptions.*

* * *

Form perception, depth perception, and perceptual constancies illuminate how we organize our visual experiences. Perceptual organization applies to our other senses, too. Listening to an unfamiliar language, we have trouble hearing where one word stops and the next one begins. Listening to our own language, we automatically hear distinct words. This, too, reflects perceptual organization. But it is more, for we even organize a string of letters—THE DOG ATE MEAT—into words that make an intelligible phrase, more likely “The dog ate meat” than “The do gate me at” (McBurney & Collings, 1984). This process involves not only the organization we've been discussing, but also interpretation—discerning meaning in what we perceive.

Visual Interpretation

Philosophers have debated whether our perceptual abilities should be credited to our nature or our nurture. To what extent do we *learn* to perceive? German philosopher Immanuel Kant (1724–1804) maintained that knowledge comes from our *inborn* ways of organizing sensory experiences. Indeed, we come equipped to process sensory information. But British philosopher John Locke (1632–1704) argued that through our experiences we also *learn* to perceive the world. Indeed, we learn to link an object's distance with its size. So, just how important is experience? How radically does it shape our perceptual interpretations?

Experience and Visual Perception



6-12: What does research on restored vision, sensory restriction, and perceptual adaptation reveal about the effects of experience on perception?

“Let us then suppose the mind to be, as we say, white paper void of all characters, without any ideas: How comes it to be furnished? . . . To this I answer, in one word, from EXPERIENCE.”

John Locke, *An Essay Concerning Human Understanding*, 1690

perceptual adaptation in vision, the ability to adjust to an artificially displaced or even inverted visual field.

Restored Vision and Sensory Restriction Writing to John Locke, William Molyneux wondered whether “a man *born* blind, and now adult, taught by his *touch* to distinguish between a cube and a sphere” could, if made to see, visually distinguish the two. Locke's answer was *No*, because the man would never have *learned* to see the difference.

Molyneux's hypothetical case has since been put to the test with a few dozen adults who, though blind from birth, have gained sight (Gregory, 1978; von Senden, 1932). Most were born with cataracts—clouded lenses that allowed them to see only diffused light, rather as you might see a foggy image through a Ping-Pong ball sliced in half. After cataract surgery, the patients could distinguish figure from ground and could sense colors—suggesting that these aspects of perception are innate. But much as Locke supposed, they often could not visually recognize objects that were familiar by touch.

Seeking to gain more control than is provided by clinical cases, researchers have outfitted infant kittens and monkeys with goggles through which they could see only diffuse, unpatterned light (Wiesel, 1982). After infancy, when the goggles were removed, these animals exhibited perceptual limitations much like those of humans born with cataracts. They could distinguish color and brightness, but not the form of a circle from that of a square. Their eyes had not degenerated; their retinas still relayed signals to their visual cortex. But lacking stimulation, the cortical cells had not developed normal connections. Thus, the animals remained functionally blind to shape. Experience guides, sustains, and maintains the brain's neural organization that enables our perceptions.

In both humans and animals, similar sensory restrictions later in life do no permanent harm. When researchers cover the eye of an adult animal for several months, its vision will be unaffected after the eye patch is removed. When surgeons remove cataracts that develop during late adulthood, most people are thrilled at the return to normal vision.

The effect of sensory restriction on infant cats, monkeys, and humans suggests there is a *critical period* (Chapter 4) for normal sensory and perceptual development. Nurture sculpts what nature has endowed. In less dramatic ways, it continues to do so throughout our lives. Despite concerns about their social costs (more on this in Chapter 13), action video games sharpen spatial skills such as visual attention, eye-hand coordination and speed, and tracking multiple objects (Spence & Feng, 2010).

Perceptual Adaptation Given a new pair of glasses, we may feel slightly disoriented, even dizzy. Within a day or two, we adjust. Our **perceptual adaptation** to changed visual input makes the world seem normal again. But imagine a far more dramatic new pair of glasses—one that shifts the apparent location of objects 40 degrees to the left. When you first put them on and toss a ball to a friend, it sails off to the left. Walking forward to shake hands with the person, you veer to the left.

Could you adapt to this distorted world? Chicks cannot. When fitted with such lenses, they continue to peck where food grains *seem* to be (Hess, 1956; Rossi, 1968). But we humans adapt to distorting lenses quickly. Within a few minutes your throws would again be accurate, your stride on target. Remove the lenses and you would experience an aftereffect: At first your throws would err in the *opposite* direction, sailing off to the right; but again, within minutes you would readapt.

Indeed, given an even more radical pair of glasses—one that literally turns the world upside down—you could still adapt. Psychologist George Stratton (1896) experienced this when he invented, and for eight days wore, optical headgear that flipped left to right *and* up to down, making him the first person to experience a right-side-up retinal image while standing upright. The ground was up, the sky was down.

At first, when Stratton wanted to walk, he found himself searching for his feet, which were now “up.” Eating was nearly impossible. He became nauseated and depressed. But he persisted, and by the eighth day he could comfortably reach for an object in the right direction and walk without bumping into things. When Stratton finally removed the headgear, he readapted quickly.

In later experiments, people wearing the optical gear have even been able to ride a motorcycle, ski the Alps, and fly an airplane (Dolezal, 1982; Kohler, 1962). The world around them still seemed above their heads or on the wrong side. But by actively moving about in these topsy-turvy worlds, they adapted to the context and learned to coordinate their movements.



AP Photo/Marcio Jose Sanchez

Learning to see At age 3, Mike May lost his vision in an explosion. Decades later, after a new cornea restored vision to his right eye, he got his first look at his wife and children. Alas, although signals were now reaching his visual cortex, it lacked the experience to interpret them. May could not recognize expressions, or faces, apart from features such as hair. Yet he can see an object in motion and has learned to navigate his world and to marvel at such things as dust floating in sunlight (Abrams, 2002).

Perceptual adaptation “Oops, missed,” thought researcher Hubert Dolezal as he viewed the world through inverting goggles. Yet, believe it or not, kittens, monkeys, and humans can adapt to an inverted world.



Courtesy of Hubert Dolezal

audition the sense or act of hearing.

frequency the number of complete wavelengths that pass a point in a given time (for example, per second).

pitch a tone's experienced highness or lowness; depends on frequency.

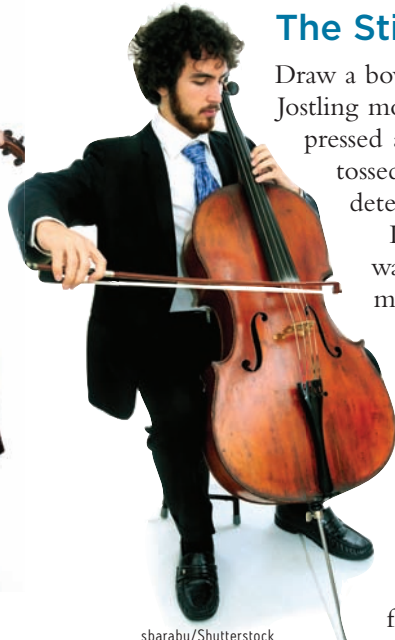
middle ear the chamber between the eardrum and cochlea containing three tiny bones (hammer, anvil, and stirrup) that concentrate the vibrations of the eardrum on the cochlea's oval window.

cochlea [KOHK-lee-uh] a coiled, bony, fluid-filled tube in the inner ear; sound waves traveling through the cochlear fluid trigger nerve impulses.

The sounds of music A violin's short, fast waves create a high pitch, a cello's longer, slower waves a lower pitch. Differences in the waves' height, or amplitude, also create differing degrees of loudness.



Zdorov Kirill Vladimirovich/Shutterstock



sbarabu/Shutterstock

Hearing



6-13: What are the characteristics of air pressure waves that we hear as sound, and how does the ear transform sound energy into neural messages?

Like our other senses, our **audition**, or hearing, is highly adaptive. We hear a wide range of sounds, but the ones we hear best are those sounds with frequencies in a range corresponding to that of the human voice. Those with normal hearing are acutely sensitive to faint sounds, an obvious boon for our ancestors' survival when hunting or being hunted, or for detecting a child's whimper. (If our ears were much more sensitive, we would hear a constant hiss from the movement of air molecules.)

We are also remarkably attuned to variations in sounds. Among thousands of possible human voices, we easily recognize a friend on the phone, from the moment she says "Hi." A fraction of a second after such events stimulate the ear's receptors, millions of neurons have simultaneously coordinated in extracting the essential features, comparing them with past experience, and identifying the stimulus (Freeman, 1991). For hearing as for seeing, we wonder: How do we do it?

The Stimulus Input: Sound Waves

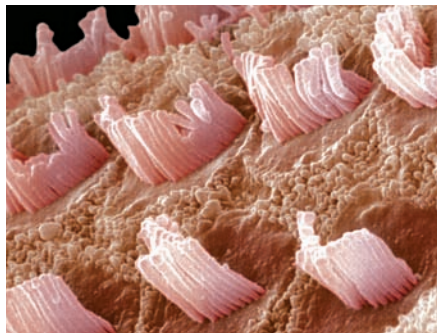
Draw a bow across a violin, and you will unleash the energy of sound waves. Jostling molecules of air, each bumping into the next, create waves of compressed and expanded air, like the ripples on a pond circling out from a tossed stone. As we swim in our ocean of moving air molecules, our ears detect these brief air pressure changes.

Like light waves, sound waves vary in shape. The *amplitude* of sound waves determines their *loudness*. Their length, or **frequency**, determines the **pitch** we experience. Long waves have low frequency—and low pitch. Short waves have high frequency—and high pitch. Sound waves produced by a violin are much shorter and faster than those produced by a cello or a bass guitar.

We measure sounds in *decibels*, with zero decibels representing the absolute threshold for hearing. Every 10 decibels correspond to a tenfold increase in sound intensity. Thus, normal conversation (60 decibels) is 10,000 times more intense than a 20-decibel whisper. And a temporarily tolerable 100-decibel passing subway train is 10 billion times more intense than the faintest detectable sound.

The Ear

The intricate process that transforms vibrating air into nerve impulses, which our brain decodes as sounds, begins when sound waves enter the *outer ear*. An intricate mechanical chain reaction begins as the visible outer ear channels the waves through the *auditory canal* to the *eardrum*, a tight membrane, causing it to vibrate (**FIGURE 6.35**). In the **middle ear**, a piston made of three tiny bones (the *hammer*, *anvil*, and *stirrup*) picks up the vibrations and transmits them to the **cochlea**, a snail-shaped tube in the **inner ear**. The incoming vibrations cause the cochlea's membrane (the *oval window*) to vibrate, jostling the fluid that fills the tube. This motion causes ripples in the *basilar membrane*, bending the *hair cells* lining its surface, not unlike the wind bending a wheat field. Hair cell movement triggers impulses in the adjacent nerve cells. Axons of those cells converge to form the *auditory nerve*, which sends neural messages (via the *thalamus*) to the *auditory cortex* in the brain's temporal lobe. From vibrating air to moving piston to fluid waves to electrical impulses to the brain: Voilá! We hear.



Dr. Fred Hossler/Visuals Unlimited

Be kind to your inner ear's hair cells When vibrating in response to sound, the hair cells shown here lining the cochlea produce an electrical signal.

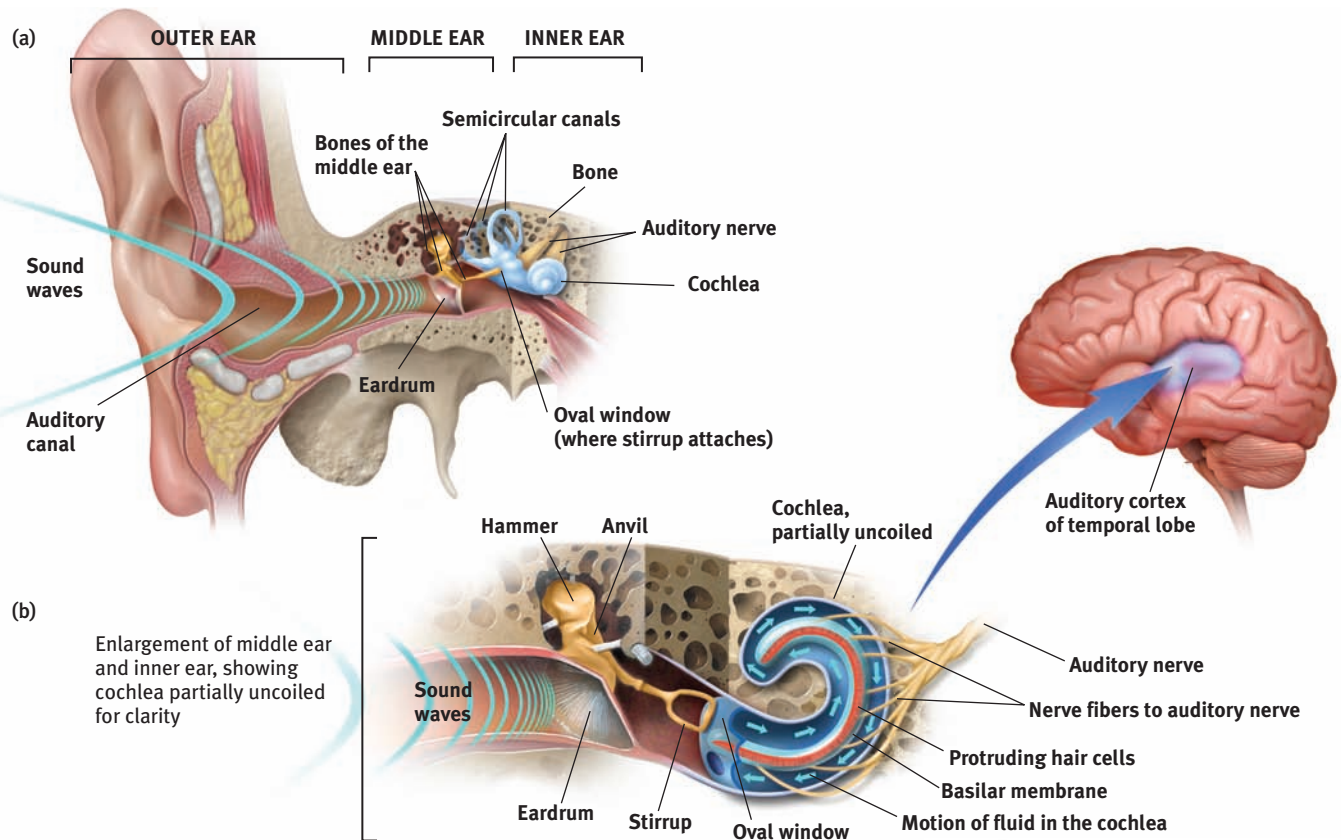


FIGURE 6.35

Hear here: How we transform sound waves into nerve impulses that our brain interprets (a) The outer ear funnels sound waves to the eardrum. The bones of the middle ear (hammer, anvil, and stirrup) amplify and relay the eardrum's vibrations through the oval window into the fluid-filled cochlea. (b) As shown in this detail of the middle and inner ear, the resulting pressure changes in the cochlear fluid cause the basilar membrane to ripple, bending the hair cells on its surface. Hair cell movements trigger impulses at the base of the nerve cells, whose fibers converge to form the auditory nerve. That nerve sends neural messages to the thalamus and on to the auditory cortex.

My vote for the most intriguing part of the hearing process is the hair cells—“quivering bundles that let us hear” thanks to their “extreme sensitivity and extreme speed” (Goldberg, 2007). A cochlea has 16,000 of them, which sounds like a lot until we compare that with an eye’s 130 million or so photoreceptors. But consider their responsiveness. Deflect the tiny bundles of *cilia* on the tip of a hair cell by the width of an atom—the equivalent of displacing the top of the Eiffel Tower by half an inch—and the alert hair cell, thanks to a special protein at its tip, triggers a neural response (Corey et al., 2004).

Damage to the cochlea’s hair cell receptors or their associated nerves can cause **sensorineural hearing loss** (or nerve deafness). (Less common is **conduction hearing loss**, caused by damage to the mechanical system that conducts sound waves to the cochlea.) Occasionally, disease causes sensorineural hearing loss, but more often the culprits are biological changes linked with heredity, aging, and prolonged exposure to ear-splitting noise or music.

Hair cells have been likened to carpet fibers. Walk around on them and they will spring back with a quick vacuuming. But leave a heavy piece of furniture on them and they may never rebound. As a general rule, if we cannot talk over a noise, it is potentially harmful, especially if prolonged and repeated (Roesser, 1998). Such experiences are common when sound exceeds 100 decibels, as happens in venues from frenzied sports arenas to bagpipe bands to iPods playing near maximum volume (FIGURE 6.36 on the next page). Ringing of the ears after exposure to loud machinery or music indicates that we have been bad to our unhappy hair cells. As pain alerts us to possible bodily harm, ringing of the ears alerts us to possible hearing damage. It is hearing’s equivalent of bleeding.

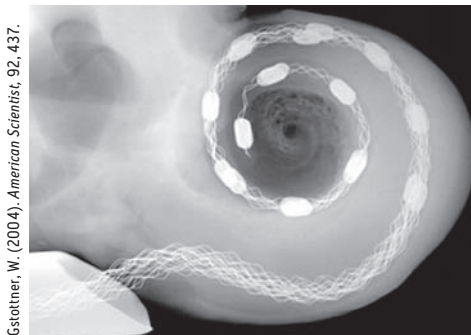
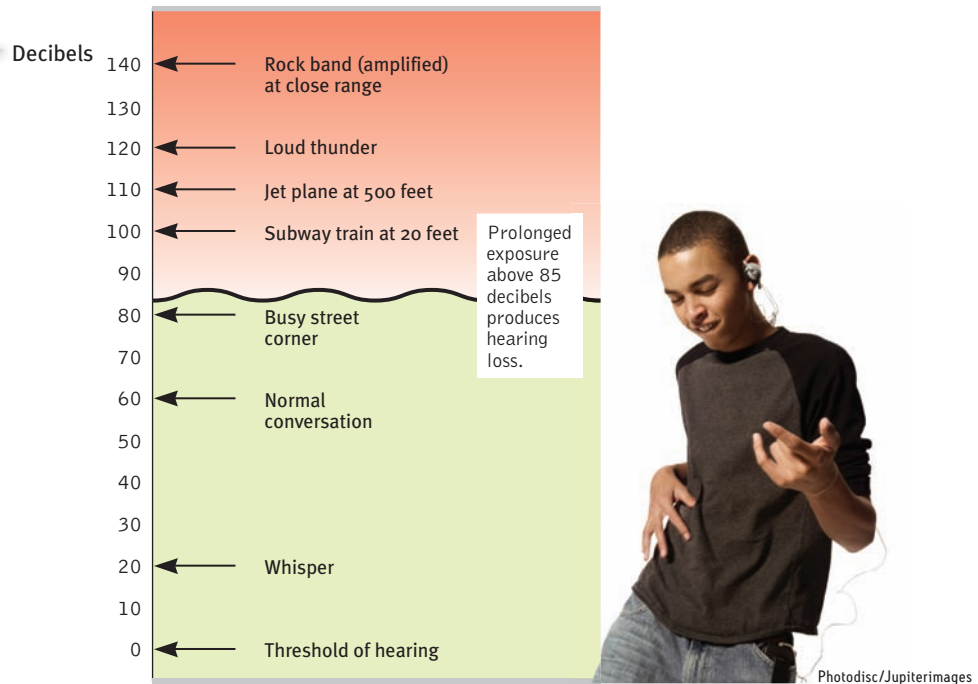
The rate of teen hearing loss, now 1 in 5, has risen by a third since the early 1990s (Shargorodsky et al., 2010). Teen boys more than teen girls or adults blast themselves with loud volumes for long periods (Zogby, 2006). Males’ greater noise exposure may help explain why men’s hearing tends to be less acute than women’s. But male or female, those who spend many hours in a loud nightclub, behind a power mower, or above a jackhammer should wear earplugs. “Condoms or, safer yet, abstinence,” say sex educators. “Earplugs or walk away,” say hearing educators.

inner ear the innermost part of the ear, containing the cochlea, semicircular canals, and vestibular sacs.

sensorineural hearing loss hearing loss caused by damage to the cochlea’s receptor cells or to the auditory nerves; also called *nerve deafness*.

conduction hearing loss hearing loss caused by damage to the mechanical system that conducts sound waves to the cochlea.

FIGURE 6.36
The intensity of some
common sounds



Gstotner, W. (2004). *American Scientist*, 92, 437.

Hardware for hearing An X-ray image shows a cochlear implant's array of wires leading to 12 stimulation sites on the auditory nerve.

That Baylen may hear When Super Bowl-winning quarterback Drew Brees celebrated New Orleans' 2010 victory amid pandemonium, he used ear muffs to protect the vulnerable hair cells of his son, Baylen.



AP Photo/Mark J. Terrill

For now, the only way to restore hearing for people with nerve deafness is a sort of bionic ear—a **cochlear implant**, which, by 2009, had been given to 188,000 people worldwide (NIDCD, 2011). This electronic device translates sounds into electrical signals that, wired into the cochlea's nerves, convey information about sound to the brain. Cochlear implants given to deaf kittens and human infants have seemed to trigger an “awakening” of the pertinent brain area (Klinke et al., 1999; Sireteanu, 1999). They can help children become proficient in oral communication (especially if they receive them as preschoolers or even before age 1) (Dettman et al., 2007; Schorr et al., 2005).

The latest cochlear implants also can help restore hearing for most adults. However, the implants will not enable normal hearing in adults if their brain never learned to process sound during childhood. Similarly, cochlear implants did not enable hearing in deaf-from-birth cats that received them when fully grown, rather than as 8-week-old kittens (Ryugo et al., 2010).

RETRIEVE IT

- The amplitude of a sound wave determines our perception of _____ (loudness/pitch).
- The longer the sound waves are, the _____ (lower/higher) their frequency is and the _____ (higher/lower) their pitch.

ANSWERS: loudness

ANSWERS: lower; lower

Perceiving Loudness

How do we detect loudness? It is not, as I would have guessed, from the intensity of a hair cell's response. Rather, a soft, pure tone activates only the few hair cells attuned to its frequency. Given louder sounds, neighboring hair cells also respond. Thus, the brain can interpret loudness from the *number* of activated hair cells.

If a hair cell loses sensitivity to soft sounds, it may still respond to loud sounds. This helps explain another surprise: Really loud sounds may seem loud to people with or without normal hearing. As a person with hearing loss, I used to wonder what really loud music must sound like to people with normal hearing. Now I realize it sounds much the same; where we differ is in our sensation of soft sounds.

Perceiving Pitch



6-14: What theories help us understand pitch perception?

How do we know whether a sound is the high-frequency, high-pitched chirp of a bird or the low-frequency, low-pitched roar of a truck? Current thinking on how we discriminate pitch, like current thinking on how we discriminate color, combines two theories.

- Hermann von Helmholtz's **place theory** presumes that we hear different pitches because different sound waves trigger activity at different places along the cochlea's basilar membrane. Thus, the brain determines a sound's pitch by recognizing the specific place (on the membrane) that is generating the neural signal. When Nobel laureate-to-be Georg von Békésy (1957) cut holes in the cochleas of guinea pigs and human cadavers and looked inside with a microscope, he discovered that the cochlea vibrated, rather like a shaken bedsheet, in response to sound. High frequencies produced large vibrations near the beginning of the cochlea's membrane, low frequencies near the end. But a problem remains: Place theory can explain how we hear high-pitched sounds but not low-pitched sounds. The neural signals generated by low-pitched sounds are not so neatly localized on the basilar membrane.
- **Frequency theory** suggests an alternative: The brain reads pitch by monitoring the frequency of neural impulses traveling up the auditory nerve. The whole basilar membrane vibrates with the incoming sound wave, triggering neural impulses to the brain at the same rate as the sound wave. If the sound wave has a frequency of 100 waves per second, then 100 pulses per second travel up the auditory nerve. But again, a problem remains: An individual neuron cannot fire faster than 1000 times per second. How, then, can we sense sounds with frequencies above 1000 waves per second (roughly the upper third of a piano keyboard)?
- Enter the *volley principle*: Like soldiers who alternate firing so that some can shoot while others reload, neural cells can alternate firing. By firing in rapid succession, they can achieve a *combined frequency* above 1000 waves per second. Thus, place theory best explains how we sense *high pitches*, frequency theory best explains how we sense *low pitches*, and some combination of place and frequency seems to handle the *pitches in the intermediate range*.

RETRIEVE IT

- Which theory of pitch perception would best explain a symphony audience's enjoyment of the high-pitched piccolo? How about the low-pitched cello?

ANSWERS: place theory; frequency theory

Locating Sounds



6-15: How do we locate sounds?

Why don't we have one big ear—perhaps above our one nose? “The better to hear you with,” the wolf said to Red Riding Hood. As the placement of our eyes allows us to sense visual depth, so the placement of our two ears allows us to enjoy stereophonic (“three-dimensional”) hearing.

Two ears are better than one for at least two reasons. If a car to the right honks, your right ear receives a more *intense* sound, and it receives sound slightly *sooner* than your left ear (**FIGURE 6.37**). Because sound travels 750 miles per hour and our ears are but 6 inches apart, the intensity difference and the time lag are extremely small. A just noticeable difference in the direction of two sound sources corresponds to a time difference of just 0.000027 second! Lucky for us, our supersensitive auditory system can detect such minute differences (Brown & Deffenbacher, 1979; Middlebrooks & Green, 1991).

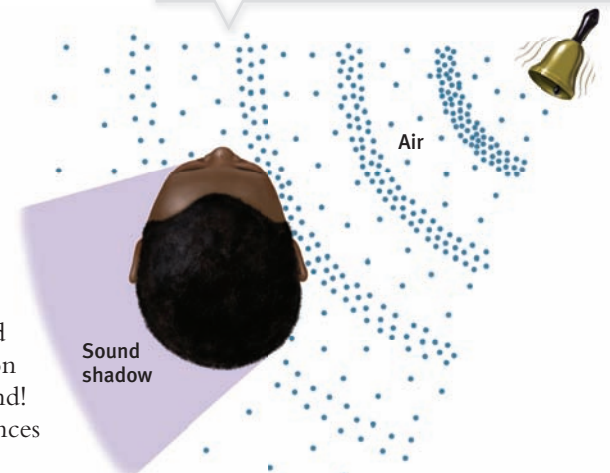
cochlear implant a device for converting sounds into electrical signals and stimulating the auditory nerve through electrodes threaded into the cochlea.

place theory in hearing, the theory that links the pitch we hear with the place where the cochlea's membrane is stimulated.

frequency theory in hearing, the theory that the rate of nerve impulses traveling up the auditory nerve matches the frequency of a tone, thus enabling us to sense its pitch.

FIGURE 6.37

How we locate sounds Sound waves strike one ear sooner and more intensely than the other. From this information, our nimble brain computes the sound's location. As you might therefore expect, people who lose all hearing in one ear often have difficulty locating sounds.





© Jose Luis Pelaez, Inc./Blend Images/Corbis

The precious sense of touch As William James wrote in his *Principles of Psychology* (1890), “Touch is both the alpha and omega of affection.”

The Other Senses

Although our brain gives seeing and hearing priority in the allocation of cortical tissue, extraordinary happenings occur within our four other senses—touch, taste, smell, and body position and movement. Sharks and dogs rely on their extraordinary sense of smell, aided by large brain areas devoted to smell. Without our own senses of touch, taste, smell, and body position and movement, we humans would also be seriously handicapped, and our capacities for enjoying the world would be devastatingly diminished.

Touch



6-16: How do we sense touch?

Although not the first sense to come to mind, touch is vital. Right from the start, touch is essential to our development. Infant rats deprived of their mother’s grooming produce less growth hormone and have a lower metabolic rate—a good way to keep alive until the mother returns, but a reaction that stunts growth if prolonged. Infant monkeys allowed to see, hear, and smell—but not touch—their mother become desperately unhappy; those separated by a screen with holes that allow touching are much less miserable. As we noted in Chapter 4, premature human babies gain weight faster and go home sooner if they are stimulated by hand massage. As lovers, we yearn to touch—to kiss, to stroke, to snuggle. And even strangers, touching only the other’s forearms and separated by a curtain, can communicate anger, fear, disgust, love, gratitude, and sympathy at levels well above chance (Hertenstein et al., 2006).

Humorist Dave Barry may be right to jest that your skin “keeps people from seeing the inside of your body, which is repulsive, and it prevents your organs from falling onto the ground.” But skin does much more. Touching various spots on the skin with a soft hair, a warm or cool wire, and the point of a pin reveals that some spots are especially sensitive to pressure, others to warmth, others to cold, still others to pain. Our “sense of touch” is actually a mix of these four basic and distinct skin senses, and our other skin sensations are variations of pressure, warmth, cold, and pain:

- Stroking adjacent pressure spots creates a tickle.
- Repeated gentle stroking of a pain spot creates an itching sensation.
- Touching adjacent cold and pressure spots triggers a sense of wetness, which you can experience by touching dry, cold metal.

Touch sensations involve more than tactile stimulation, however. A self-administered tickle produces less somatosensory cortex activation than does the same tickle from something or someone else (Blakemore et al., 1998). (The brain is wise enough to be most sensitive to unexpected stimulation.)

Pain



6-17: How can we best understand and control pain?

Be thankful for occasional pain. Pain is your body’s way of telling you something has gone wrong. Drawing your attention to a burn, a break, or a sprain, pain orders you to change your behavior—“Stay off that turned ankle!” The rare people born without the ability to feel pain may experience severe injury or even die before early adulthood. Without the discomfort that makes us occasionally shift position, their joints fail from excess strain, and without the warnings of pain, the effects of unchecked infections and injuries accumulate (Neese, 1991).

gate-control theory the theory that the spinal cord contains a neurological “gate” that blocks pain signals or allows them to pass on to the brain. The “gate” is opened by the activity of pain signals traveling up small nerve fibers and is closed by activity in larger fibers or by information coming from the brain.

More numerous are those who live with chronic pain, which is rather like an alarm that won't shut off. The suffering of such people, and of those with persistent or recurring backaches, arthritis, headaches, and cancer-related pain, prompts two questions: What is pain? How might we control it?

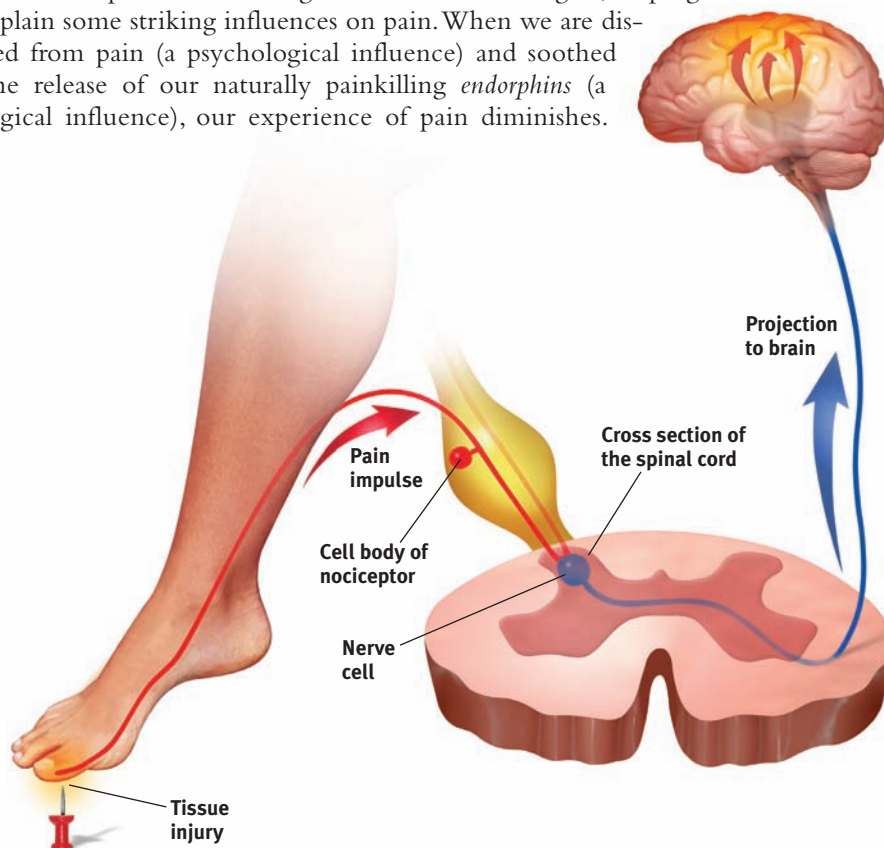
Understanding Pain

Our pain experiences vary widely. Women are more pain sensitive than men are (Wickelgren, 2009). Individual pain sensitivity varies, too, depending on genes, physiology, experience, attention, and surrounding culture (Gatchel et al., 2007; Reimann et al., 2010). Thus, our experience of pain reflects both bottom-up sensations and top-down cognition.

Biological Influences There is no one type of stimulus that triggers pain (as light triggers vision). Instead, there are different *nociceptors*—sensory receptors that detect hurtful temperatures, pressure, or chemicals (FIGURE 6.38).

Although no theory of pain explains all available findings, psychologist Ronald Melzack and biologist Patrick Wall's (1965, 1983) classic **gate-control theory** provides a useful model. The spinal cord contains small nerve fibers that conduct most pain signals, and larger fibers that conduct most other sensory signals. Melzack and Wall theorized that the spinal cord contains a neurological "gate." When tissue is injured, the small fibers activate and open the gate, and you feel pain. Large-fiber activity closes the gate, blocking pain signals and preventing them from reaching the brain. Thus, one way to treat chronic pain is to stimulate (by massage, electric stimulation, or acupuncture) "gate-closing" activity in the large neural fibers (Wall, 2000).

But pain is not merely a physical phenomenon of injured nerves sending impulses to a definable brain area—like pulling on a rope to ring a bell. Melzack and Wall noted that brain-to-spinal-cord messages can also close the gate, helping to explain some striking influences on pain. When we are distracted from pain (a psychological influence) and soothed by the release of our naturally painkilling *endorphins* (a biological influence), our experience of pain diminishes.



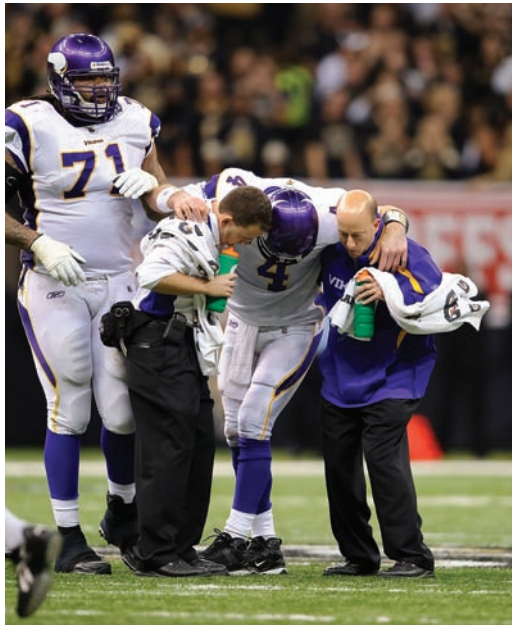
A pain-free, problematic life Ashlyn Blocker (right), shown here with her mother and sister, has a rare genetic disorder. She feels neither pain nor extreme hot and cold. She must frequently be checked for accidentally self-inflicted injuries that she herself cannot feel. "Some people would say [that feeling no pain is] a good thing," says her mother. "But no, it's not. Pain's there for a reason. It lets your body know something's wrong and it needs to be fixed. I'd give anything for her to feel pain" (quoted by Bynum, 2004).



AP Photo/Stephen Morton

FIGURE 6.38

The pain circuit Sensory receptors (*nociceptors*) respond to potentially damaging stimuli by sending an impulse to the spinal cord, which passes the message to the brain, which interprets the signal as pain.



AP Photo/Paul Abell

Playing with pain In a 2010 Super Bowl playoff game, Vikings quarterback Brett Favre seriously injured his ankle and hamstring. He was taken out of the game briefly but came back and played through the pain, which reclaimed his attention after the game's end.

Sports injuries may go unnoticed until the after-game shower. People who carry a gene that boosts the availability of endorphins are less bothered by pain, and their brain is less responsive to pain (Zubieta et al., 2003). Others who carry a mutated gene that disrupts pain circuit neurotransmission experience little pain (Cox et al., 2006). Such discoveries may point the way toward new pain medications that mimic these genetic effects.

The brain can also create pain, as it does in people's experiences of *phantom limb sensations*, after a limb has been amputated. Their brain may misinterpret the spontaneous central nervous system activity that occurs in the absence of normal sensory input: As the dreamer may see with eyes closed, so 7 in 10 such people may feel pain or movement in nonexistent limbs (Melzack, 1992, 2005). (Some may also try to step off a bed onto a phantom limb or to lift a cup with a phantom hand.) Even those born without a limb sometimes perceive sensations from the absent arm or leg. The brain, Melzack (1998) has surmised, comes prepared to anticipate "that it will be getting information from a body that has limbs."

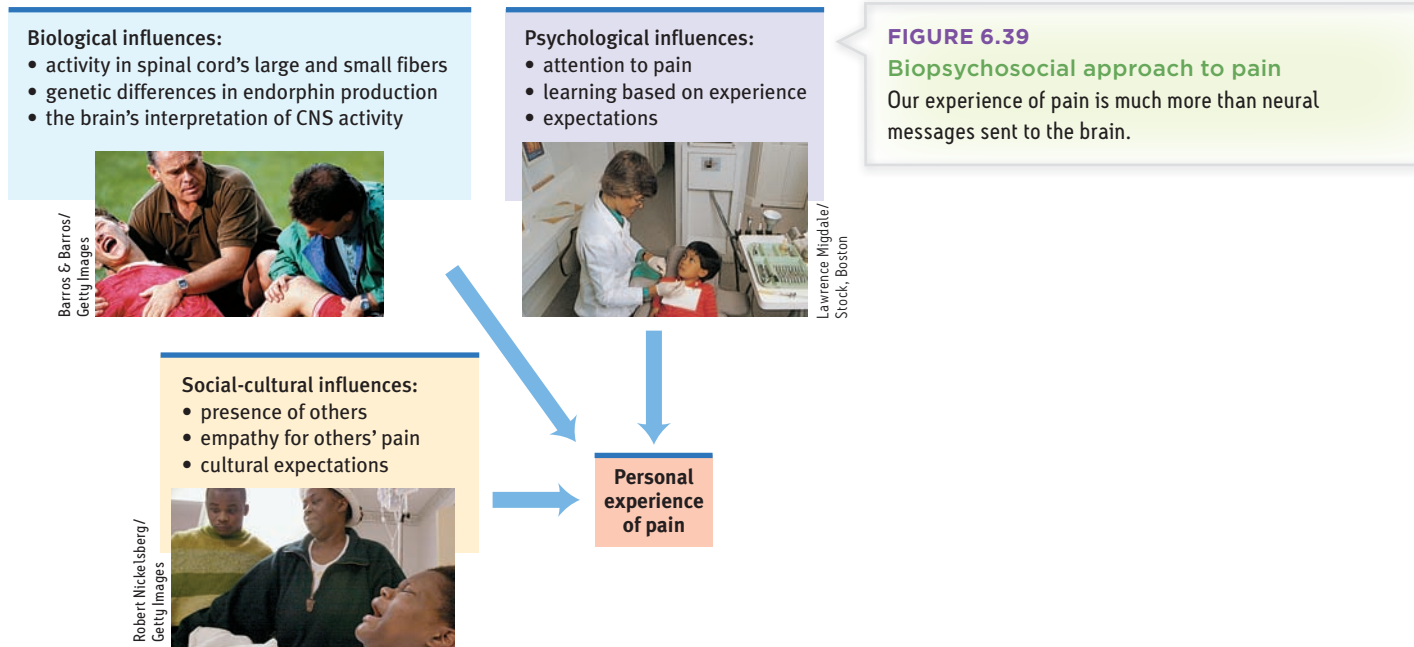
A similar phenomenon occurs with other senses. People with hearing loss often experience the sound of silence: phantom sounds—a ringing-in-the-ears sensation known as *tinnitus*. Those who lose vision to glaucoma, cataracts, diabetes, or macular degeneration may experience phantom sights—nonthreatening hallucinations (Ramachandran & Blakeslee, 1998). Some with nerve damage have had taste phantoms, such as ice water seeming sickeningly sweet (Goode, 1999). Others have experienced phantom smells, such as nonexistent rotten food. The point to remember: *We feel, see, hear, taste, and smell with our brain*, which can sense even without functioning senses.

Psychological Influences The psychological effects of distraction are clear in the stories of athletes who, focused on winning, play through the pain. We also seem to edit our *memories* of pain, which often differ from the pain we actually experienced. In experiments, and after medical procedures, people overlook a pain's duration. Their memory snapshots instead record two factors: their pain's *peak* moment (which can lead them to recall variable pain, with peaks, as worse [Stone et al., 2005]), and how much pain they felt at the *end*.

In one experiment, researchers asked people to immerse one hand in painfully cold water for 60 seconds, and then the other hand in the same painfully cold water for 60 seconds followed by a slightly less painful 30 seconds more (Kahneman et al., 1993). Which experience would you expect to recall as most painful? Curiously, when asked which trial they would prefer to repeat, most preferred the longer trial, with more net pain—but less pain at the end. Physicians have used this principle with patients undergoing colon exams—lengthening the discomfort by a minute, but lessening its intensity (Kahneman, 1999). Although the extended milder discomfort added to their net pain experience, patients experiencing this taper-down treatment later recalled the exam as less painful than did those whose pain ended abruptly. (If, at the end of a painful root canal, the oral surgeon asks if you'd like to go home or to have a few more minutes of milder discomfort, there's a case to be made for prolonging your hurt.)

Social-Cultural Influences Our perception of pain also varies with our social situation and our cultural traditions. We tend to perceive more pain when others also seem to be experiencing pain (Symbaluk et al., 1997). This may help explain other apparent social aspects of pain, as when pockets of Australian keyboard operators during the mid-1980s suffered outbreaks of severe pain during typing or other repetitive work—without any discernible physical abnormalities (Gawande, 1998). Sometimes the pain in sprain is mainly in the brain—literally. When feeling empathy for another's pain, a person's own brain activity may partly mirror that of the other's brain in pain (Singer et al., 2004).

Thus, our perception of pain is a biopsychosocial phenomenon (**FIGURE 6.39**). Viewing pain this way can help us better understand how to cope with pain and treat it.



Controlling Pain

If pain is where body meets mind—if it is both a physical and a psychological phenomenon—then it should be treatable both physically and psychologically. Depending on the patient's symptoms, pain control clinics select one or more therapies from a list that includes drugs, surgery, acupuncture, electrical stimulation, massage, exercise, hypnosis, relaxation training, and thought distraction.

Even an inert placebo can help, by dampening the central nervous system's attention and responses to painful experiences—mimicking analgesic drugs (Eippert et al., 2009; Wager, 2005). After being injected in the jaw with a stinging saltwater solution, men in one experiment received a placebo said to relieve pain, and they immediately felt better. Being given fake pain-killing chemicals caused the brain to dispense real ones, as indicated by activity in an area that releases natural pain-killing opiates (Scott et al., 2007; Zubieta et al., 2005). “Believing becomes reality,” noted one commentator (Thernstrom, 2006), as “the mind unites with the body.”

Distraction also works. Presenting pleasant images (“Think of a warm, comfortable environment”) or drawing attention away from painful stimulation (“Count backward by 3’s”) are especially effective ways to activate pain-inhibiting circuits and increase pain tolerance (Edwards et al., 2009). A well-trained nurse may chat with needle-shy patients and ask them to look away when inserting the needle. For burn victims receiving excruciating wound care, an even more effective distraction comes from immersion in a computer-generated 3-D world, like the snow scene in **FIGURE 6.40** on the next page. Functional MRI (fMRI) scans reveal that playing in the virtual reality reduces the brain's pain-related activity (Hoffman, 2004). Because pain is in the brain, diverting the brain's attention may bring relief.

“Pain is increased by attending to it.”

Charles Darwin, Expression of Emotions in Man and Animals, 1872

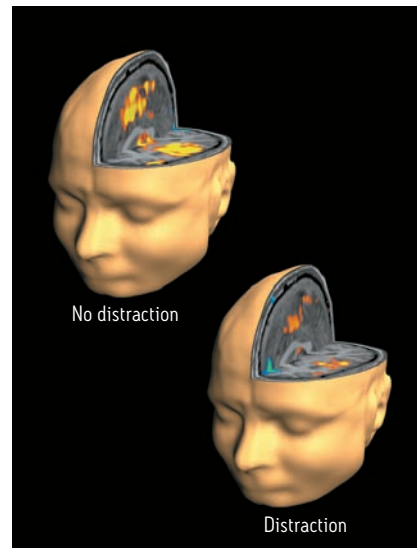


Gary Comer/PhototakeUSA.com

Acupuncture: A job well done This acupuncturist is attempting to help this woman gain relief from back pain by using needles on points of the patient's hand.



Image by Todd Richards and Aric Britts, U.W., ©Hunter Hoffman, www.vrpain.com

**FIGURE 6.40**

Virtual-reality pain control For burn victims undergoing painful skin repair, an escape into virtual reality can powerfully distract attention, thus reducing pain and the brain's response to painful stimulation. The fMRI scans on the right illustrate a lowered pain response when the patient is distracted.

RETRIEVE IT

- Which of the following options has NOT been proven to reduce pain?
 - Distraction
 - Placebos
 - Phantom limb sensations
 - Endorphins

ANSWER: c.

Taste**6-18: How do we experience taste and smell?**

Like touch, our sense of taste involves several basic sensations. Taste's sensations were once thought to be sweet, sour, salty, and bitter, with all others stemming from mixtures of these four (McBurney & Gent, 1979). Then, as investigators searched for specialized nerve fibers for the four taste sensations, they encountered a receptor for what we now know is a fifth—the savory meaty taste of *umami*, best experienced as the flavor enhancer monosodium glutamate.

Tastes exist for more than our pleasure (see **TABLE 6.2**). Pleasureful tastes attracted our ancestors to energy- or protein-rich foods that enabled their survival. Aversive tastes deterred them from new foods that might be toxic. We see the inheritance of this biological wisdom in today's 2- to 6-year-olds, who are typically fussy eaters, especially when offered new meats or bitter-tasting vegetables, such as spinach and brussels sprouts (Cooke et al., 2003). Meat and plant toxins were both potentially dangerous sources of food poisoning for our ancestors, especially for children. Given repeated small tastes of disliked new foods, children will, however, typically begin to accept them (Wardle et al., 2003).

Taste is a chemical sense. Inside each little bump on the top and sides of your tongue are 200 or more taste buds, each containing a pore that catches food chemicals. Into each taste bud pore, 50 to 100 taste receptor cells project antenna-like hairs that sense food molecules. Some receptors respond mostly to sweet-tasting molecules, others to salty-, sour-, umami-, or bitter-tasting ones. It doesn't take much to trigger a response that alerts your brain's temporal lobe. If a stream of water is pumped across your tongue, the addition of a concentrated salty or sweet taste for but one-tenth of a second will get your attention (Kelling & Halpern, 1983). When a friend asks for “just a taste” of your soft drink, you can squeeze off the straw after a mere instant.

Taste receptors reproduce themselves every week or two, so if you burn your tongue with hot food it hardly matters. However, as you grow older, the number of taste buds decreases, as does taste sensitivity (Cowart, 1981). (No wonder adults enjoy

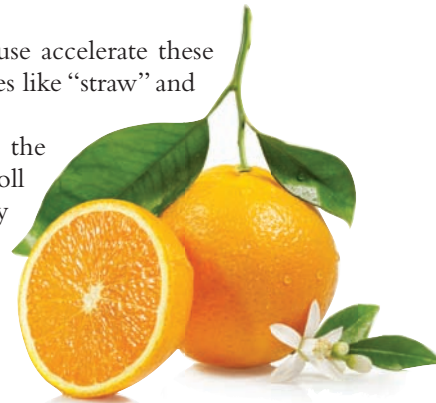
Table 6.2**The Survival Functions of Basic Tastes**

Taste	Indicates
Sweet	Energy source
Salty	Sodium essential to physiological processes
Sour	Potentially toxic acid
Bitter	Potential poisons
Umami	Proteins to grow and repair tissue

(Adapted from Cowart, 2005.)

strong-tasting foods that children resist.) Smoking and alcohol use accelerate these declines. Those who lose their sense of taste report that food tastes like “straw” and is hard to swallow (Coward, 2005).

Essential as taste buds are, there’s more to taste than meets the tongue. Expectations can influence taste. When told a sausage roll was “vegetarian,” people in one experiment found it decidedly inferior to its identical partner labeled “meat” (Allen et al., 2008). In another experiment, being told that a wine cost \$90 rather than its real \$10 price made it taste better and triggered more activity in a brain area that responds to pleasant experiences (Plassmann et al., 2008).



Lauren Burke/Jupiterimages

Impress your friends with your new word for the day: People unable to see are said to experience blindness. People unable to hear experience deafness. People unable to smell experience *anosmia*.

Smell

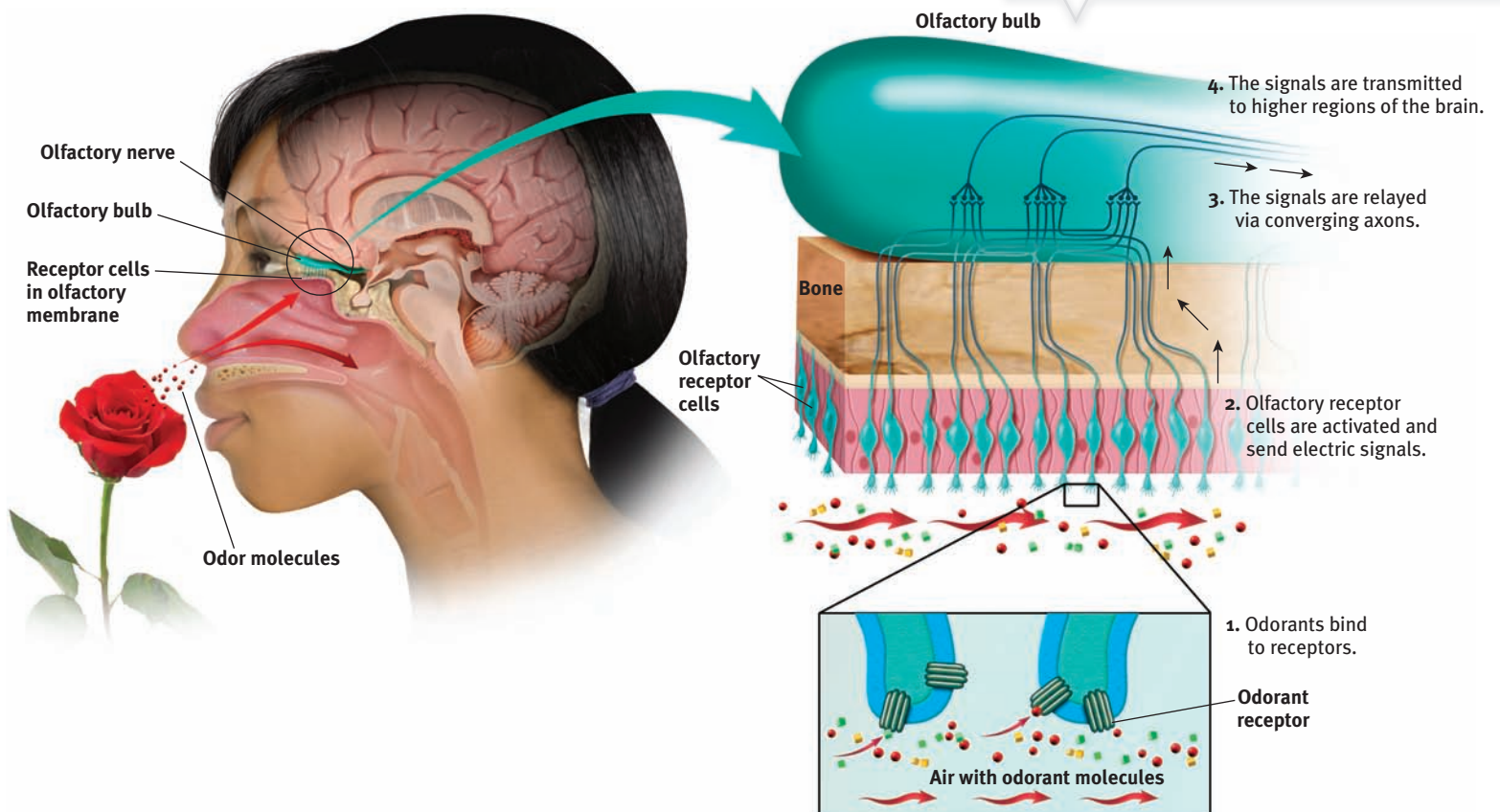
Inhale, exhale. Inhale, exhale. Breaths come in pairs—beginning at birth and ending at death. Between those two moments, you will daily inhale and exhale nearly 20,000 breaths of life-sustaining air, bathing your nostrils in a stream of scent-laden molecules. The resulting experiences of smell (*olfaction*) are strikingly intimate: You inhale something of whatever or whoever it is you smell.

Like taste, smell is a chemical sense. We smell something when molecules of a substance carried in the air reach a tiny cluster of 5 million or more receptor cells at the top of each nasal cavity (FIGURE 6.41). These olfactory receptor cells, waving like sea anemones on a reef, respond selectively—to the aroma of a cake baking, to a wisp of smoke, to a friend’s fragrance. Instantly, they alert the brain through their axon fibers.

Research has shown that even nursing infants and their mothers have a literal chemistry to their relationship: They quickly learn to recognize each other’s scents (McCarthy, 1986). Aided by smell, a mother fur seal returning to a beach crowded with pups will find her own. Our human sense of smell is less acute than our senses

FIGURE 6.41

The sense of smell If you are to smell a flower, airborne molecules of its fragrance must reach receptors at the top of your nose. Sniffing swirls air up to the receptors, enhancing the aroma. The receptor cells send messages to the brain’s olfactory bulb, and then onward to the temporal lobe’s primary smell cortex and to the parts of the limbic system involved in memory and emotion.





Tish1/Shutterstock

of seeing and hearing. Looking out across a garden, we see its forms and colors in exquisite detail and hear a variety of birds singing, yet we smell little of it without sticking our nose into the blossoms.

Odor molecules come in many shapes and sizes—so many, in fact, that it takes many different receptors to detect them. A large family of genes designs the 350 or so receptor proteins that recognize particular odor molecules (Miller, 2004). Linda Buck and Richard Axel (1991) discovered (in work for which they received a 2004 Nobel Prize) that these receptor proteins are embedded on the surface of nasal cavity neurons. As a key slips into a lock, so odor molecules slip into these receptors. Yet we don't seem to have a distinct receptor for each detectable odor. This suggests that some odors trigger a combination of receptors, in patterns that are interpreted by the olfactory cortex. As the English alphabet's 26 letters can combine to form many words, so odor molecules bind to different receptor arrays, producing the 10,000 odors we can detect (Malnic et al., 1999). It is the combinations of olfactory receptors, which activate different neuron patterns, that allow us to distinguish between the aromas of fresh-brewed and hours-old coffee (Zou et al., 2005).

For humans, the attractiveness of smells depends on learned associations (Herz, 2001). As babies nurse, their preference for the smell of their mother's breast builds. So, too, with other associations. As good experiences are linked with a particular scent, people come to like that scent, which helps explain why people in the United States tend to like the smell of wintergreen (which they associate with candy and gum) more than do those in Great Britain (where it often is associated with medicine). In another example of odors evoking unpleasant emotions, researchers frustrated Brown University students with a rigged computer game in a scented room (Herz et al., 2004). Later, if exposed to the same odor while working on a verbal task, the students' frustration was rekindled and they gave up sooner than others exposed to a different odor or no odor.

Though it's difficult to recall odors by name, we have a remarkable capacity to recognize long-forgotten odors and their associated memories (Engen, 1987; Schab, 1991). The smell of the sea, the scent of a perfume, or an aroma of a favorite relative's kitchen can bring to mind a happy time. It's a phenomenon the British travel agent chain Lunn Poly understood well. To evoke memories of lounging on sunny, warm beaches, the company once piped the aroma of coconut suntan oil into its shops (Fracassini, 2000).

Our brain's circuitry helps explain an odor's power to evoke feelings and memories (**FIGURE 6.42**). A hotline runs between the brain area receiving information from the nose and the brain's ancient limbic centers associated with memory and emotion. Thus, when put in a foul-smelling room, people expressed harsher judgments of immoral acts (such as lying or keeping a found wallet) and more negative attitudes toward gay men (Inbar et al., 2011; Schnall et al., 2008).

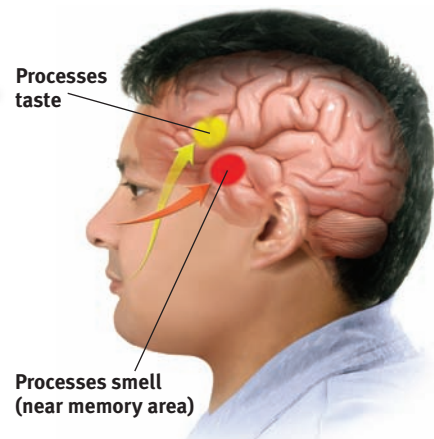


AP Photo/ The Charlotte Observer. Layne Bailey

The nose knows Humans have 10 to 20 million olfactory receptors. A bloodhound has some 200 million (Herz, 2001).

FIGURE 6.42

Taste, smell, and memory Information from the taste buds (yellow arrow) travels to an area between the frontal and temporal lobes of the brain. It registers in an area not far from where the brain receives information from our sense of smell, which interacts with taste. The brain's circuitry for smell (red circle) also connects with areas involved in memory storage, which helps explain why a smell can trigger a memory.



RETRIEVE IT

- How does our system for sensing smell differ from our sensory systems for vision, touch, and taste?

ANSWER: We have two types of retinal receptors, four basic touch senses, and five taste sensations. But we have no basic smell receptors. Instead, different combinations of odor receptors send messages to the brain, enabling us to recognize some 10,000 different smells.

Body Position and Movement



6-19: How do we sense our body's position and movement?

Important sensors in your joints, tendons, and muscles enable your **kinesthesia**—your sense of the position and movement of your body parts. By closing your eyes or plugging your ears you can momentarily imagine being without sight or sound. But what would it be like to live without touch or kinesthesia—without, therefore, being able to sense the positions of your limbs when you wake during the night? Ian Waterman of Hampshire, England, knows. In 1972, at age 19, Waterman contracted a rare viral infection that destroyed the nerves enabling his sense of light touch and of body position and movement. People with this condition report feeling disembodied, as though their body is dead, not real, not theirs (Sacks, 1985). With prolonged practice, Waterman has learned to walk and eat—by visually focusing on his limbs and directing them accordingly. But if the lights go out, he crumples to the floor (Azar, 1998). Even for the rest of us, vision interacts with kinesthesia. Stand with your right heel in front of your left toe. Easy. Now close your eyes and you will probably wobble.

A companion **vestibular sense** monitors your head's (and thus your body's) position and movement. The biological gyroscopes for this sense of equilibrium are in your inner ear. The *semicircular canals*, which look like a three-dimensional pretzel (Figure 6.35a), and the *vestibular sacs*, which connect the canals with the cochlea, contain fluid that moves when your head rotates or tilts. This movement stimulates hairlike receptors, which send messages to the cerebellum at the back of the brain, thus enabling you to sense your body position and to maintain your balance.

If you twirl around and then come to an abrupt halt, neither the fluid in your semi-circular canals nor your kinesthetic receptors will immediately return to their neutral state. The dizzy aftereffect fools your brain with the sensation that you're still spinning. This illustrates a principle that underlies perceptual illusions: Mechanisms that normally give us an accurate experience of the world can, under special conditions, fool us. Understanding how we get fooled provides clues to how our perceptual system works.

RETRIEVE IT

- Where are kinesthetic sense and vestibular sense receptors located?

ANSWER: Kinesthetic sense receptors are located in our joints, tendons, and muscles. Vestibular sense receptors are located in our inner ear.

Sensory Interaction



6-20: How do our senses interact?

Our senses—seeing, hearing, touching, tasting, smelling—are not totally separate information channels. In interpreting the world, our brain blends their inputs. Consider what happens to your sense of taste if you hold your nose, close your eyes, and have someone feed you various foods. A slice of apple may be



© Robert Kanavel

Bodies in space These high school competitive cheer team members can thank their inner ears for the information that enables their brains to monitor their bodies' position so expertly.

kinesthesia [kin-ehs-THÉE-sehs] the system for sensing the position and movement of individual body parts.

vestibular sense the sense of your head's (and thus your body's) movement and position, including the sense of balance.

sensory interaction the principle that one sense may influence another, as when the smell of food influences its taste.

indistinguishable from a chunk of raw potato. A piece of steak may taste like cardboard. Without their smells, a cup of cold coffee may be hard to distinguish from a glass of red wine. To savor a taste, we normally breathe the aroma through our nose—which is why eating is not much fun when you have a bad cold. Smell can also change our perception of taste: A drink’s strawberry odor enhances our perception of its sweetness. Even touch can influence taste. Depending on its texture, a potato chip “tastes” fresh or stale (Smith, 2011). This is **sensory interaction** at work—the principle that one sense may influence another. Smell + texture + taste = flavor.

Vision and hearing may similarly interact. An almost imperceptible flicker of light is more easily visible when accompanied by a short burst of sound (Kayser, 2007). And a sound may be easier to hear with a visual cue. If I (as a person with hearing loss) watch a video with simultaneous captioning, I have no trouble hearing the words I am seeing (and may therefore think I don’t need the captioning). If I then turn off the captioning, I suddenly realize I do need it. The eyes guide the ears (**FIGURE 6.43**).

But what do you suppose happens if the eyes and the ears disagree? What if we *see* a speaker saying one syllable while we *hear* another? Surprise: We may perceive a third syllable that blends both inputs. Seeing the mouth movements for *ga* while hearing *ba* we may perceive *da*. This phenomenon is known as the *McGurk effect*, after its discoverers, psychologist Harry McGurk and his assistant John MacDonald (1976).

Touch also interacts with our other senses. In detecting events, the brain can combine simultaneous touch and visual signals, thanks to neurons projecting from the somatosensory cortex back to the visual cortex (Macaluso et al., 2000). Touch even interacts with hearing. In one experiment, researchers blew a puff of air (such as our mouths produce when saying *pa* and *ta*) on the neck or hands as people heard either these sounds or the more airless sounds *ba* or *da*. To my surprise (and yours?), the people more often misheard *ba* or *da* as *pa* or *ta* when played with the faint puff (Gick & Derrick, 2009). Thanks to sensory interaction, they were hearing with their skin.

Our brain even blends our tactile and social judgments:

- After holding a warm drink rather than a cold one, people are more likely to rate someone more warmly, feel closer to them, and behave more generously (IJzerman & Semin, 2009; Williams & Bargh, 2008). Physical warmth promotes social warmth.
- After being given the cold shoulder by others in an experiment, people judge the room as colder than do those treated warmly (Zhong & Leonardelli, 2008). Social exclusion literally feels cold.



FIGURE 6.43

Sensory interaction When a hard-of-hearing listener sees an animated face forming the words being spoken at the other end of a phone line, the words become easier to understand (Knight, 2004).

- Holding a heavy rather than light clipboard makes job candidates seem more important. Holding rough objects makes social interactions seem more difficult (Ackerman et al., 2010).
- When leaning to the left—by sitting in a left- rather than right-leaning chair, or squeezing a hand-grip with their left hand, or using a mouse with their left hand—people lean more left in their expressed political attitudes (Oppenheimer & Trail, 2010).

These examples of **embodied cognition** illustrate how brain circuits processing our bodily sensations connect with brain circuits responsible for cognition.

So, the senses interact: As we attempt to decipher our world, our brain blends inputs from multiple channels. For many people, an odor, perhaps of mint or chocolate, can evoke a sensation of taste (Stevenson & Tomiczek, 2007). But in a few select individuals, the senses become joined in a phenomenon called *synaesthesia*, where one sort of sensation (such as hearing sound) produces another (such as seeing color). Thus, hearing music may activate color-sensitive cortex regions and trigger a sensation of color (Brang et al., 2008; Hubbard et al., 2005). Seeing the number 3 may evoke a taste sensation (Ward, 2003).

For a summary of our sensory systems, see **TABLE 6.3**. The river of perception is fed by sensation, cognition, and emotion. And that is why we need biological, psychological, and social-cultural levels of analysis.

If perception is the product of these three sources, what can we say about extra-sensory perception, which claims that perception can occur apart from sensory input? For more on that question, see Thinking Critically About: ESP—Perception Without Sensation? on the next page.

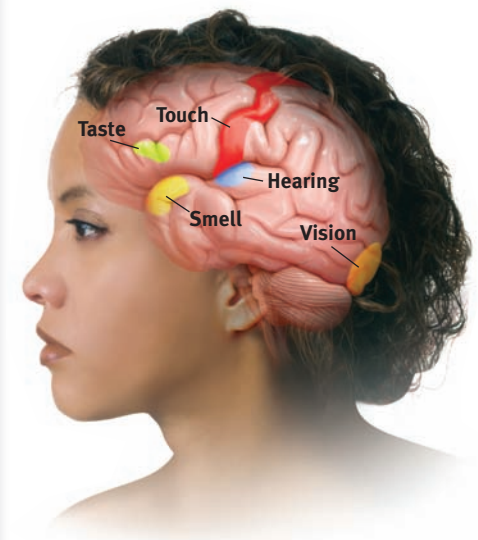
To feel awe, mystery, and a deep reverence for life, we need look no further than our own perceptual system and its capacity for organizing formless nerve impulses into colorful sights, vivid sounds, and evocative smells. As Shakespeare’s Hamlet recognized, “There are more things in Heaven and Earth, Horatio, than are dreamt of in your philosophy.” Within our ordinary sensory and perceptual experiences lies much that is truly extraordinary—surely much more than has so far been dreamt of in our psychology.

embodied cognition the influence of bodily sensations, gestures, and other states on cognitive preferences and judgments.

Table 6.3
Summarizing the Senses

Sensory System	Source	Receptors
Vision	Light waves striking the eye	Rods and cones in the retina
Hearing	Sound waves striking the outer ear	Cochlear hair cells in the inner ear
Touch	Pressure, warmth, cold on the skin	Skin receptors detect pressure, warmth, cold, and pain
Taste	Chemical molecules in the mouth	Basic tongue receptors for sweet, sour, salty, bitter, and umami
Smell	Chemical molecules breathed in through the nose	Millions of receptors at top of nasal cavity
Position/movement of body parts—kinesthesia	Any change in position of a body part, interacting with vision	Kinesthetic sensors in joints, tendons, and muscles
Position/movement of head—vestibular sense	Movement of fluids in the inner ear caused by head/body movement	Hairlike receptors in the semi-circular canals and vestibular sacs

Sensory information travels to these areas of the brain’s cerebral cortex:



THINKING CRITICALLY ABOUT:

ESP—Perception Without Sensation?



6-21: What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test?

Without sensory input, are we capable of **extrasensory perception (ESP)**? Are there indeed people—any people—who can read minds, see through walls, or foretell the future? Nearly half of Americans believe there are (AP, 2007; Moore, 2005).

The most testable and, for this chapter, most relevant parapsychological concepts are claims of

- *telepathy*: mind-to-mind communication.
- *clairvoyance*: perceiving remote events, such as a house on fire in another state.
- *precognition*: perceiving future events, such as an unexpected death in the next month.

Closely linked is *psychokinesis*, or “mind over matter,” such as levitating a table or influencing the roll of a die. (The claim is illustrated by the wry request, “Will all those who believe in psychokinesis please raise my hand?”)

If ESP is real, we would need to overturn the scientific understanding that we are creatures whose minds are tied to our physical brains and whose perceptual experiences of the world are built of sensations. Sometimes new evidence does overturn our scientific preconceptions.

Science, as we will see throughout this book, offers us various surprises—about the extent of the unconscious mind, about the effects of emotions on health, about what heals and what doesn’t, and much more.

Most research psychologists and scientists—including 96 percent of the scientists in the U.S. National Academy of Sciences—have been skeptical that paranormal phenomena exist (McConnell, 1991). But in reputable universities in many locations, including Great Britain, the Netherlands, and Australia, faculty researchers in **parapsychology** perform scientific experiments searching for possible ESP and other paranormal phenomena (Storm, 2010a,b; Turpin, 2005). Before seeing how they do research on ESP, let’s consider some popular beliefs.

Premonitions or Pretensions?

Can psychics see into the future? Although one might wish for a psychic stock forecaster, the tallied forecasts of “leading psychics” reveal meager accuracy. During the 1990s, the tabloid psychics were all wrong in predicting surprising events. (Madonna did not become a gospel singer, the Statue of Liberty did not lose both its arms in a terrorist blast, Queen Elizabeth did not abdicate her throne to enter a convent.) And the psychics have missed recent big-news events. Where were the psychics on 9/11 when we needed them? Why, despite a \$50 million reward offered, could none of them help locate Osama bin Laden after 9/11, or step forward to predict the impending stock crashes in 2008? In 30 years, unusual predictions have almost never come true, and psychics have virtually never anticipated any of the year’s headline events (Emery, 2004, 2006). In 2010, when a mine collapse trapped 33 miners, the Chilean government reportedly consulted four psychics. Their verdict? “They’re all dead” (Kraul, 2010). But 69 days later, all 33 were rescued.

Moreover, the hundreds of psychic visions offered to police departments have been no

more accurate than guesses made by others (Nickell, 1994, 2005; Radford, 2010; Reiser, 1982). Their sheer volume does, however, increase the odds of an occasional correct guess, which psychics can then report to the media. Police departments are wise to all this. When researchers asked the police departments of America’s 50 largest cities whether they ever had used psychics, 65 percent said *No* (Sweat & Durm, 1993). Of those that had, not one had found them helpful.

Psychics’ vague predictions sometimes sound correct when later interpreted (“retrofitted”) to match events that provide a perceptual set for “understanding” them. Nostradamus, a sixteenth-century French psychic, explained in an unguarded moment that his ambiguous prophecies “could not possibly be understood till they were interpreted after the event and by it.”

Are the spontaneous “visions” of everyday people any more accurate? Do dreams, for example, foretell the future, as people from both Eastern and Western cultures tend to believe—making some people more reluctant to fly after dreaming of a plane crash (Morewedge & Norton, 2009)? Or do they only seem to do so when we recall or reconstruct them in light of what has already happened? Two Harvard psychologists tested the prophetic power of dreams after superhero aviator Charles Lindbergh’s baby son was kidnapped and murdered in 1932, but before the body was discovered (Murray & Wheeler, 1937). When invited to report their dreams about the child, 1300 visionaries submitted dream reports. How many accurately envisioned the child

“To be sure of hitting the target, shoot first and call whatever you hit the target.”

Writer-artist Ashleigh Brilliant, 1933–

“A person who talks a lot is sometimes right.”

Spanish proverb



dead? Five percent. And how many also correctly anticipated the body's location—buried among trees? Only 4 of the 1300. Although this number was surely no better than chance, to those 4 dreamers the accuracy of their apparent precognitions must have seemed uncanny.

Given the billions of events in the world each day, and given enough days, some stunning coincidences are sure to occur. By one careful estimate, chance alone would predict that more than a thousand times a day someone on Earth will think of another person and then within the next five minutes will learn of that person's death (Charpak & Broch, 2004). Thus, when explaining an astonishing event, we should “give chance a chance” (Lilienfeld, 2009). With enough time and people, the improbable becomes inevitable.

Putting ESP to Experimental Test

When faced with claims of mind reading or out-of-body travel or communication with the dead, how can we separate bizarre ideas from those that sound bizarre but are true? At the heart of science is a simple answer: *Test them to see if they work.* If they do, so much the better for the ideas. If they don't, so much the better for our skepticism.

This scientific attitude has led both believers and skeptics to agree that what

“At the heart of science is an essential tension between two seemingly contradictory attitudes—an openness to new ideas, no matter how bizarre or counterintuitive they may be, and the most ruthless skeptical scrutiny of all ideas, old and new.”

Carl Sagan (1987)

Magician Harry Houdini after fooling Sir Arthur Conan Doyle with a pseudo-psychic trick: “Now I beg of you, Sir Arthur, do not jump to the conclusion that certain things you see are necessarily ‘supernatural,’ or with the work of ‘spirits,’ just because you cannot explain them.”

Quoted by William Kalush and Larry Sloman, *The Secret Life of Houdini*, 2007



Courtesy of Claire Cole

Testing psychic powers in the British population Hertfordshire University psychologist Richard Wiseman created a “mind machine” to see if people could influence or predict a coin toss. Using a touch-sensitive screen, visitors to festivals around the country were given four attempts to call heads or tails. Using a random-number generator, a computer then decided the outcome. When the experiment concluded in January 2000, nearly 28,000 people had predicted 110,972 tosses—with 49.8 percent correct.

parapsychology needs is a reproducible phenomenon and a theory to explain it. Parapsychologist Rhea White (1998) spoke for many in saying “The image of parapsychology that comes to my mind, based on nearly 44 years in the field, is that of a small airplane [that] has been perpetually taxiing down the runway of the Empirical Science Airport since 1882 . . . its movement punctuated occasionally by lifting a few feet off the ground only to bump back down on the tarmac once again. It has never taken off for any sustained flight.”

How might we test ESP claims in a controlled, reproducible experiment? An experiment differs from a staged demonstration: In the laboratory, the experimenter controls what the “psychic” sees and hears; on stage, the psychic controls what the audience sees and hears.

Daryl Bem, a respected social psychologist, has been a skeptic of stage psychics;

he once quipped that “a psychic is an actor playing the role of a psychic” (1984). Yet he has reignited hopes for replicable evidence with nine experiments that seemed to show people anticipating future events (2011). In one, when an erotic scene was about to appear on a screen in one of two randomly selected positions, Cornell University participants guessed right 53.1 percent of the time (beating 50 percent by a small but statistically significant margin).

•••••
extrasensory perception (ESP) the controversial claim that perception can occur apart from sensory input; includes telepathy, clairvoyance, and precognition.

parapsychology the study of paranormal phenomena, including ESP and psychokinesis.

Continued on next page

In another, people viewed a set of words, took a recall test of those words, and then rehearsed a randomly selected subset of those words. People better remembered the rehearsed words—even though the rehearsal took place *after* the recall test. The upcoming rehearsal—a future event—apparently affected their ability to recall words.

Despite the published research having survived critical reviews by a top-tier journal, other critics found the methods “badly flawed” (Alcock, 2011) or the statistical analyses “biased” (Wagenmakers et al., 2011). “A result—especially one of this importance—must recur several times in tests by independent and skeptical researchers to gain scientific credibility,” observed astronomer David Helfand (2011). “I have little doubt that Professor Bem’s experiments will fail this test.”

Anticipating such skepticism, Bem has made his computer materials available to anyone who wishes to replicate his studies, and replications are now under way (see Ritchie et al., 2012, for three attempts to replicate Bem’s results). Regardless of the outcomes, science will have done its work. It will have been open to a finding that challenges its own worldview, and then, through follow-up research, it will have assessed its validity. And that is how science sifts crazy-sounding ideas, leaving most on the historical waste heap while occasionally surprising us.

One skeptic, magician James Randi, has a long-standing offer of \$1 million to be given “to anyone who proves a genuine psychic power under proper observing conditions” (Randi, 1999; Thompson, 2010). French, Australian, and Indian groups have made similar offers of up to 200,000 euros (CFI, 2003). Large as these sums are, the scientific seal of approval would be worth far more. To refute those who say there is no ESP, one need only produce a single person who can demonstrate a single, reproducible ESP event. (To refute those who say pigs can’t talk would take but one talking pig.) So far, no such person has emerged.

RETRIEVE IT

- What is the field of study that researches claims of extrasensory perception (ESP)?

ANSWER: parapsychology

CHAPTER REVIEW

Sensation and Perception

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

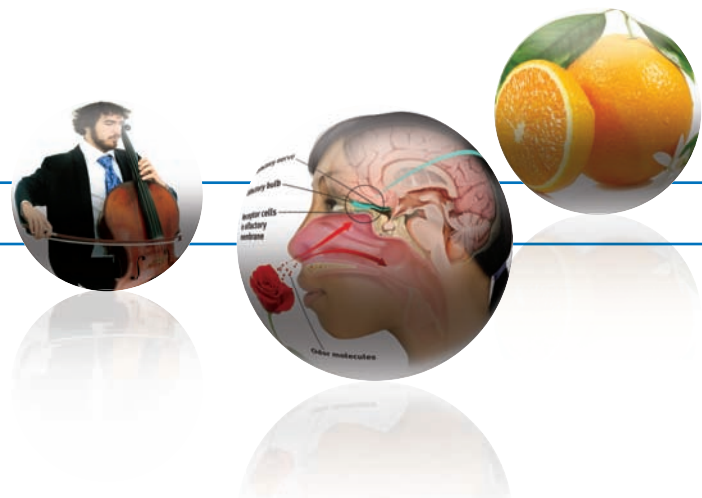
Basic Principles of Sensation and Perception

- 6-1:** What are *sensation* and *perception*? What do we mean by *bottom-up processing* and *top-down processing*?
- 6-2:** What three steps are basic to all our sensory systems?

- 6-3:** What are the absolute and difference thresholds, and do stimuli below the absolute threshold have any influence on us?
- 6-4:** What is the function of sensory adaptation?
- 6-5:** How do our expectations, contexts, emotions, and motivation influence our perceptions?

Vision

- 6-6:** What is the energy that we see as visible light?
- 6-7:** How does the eye transform light energy into neural messages, and how do the eye and brain process that information?



- 6-8:** What theories help us understand color vision?
- 6-9:** How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?
- 6-10:** How do we use binocular and monocular cues to perceive the world in three dimensions?
- 6-11:** How do perceptual constancies help us organize our sensations into meaningful perceptions?
- 6-12:** What does research on restored vision, sensory restriction, and perceptual adaptation reveal about the effects of experience on perception?

Hearing

- 6-13:** What are the characteristics of air pressure waves that we hear as sound, and how does the ear transform sound energy into neural messages?

- 6-14:** What theories help us understand pitch perception?

- 6-15:** How do we locate sounds?

The Other Senses

- 6-16:** How do we sense touch?

- 6-17:** How can we best understand and control pain?

- 6-18:** How do we experience taste and smell?

- 6-19:** How do we sense our body's position and movement?

Sensory Interaction

- 6-20:** How do our senses interact?

- 6-21:** What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

sensation, [p. 192](#)

perception, [p. 192](#)

bottom-up processing, [p. 192](#)

top-down processing, [p. 192](#)

transduction, [p. 192](#)

absolute threshold, [p. 193](#)

signal detection theory, [p. 193](#)

subliminal, [p. 194](#)

priming, [p. 194](#)

difference threshold, [p. 194](#)

Weber's law, [p. 195](#)

sensory adaptation, [p. 196](#)

perceptual set, [p. 197](#)

wavelength, [p. 200](#)

hue, [p. 200](#)

intensity, [p. 200](#)

retina, [p. 201](#)

accommodation, [p. 201](#)

rods, [p. 202](#)

cones, [p. 202](#)

optic nerve, [p. 202](#)

blind spot, [p. 202](#)

fovea, [p. 203](#)

feature detectors, [p. 204](#)

parallel processing, [p. 205](#)

Young-Helmholtz trichromatic (three-color) theory, [p. 207](#)

opponent-process theory, [p. 207](#)

gestalt, [p. 208](#)

figure-ground, [p. 209](#)

grouping, [p. 209](#)

depth perception, [p. 210](#)

visual cliff, [p. 210](#)

binocular cues, [p. 210](#)

retinal disparity, [p. 210](#)

monocular cues, [p. 211](#)

perceptual constancy, [p. 212](#)

color constancy, [p. 212](#)

perceptual adaptation, [p. 215](#)

audition, [p. 216](#)

frequency, [p. 216](#)

pitch, [p. 216](#)

middle ear, [p. 216](#)

cochlea [KOHK-lee-uh], [p. 216](#)

inner ear, [p. 216](#)

sensorineural hearing loss, [p. 217](#)

conduction hearing loss, [p. 217](#)

cochlear implant, [p. 218](#)

place theory, [p. 219](#)

frequency theory, [p. 219](#)

gate-control theory, [p. 221](#)

kinesthesia [kin-ehs-THEE-sehs], [p. 227](#)

vestibular sense, [p. 227](#)

sensory interaction, [p. 228](#)

embodied cognition, [p. 229](#)

extrasensory perception (ESP), [p. 230](#)

parapsychology, [p. 230](#)

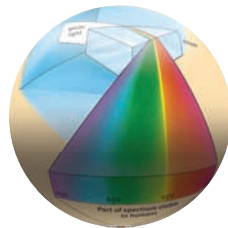
EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Sensation is to _____ as perception is to _____.
 - absolute threshold; difference threshold
 - bottom-up processing; top-down processing
 - interpretation; detection
 - grouping; priming
- The process by which we organize and interpret sensory information is called _____.
- Subliminal stimuli are
 - too weak to be processed by the brain in any way.
 - consciously perceived more than 50 percent of the time.
 - always strong enough to affect our behavior.
 - below our absolute threshold for conscious awareness.
- Another term for difference threshold is the _____.
- Weber's law states that for a difference to be perceived, two stimuli must differ by
 - a fixed or constant energy amount.
 - a constant minimum percentage.
 - a constantly changing amount.
 - more than 7 percent.
- Sensory adaptation helps us focus on
 - visual stimuli.
 - auditory stimuli.
 - constant features of the environment.
 - important changes in the environment.
- Our perceptual set influences what we perceive. This mental tendency reflects our
 - experiences, assumptions, and expectations.
 - perceptual adaptation.
 - priming ability.
 - difference thresholds.
- The characteristic of light that determines the color we experience, such as blue or green, is _____.
- The amplitude of a sound wave determines our perception of loudness. The amplitude of a light wave determines our perception of _____.
 - brightness.
 - color.
 - meaning.
 - distance.
- The blind spot in your retina is located where
 - there are rods but no cones.
 - there are cones but no rods.
 - the optic nerve leaves the eye.
 - the bipolar cells meet the ganglion cells.
- Cones are the eye's receptor cells that are especially sensitive to _____ light and are responsible for our _____ vision.
 - bright; black-and-white
 - dim; color
 - bright; color
 - dim; black-and-white
- The cells in the visual cortex that respond to certain lines, edges, and angles are called _____.
- The brain's ability to process many aspects of an object or a problem simultaneously is called _____.
- Two theories together account for color vision. The Young-Helmholtz theory shows that the eye contains _____, and the Hering theory accounts for the nervous system's having _____.
 - opposing retinal processes; three pairs of color receptors
 - opponent-process cells; three types of color receptors
 - three pairs of color receptors; opposing retinal processes
 - three types of color receptors; opponent-process cells
- What mental processes allow you to perceive a lemon as yellow?
- Our tendencies to fill in the gaps and to perceive a pattern as continuous are two different examples of the organizing principle called
 - the Ames illusion.
 - depth perception.
 - shape constancy.
 - grouping.
- In listening to a concert, you attend to the solo instrument and perceive the orchestra as accompaniment. This illustrates the organizing principle of
 - figure-ground.
 - shape constancy.
 - grouping.
 - depth perception.

18. The visual cliff experiments suggest that
- infants have not yet developed depth perception.
 - crawling human infants and very young animals perceive depth.
 - we have no way of knowing whether infants can perceive depth.
 - unlike other species, humans are able to perceive depth in infancy.
19. Depth perception underlies our ability to
- group similar items in a gestalt.
 - perceive objects as having a constant shape or form.
 - judge distances.
 - fill in the gaps in a figure.
20. Two examples of _____ depth cues are interposition and linear perspective.
21. Perceiving a tomato as consistently red, despite lighting shifts, is an example of
- shape constancy.
 - perceptual constancy.
 - a binocular cue.
 - continuity.
22. After surgery to restore vision, patients who had been blind from birth had difficulty
- recognizing objects by touch.
 - recognizing objects by sight.
 - distinguishing figure from ground.
 - distinguishing between bright and dim light.
23. In experiments, people have worn glasses that turned their visual fields upside down. After a period of adjustment, they learned to function quite well. This ability is called _____.
24. The snail-shaped tube in the inner ear, where sound waves are converted into neural activity, is called the _____.
25. What are the basic steps in transforming sound waves into perceived sound?
26. _____ theory explains how we hear high-pitched sounds, and _____ theory explains how we hear low-pitched sounds.
27. The gate-control theory of pain proposes that
- special pain receptors send signals directly to the brain.
 - pain is a property of the senses, not of the brain.
 - small spinal cord nerve fibers conduct most pain signals, but large-fiber activity can close access to those pain signals.
 - the stimuli that produce pain are unrelated to other sensations.
28. How does the biopsychosocial approach explain our experience of pain? Provide examples.
29. Why might it be helpful for people with chronic pain to meditate or exercise?
30. _____ is your sense of body position and movement. Your _____ specifically monitors your head's movement, with sensors in the inner ear.
31. Why do you feel a little dizzy immediately after a roller coaster ride?
32. We have specialized nerve receptors for detecting which five tastes? How did this ability aid our ancestors?
33. A food's aroma can greatly enhance its taste. This is an example of
- sensory adaptation.
 - chemical sensation.
 - kinesthesia.
 - sensory interaction.
34. Which of the following ESP phenomena is supported by solid, replicable scientific evidence?
- Telepathy
 - Clairvoyance
 - Precognition
 - None of these answers

Find answers to these questions in Appendix E in the back of the book.



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HOW DO WE LEARN?

CLASSICAL CONDITIONING

Pavlov's Experiments

Pavlov's Legacy

OPERANT CONDITIONING

Skinner's Experiments

Skinner's Legacy

CLOSE-UP: Training Our Partners

Contrasting Classical and Operant Conditioning

BIOLOGY, COGNITION, AND LEARNING

Biological Constraints on Conditioning

Cognition's Influence on Conditioning

LEARNING BY OBSERVATION

Mirrors and Imitation in the Brain

Applications of Observational Learning

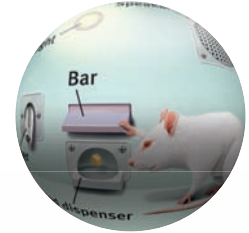
THINKING CRITICALLY ABOUT: Does Viewing Media Violence Trigger Violent Behavior?





CHAPTER 7

Learning



When a chinook salmon first emerges from its egg in a stream's gravel bed, its genes provide most of the behavioral instructions it needs for life. It knows instinctively how and where to swim, what to eat, and how to avoid predators. Following a built-in plan, the young salmon soon begins its trek to the sea. After a few years in the ocean, the mature salmon somehow navigates hundreds of miles to return to its birthplace. At home in its ancestral spawning ground, the salmon seeks out the best gravel and water flow for breeding. It then mates and, its life mission accomplished, dies.

Unlike salmon, we are not born with a genetic plan for life. Much of what we do we learn from experience. Although we struggle to find the life direction a salmon is born with, our learning gives us more flexibility. We can learn how to build grass huts or snow shelters, submarines or space stations, and thereby adjust to almost any environment. Indeed, nature's most important gift to us may be our *adaptability*—our capacity to learn new behaviors that help us cope with changing circumstances.

Learning breeds hope. What is learnable we can potentially teach—a fact that encourages parents, educators, coaches, and animal trainers. What has been learned we can potentially change by new learning—an assumption that underlies counseling, psychotherapy, and rehabilitation programs. No matter how unhappy, unsuccessful, or unloving we are, that need not be the end of our story.

No topic is closer to the heart of psychology than *learning*, the process of acquiring new and relatively enduring information or behaviors. (Learning acquires information, and memory—our next chapter topic—retains it.) In earlier chapters we considered the learning of sleep patterns, of gender roles, and of visual perceptions. In later chapters we will see how learning shapes our thoughts, our emotions, our personalities, and our attitudes. This chapter examines some core processes of three types of learning: *classical conditioning*, *operant conditioning*, and *cognitive learning*.



learning the process of acquiring through experience new and relatively enduring information or behaviors.

associative learning learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a response and its consequences (as in operant conditioning).

stimulus any event or situation that evokes a response.

cognitive learning the acquisition of mental information, whether by observing events, by watching others, or through language.

classical conditioning a type of learning in which one learns to link two or more stimuli and anticipate events.

Most of us would be unable to name the order of the songs on our favorite album or playlist. Yet, hearing the end of one piece cues (by association) an anticipation of the next. Likewise, when singing your national anthem, you associate the end of each line with the beginning of the next. (Pick a line out of the middle and notice how much harder it is to recall the previous line.)

How Do We Learn?



7-1: What is learning, and what are some basic forms of learning?

One way we **learn** is by *association*. Our mind naturally connects events that occur in sequence. Suppose you see and smell freshly baked bread, eat some, and find it satisfying. The next time you see and smell fresh bread, you will expect that eating it will again be satisfying. So, too, with sounds. If you associate a sound with a frightening consequence, hearing the sound alone may trigger your fear. As one 4-year-old exclaimed after watching a TV character get mugged, “If I had heard that music, I wouldn’t have gone around the corner!” (Wells, 1981).

Learned associations feed our habitual behaviors (Wood & Neal, 2007). As we repeat behaviors in a given context—sleeping in a certain posture in bed, walking certain routes on campus, eating popcorn in a movie theater—the behaviors become associated with the contexts. Our next experience of the context then evokes our habitual response. How long does it take to form such habits? To find out, one British research team asked 96 university students to choose some healthy behavior (such as running before dinner or eating fruit with lunch), to do it daily for 84 days, and to record whether the behavior felt automatic (something they did without thinking and would find it hard not to do). On average, behaviors became habitual after about 66 days (Lally et al., 2010). (Is there something you’d like to make a routine part of your life? Just do it every day for two months, or a bit longer for exercise, and you likely will find yourself with a new habit.)

Other animals also learn by association. Disturbed by a squirt of water, the sea slug *Aplysia* protectively withdraws its gill. If the squirts continue, as happens naturally in choppy water, the withdrawal response diminishes. But if the sea slug repeatedly receives an electric shock just after being squirted, its response to the squirt instead grows stronger. The animal has associated the squirt with the impending shock.

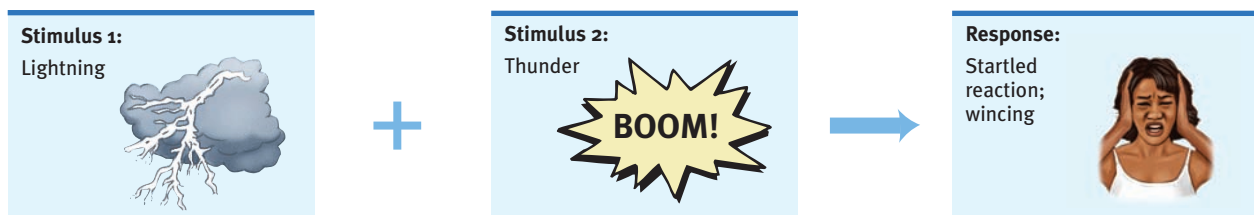
Complex animals can learn to associate their own behavior with its outcomes. An aquarium seal will repeat behaviors, such as slapping and barking, that prompt people to toss it a herring.

By linking two events that occur close together, both animals are exhibiting **associative learning**. The sea slug associates the squirt with an impending shock; the seal associates slapping and barking with a herring treat. Each animal has learned something important to its survival: predicting the immediate future.

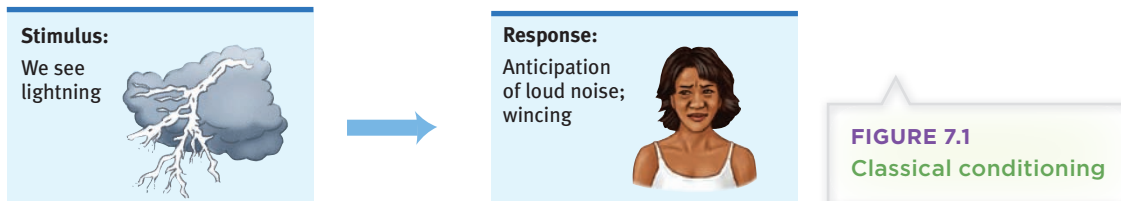
This process of learning associations is *conditioning*, and it takes two main forms:

- In *classical conditioning*, we learn to associate two stimuli and thus to anticipate events. (A **stimulus** is any event or situation that evokes a response.) We learn that a flash of lightning signals an impending crack of thunder; when lightning flashes nearby, we start to brace ourselves (**FIGURE 7.1**).

Two related events:



Result after repetition:



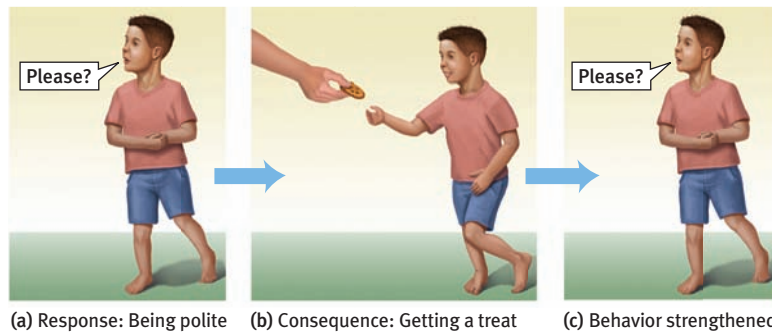


FIGURE 7.2
Operant conditioning

- In *operant conditioning*, we learn to associate a response (our behavior) and its consequence. Thus we (and other animals) learn to repeat acts followed by good results (**FIGURE 7.2**) and avoid acts followed by bad results.

To simplify, we will explore these two types of associative learning separately. Often, though, they occur together, as on one Japanese cattle ranch, where the clever rancher outfitted his herd with electronic pagers, which he calls from his cell phone. After a week of training, the animals learn to associate two stimuli—the beep on their pager and the arrival of food (classical conditioning). But they also learn to associate their hustling to the food trough with the pleasure of eating (operant conditioning).

Conditioning is not the only form of learning. Through **cognitive learning** we acquire mental information that guides our behavior. *Observational learning*, one form of cognitive learning, lets us learn from others' experiences. Chimpanzees, for example, sometimes learn behaviors merely by watching others perform them. If one animal sees another solve a puzzle and gain a food reward, the observer may perform the trick more quickly. So, too, in humans: We look and we learn.

By learning, we humans adapt to our environments. We learn to expect and prepare for significant events such as food or pain (*classical conditioning*). We learn to repeat acts that bring rewards and to avoid acts that bring unwanted results (*operant conditioning*). We learn new behaviors by observing events and by watching others, and through language we learn things we have neither experienced nor observed (*cognitive learning*).

RETRIEVE IT

- Why are habits, such as having something sweet with that cup of coffee, so hard to break?

ANSWER: Habits form when we repeat behaviors in a given context and, as a result, learn associations—often without our awareness. For example, we may have eaten a sweet pastry with a cup of coffee often enough to associate the flavor of the coffee with the treat, so that the cup of coffee alone just doesn't seem right anymore!

Classical Conditioning

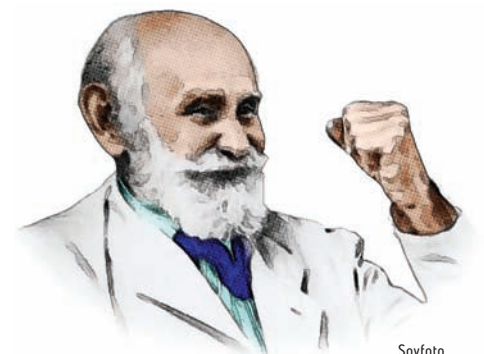


7-2: What are the basic components of classical conditioning, and what was behaviorism's view of learning?

For many people, the name Ivan Pavlov (1849–1936) rings a bell. His early twentieth-century experiments—now psychology's most famous research—are classics, and the phenomenon he explored we justly call **classical conditioning**.

Pavlov's work laid the foundation for many of psychologist John B. Watson's ideas. In searching for laws underlying learning, Watson (1913) urged his colleagues to discard reference to inner thoughts, feelings, and motives. The science of psychology should instead study how organisms respond to stimuli in their environments, said Watson: "Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods." Simply said, psychology should be an objective science based on observable behavior.

Ivan Pavlov "Experimental investigation . . . should lay a solid foundation for a future true science of psychology" (1927).



This view, which influenced North American psychology during the first half of the twentieth century, Watson called **behaviorism**. Pavlov and Watson shared both a disdain for “mentalist” concepts (such as consciousness) and a belief that the basic laws of learning were the same for all animals—whether dogs or humans. Few researchers today propose that psychology should ignore mental processes, but most now agree that classical conditioning is a basic form of learning by which all organisms adapt to their environment.

Pavlov’s Experiments

Pavlov was driven by a lifelong passion for research. After setting aside his initial plan to follow his father into the Russian Orthodox priesthood, Pavlov received a medical degree at age 33 and spent the next two decades studying the digestive system.

This work earned him Russia’s first Nobel Prize in 1904. But his novel experiments on learning, which consumed the last three decades of his life, earned this feisty scientist his place in history.

Pavlov’s new direction came when his creative mind seized on an incidental observation. Without fail, putting food in a dog’s mouth caused the animal to salivate. Moreover, the

dog began salivating not only to the taste of the food, but also to the mere sight of the food, or the food dish, or the person delivering the food, or even the sound of that person’s approaching footsteps. At first, Pavlov considered these “psychic secretions” an annoyance—until he realized they pointed to a simple but important form of learning.

Pavlov and his assistants tried to imagine what the dog was thinking and feeling as it drooled in anticipation of the food. This only led them into fruitless debates. So, to explore the phenomenon more objectively, they experimented. To eliminate other possible influences, they isolated the dog in a small room, secured it in a harness, and attached a device to divert its saliva to a measuring instrument. From the next room, they presented food—first by sliding in a food bowl, later by blowing meat powder into the dog’s mouth at a precise moment. They then paired various **neutral stimuli (NS)**—events the dog could see or hear but didn’t associate with food—with food in the dog’s mouth. If a sight or sound regularly signaled the arrival of food, would the dog learn the link? If so, would it begin salivating in anticipation of the food?

The answers proved to be *Yes* and *Yes*. Just before placing food in the dog’s mouth to produce salivation, Pavlov sounded a tone. After several pairings of tone and food, the dog, now anticipating the meat powder, began salivating to the tone alone. In later experiments, a buzzer,¹ a light, a touch on the leg, even the sight of a circle set off the drooling. (This procedure works with people, too. When hungry young Londoners viewed abstract figures before smelling peanut butter or vanilla, their brain soon responded in anticipation to the abstract images alone [Gottfried et al., 2003].)

A dog doesn’t learn to salivate in response to food in its mouth. Food in the mouth automatically, *unconditionally*, triggers a dog’s salivary reflex (**FIGURE 7.3**). Thus, Pavlov called the drooling an **unconditioned response (UR)**. And he called the food an **unconditioned stimulus (US)**.

Salivation in response to the tone, however, is learned. Because it is *conditional* upon the dog’s associating the tone and the food, we call this response the **conditioned response (CR)**. The stimulus that used to be neutral (in this case, a previously meaningless tone that now triggers the salivation) is the **conditioned stimulus (CS)**.



behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2).

neutral stimulus (NS) in classical conditioning, a stimulus that elicits no response before conditioning.

unconditioned response (UR) in classical conditioning, an unlearned, naturally occurring response (such as salivation) to an unconditioned stimulus (US) (such as food in the mouth).

unconditioned stimulus (US) in classical conditioning, a stimulus that unconditionally—naturally and automatically—triggers a response (UR).

conditioned response (CR) in classical conditioning, a learned response to a previously neutral (but now conditioned) stimulus (CS).

conditioned stimulus (CS) in classical conditioning, an originally irrelevant stimulus that, after association with an unconditioned stimulus (US), comes to trigger a conditioned response (CR).

¹ The “buzzer” (English translation) was perhaps Pavlov’s supposed bell—a small electric bell (Tully, 2003).

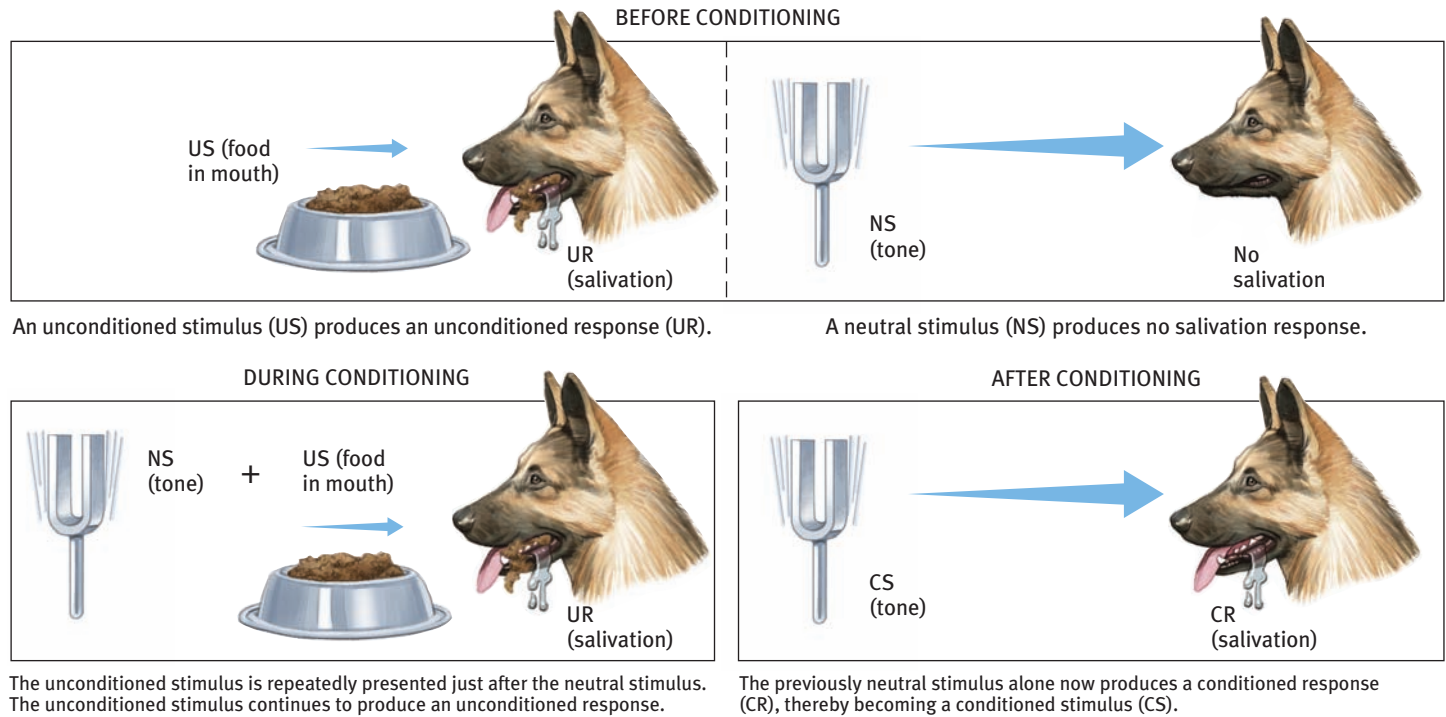


FIGURE 7.3
Pavlov's classic experiment Pavlov presented a neutral stimulus (a tone) just before an unconditioned stimulus (food in mouth). The neutral stimulus then became a conditioned stimulus, producing a conditioned response.

Distinguishing these two kinds of stimuli and responses is easy: Conditioned = learned; unconditioned = unlearned.

If Pavlov's demonstration of associative learning was so simple, what did he do for the next three decades? What discoveries did his research factory publish in his 532 papers on salivary conditioning (Windholz, 1997)? He and his associates explored five major conditioning processes: *acquisition*, *extinction*, *spontaneous recovery*, *generalization*, and *discrimination*.

RETRIEVE IT

- An experimenter sounds a tone just before delivering an air puff to your blinking eye. After several repetitions, you blink to the tone alone. What is the NS? The US? The UR? The CS? The CR?

ANSWERS: NS = tone before procedure; US = air puff; UR = blink to air puff; CS = tone after procedure; CR = blink to tone

Acquisition



7-3: In classical conditioning, what are the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination?

Acquisition is the initial learning of an association. How much time should elapse between presenting the NS (the tone, the light, the touch) and the US (the food), Pavlov and his associates wondered? In most cases, not much—half a second usually works well.

What do you suppose would happen if the food (US) appeared before the tone (NS) rather than after? Would conditioning occur? Not likely. With but a few exceptions, conditioning doesn't happen when the NS follows the US. Remember, classical conditioning is biologically adaptive because it helps humans and other animals prepare for good or bad events. To Pavlov's dogs, the originally neutral tone became a CS after signaling an important biological event—the arrival of food (US). To deer in the forest, the snapping of a twig (CS) may signal a predator's approach (US). If the good or bad event has already occurred, the tone or the sound won't help the animal prepare.

acquisition in classical conditioning, the initial stage, when one links a neutral stimulus and an unconditioned stimulus so that the neutral stimulus begins triggering the conditioned response. In operant conditioning, the strengthening of a reinforced response.



Eric Isselee/Shutterstock

More recent research on male Japanese quail shows how a CS can signal another important biological event (Domjan, 1992, 1994, 2005). Just before presenting a sexually approachable female quail, the researchers turned on a red light. Over time, as the red light continued to herald the female's arrival, the light caused the male quail to become excited. They developed a preference for their cage's red-light district, and when a female appeared, they mated with her more quickly and released more semen and sperm (Matthews et al., 2007). All in all, the quail's capacity for classical conditioning gives it a reproductive edge.

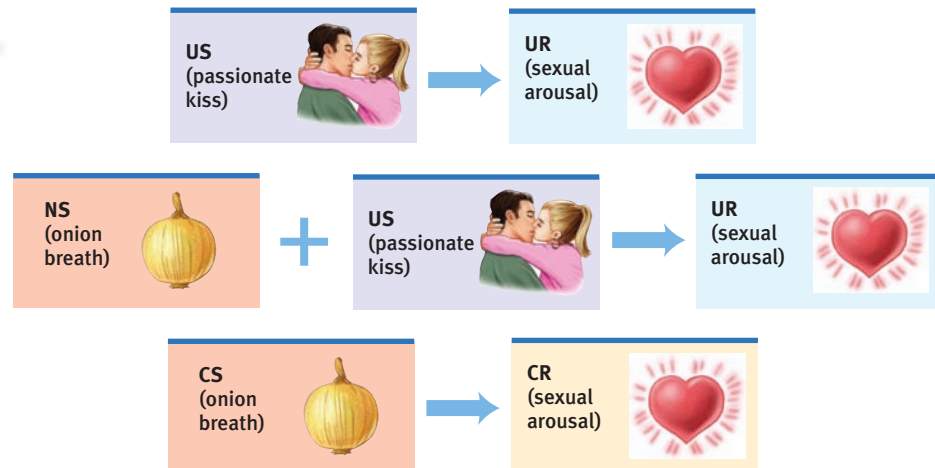
In humans, too, objects, smells, and sights associated with sexual pleasure—even a geometric figure in one experiment—can become conditioned stimuli for sexual arousal (Byrne, 1982). Onion breath does not usually produce sexual arousal. But when repeatedly paired with a passionate kiss, it can become a CS and do just that (**FIGURE 7.4**). The larger lesson: *Conditioning helps an animal survive and reproduce—by responding to cues that help it gain food, avoid dangers, locate mates, and produce offspring* (Hollis, 1997).

Remember:

NS = Neutral Stimulus
US = Unconditioned Stimulus
UR = Unconditioned Response
CS = Conditioned Stimulus
CR = Conditioned Response

FIGURE 7.4

An unexpected CS Psychologist Michael Tirrell (1990) recalled: “My first girlfriend loved onions, so I came to associate onion breath with kissing. Before long, onion breath sent tingles up and down my spine. Oh what a feeling!”



RETRIEVE IT

- In slasher movies, sexually arousing images of women are sometimes paired with violence against women. Based on classical conditioning principles, what might be an effect of this pairing?

ANSWER: If viewing an attractive nude or semi-nude woman (a US) elicits sexual arousal (a UR), then pairing the US with a new stimulus (violence) could turn the violence into a conditioned stimulus (CS) that also becomes sexually arousing, a conditioned response (CR).

extinction the diminishing of a conditioned response; occurs in classical conditioning when an unconditioned stimulus does not follow a conditioned stimulus; occurs in operant conditioning when a response is no longer reinforced.

spontaneous recovery the reappearance, after a pause, of an extinguished conditioned response.

Extinction and Spontaneous Recovery

What would happen, Pavlov wondered, if after conditioning, the CS occurred repeatedly without the US? If the tone sounded again and again, but no food appeared, would the tone still trigger salivation? The answer was mixed. The dogs salivated less and less, a reaction known as **extinction**, the diminished responding that occurs when the CS (tone) no longer signals an impending US (food). But a different picture emerged when Pavlov allowed several hours to elapse before sounding the tone again. After the delay, the dogs would again begin salivating to the tone (**FIGURE 7.5**). This **spontaneous recovery**—the reappearance of a (weakened) CR after a pause—suggested to Pavlov that extinction was suppressing the CR rather than eliminating it.

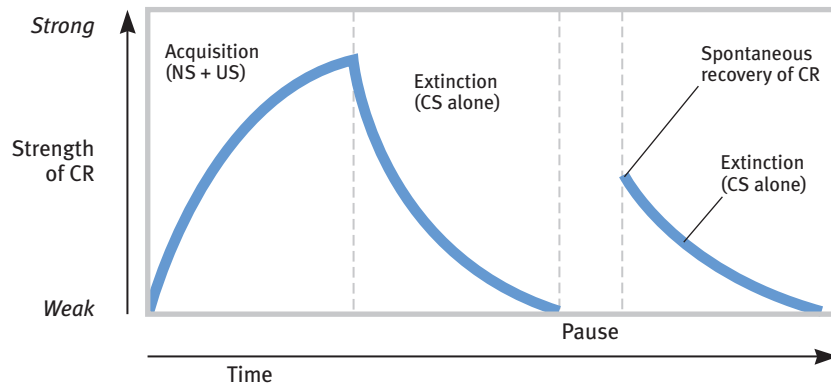


FIGURE 7.5
Idealized curve of acquisition, extinction, and spontaneous recovery The rising curve shows that the CR rapidly grows stronger as the NS becomes a CS as it is repeatedly paired with the US (acquisition), then weakens as the CS is presented alone (extinction). After a pause, the CR reappears (spontaneous recovery).

RETRIEVE IT

- The first step of classical conditioning, when an NS becomes a CS, is called _____. When a US no longer follows the CS, and the CR becomes weakened, this is _____.

ANSWERS: acquisition; extinction

Generalization

Pavlov and his students noticed that a dog conditioned to the sound of one tone also responded somewhat to the sound of a new and different tone. Likewise, a dog conditioned to salivate when rubbed would also drool a bit when scratched (Windholz, 1989) or when touched on a different body part (FIGURE 7.6). This tendency to respond likewise to stimuli similar to the CS is called **generalization**.

Generalization can be adaptive, as when toddlers taught to fear moving cars also become afraid of moving trucks and motorcycles. And generalized fears can linger. One Argentine writer who underwent torture still recoils with fear when he sees black shoes—his first glimpse of his torturers as they approached his cell. Generalized anxiety reactions have been demonstrated in laboratory studies comparing abused with nonabused children (FIGURE 7.7). When an angry face appeared on a computer screen, abused children’s brain-wave responses were dramatically stronger and longer lasting (Pollak et al., 1998).

Drops of saliva

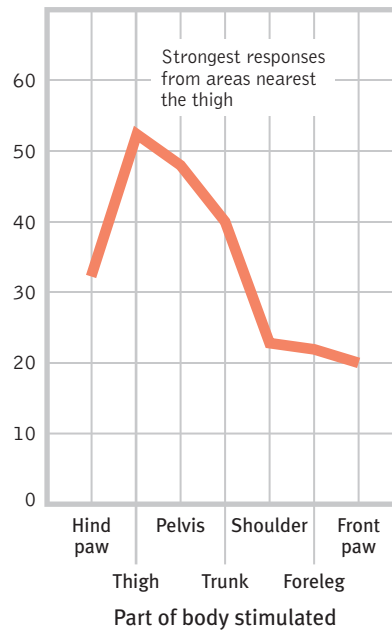


FIGURE 7.6
Generalization Pavlov demonstrated generalization by attaching miniature vibrators to various parts of a dog’s body. After conditioning salivation to stimulation of the thigh, he stimulated other areas. The closer a stimulated spot was to the dog’s thigh, the stronger the conditioned response. (From Pavlov, 1927.)



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FIGURE 7.7
Child abuse leaves tracks in the brain Studies have shown that abused children’s sensitized brains react more strongly to angry faces (Pollak et al., 1998). This generalized anxiety response may help explain their greater risk of psychological disorder.

generalization the tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to elicit similar responses.

discrimination in classical conditioning, the learned ability to distinguish between a conditioned stimulus and stimuli that do not signal an unconditioned stimulus.

Stimuli similar to naturally disgusting objects will, by association, also evoke some disgust, as otherwise desirable fudge did when shaped to resemble dog feces (Rozin et al., 1986). Researchers have also found that we like unfamiliar people more if they look like someone we've learned to like rather than dislike (Verosky & Todorov, 2010). (They find this by subtly morphing the facial features of someone we've learned to like or dislike onto a novel face.) In these human examples, people's emotional reactions to one stimulus have generalized to similar stimuli.

Discrimination

Pavlov's dogs also learned to respond to the sound of a particular tone and *not* to other tones. This learned ability to *distinguish* between a conditioned stimulus (which predicts the US) and other irrelevant stimuli is called **discrimination**. Being able to recognize differences is adaptive. Slightly different stimuli can be followed by vastly different consequences. Confronted by a guard dog, your heart may race; confronted by a guide dog, it probably will not.

RETRIEVE IT

- What conditioning principle is affecting the snail's affections?

ANSWER: generalization

Pavlov's Legacy



7-4: Why does Pavlov's work remain so important, and what have been some applications of his work to human health and well-being?

What remains today of Pavlov's ideas? A great deal. Most psychologists now agree that classical conditioning is a basic form of learning. Judged by today's knowledge of the interplay of our biology, psychology, and social-cultural environment, Pavlov's ideas were incomplete. But if we see further than Pavlov did, it is because we stand on his shoulders.

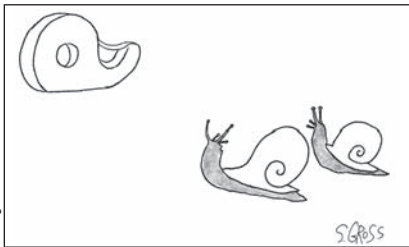
Why does Pavlov's work remain so important? If he had merely taught us that old dogs can learn new tricks, his experiments would long ago have been forgotten. Why should we care that dogs can be conditioned to salivate at the sound of a tone? The importance lies first in this finding: *Many other responses to many other stimuli can be classically conditioned in many other organisms*—in fact, in every species tested, from earthworms to fish to dogs to monkeys to people (Schwartz, 1984). Thus, classical conditioning is one way that virtually all organisms learn to adapt to their environment.

Second, *Pavlov showed us how a process such as learning can be studied objectively*. He was proud that his methods involved virtually no subjective judgments or guesses about what went on in a dog's mind. The salivary response is a behavior measurable in cubic centimeters of saliva. Pavlov's success therefore suggested a scientific model for how the young discipline of psychology might proceed—by isolating the basic building blocks of complex behaviors and studying them with objective laboratory procedures.

RETRIEVE IT

- If the aroma of cake baking sets your mouth to watering, what is the US? The CS? The CR?

ANSWERS: The cake (and its taste) are the US. The associated aroma is the CS. Salivation to the aroma is the CR.



"I don't care if she's a tape dispenser. I love her."

Applications of Classical Conditioning

Other chapters in this text—on consciousness, motivation, emotion, health, psychological disorders, and therapy—show how Pavlov’s principles can influence human health and well-being. Two examples:

- Former drug users often feel a craving when they are again in the drug-using context—with people or in places they associate with previous highs. Thus, drug counselors advise addicts to steer clear of people and settings that may trigger these cravings (Siegel, 2005).
- Classical conditioning even works on the body’s disease-fighting immune system. When a particular taste accompanies a drug that influences immune responses, the taste by itself may come to produce an immune response (Ader & Cohen, 1985).

Pavlov’s work also provided a basis for Watson’s (1913) idea that human emotions and behaviors, though biologically influenced, are mainly a bundle of conditioned responses. Working with an 11-month-old, Watson and Rosalie Rayner (1920; Harris, 1979) showed how specific fears might be conditioned. Like most infants, “Little Albert” feared loud noises but not white rats. Watson and Rayner presented a white rat and, as Little Albert reached to touch it, struck a hammer against a steel bar just behind his head. After seven repeats of seeing the rat and hearing the frightening noise, Albert burst into tears at the mere sight of the rat. Five days later, he had generalized this startled fear reaction to the sight of a rabbit, a dog, and a sealskin coat, but not to dissimilar objects, such as toys.

For years, people wondered what became of Little Albert. Not until 2009 did some psychologist-sleuths identify him as Douglas Merritte, the son of a campus hospital wet nurse who received \$1 for her tot’s participation. Sadly, Albert died at age 6, apparently having suffered all his short life from congenital hydrocephalus, complicated later by meningitis. This brain damage must have influenced his behavior during Watson and Rayner’s experiment (Beck et al., 2009, 2010; Fridlund et al., 2012a,b). People also wondered what became of Watson. After losing his Johns Hopkins professorship over an affair with Rayner (whom he later married), he joined the J. Walter Thompson Agency as their resident psychologist. There he used his knowledge of associative learning to conceive many successful advertising campaigns, including one for Maxwell House that helped make the “coffee break” an American custom (Hunt, 1993).

The treatment of Little Albert would be unacceptable by today’s ethical standards. Also, some psychologists, noting that the infant’s fear wasn’t learned quickly, had difficulty repeating Watson and Rayner’s findings with other children. Nevertheless, Little Albert’s learned fears led many psychologists to wonder whether each of us might be a walking repository of conditioned emotions. If so, might extinction procedures or even new conditioning help us change our unwanted responses to emotion-arousing stimuli? One patient, who for 30 years had feared going into an elevator alone, did just that. Following his therapist’s advice, he forced himself to enter 20 elevators a day. Within 10 days, his fear had nearly vanished (Ellis & Becker, 1982). In Chapters 14 and 15 we will see more examples of how psychologists use behavioral techniques to treat emotional disorders and promote personal growth.

RETRIEVE IT

- In Watson and Rayner’s experiments, “Little Albert” learned to fear a white rat after repeatedly experiencing a loud noise as the rat was presented. In this experiment, what was the US? The UR? The NS? The CS? The CR?

ANSWERS: The US was the loud noise; the UR was the fear response; the NS was the rat before it was paired with the noise; the CS was the rat after pairing; the CR was fear.



Brown Brothers

John B. Watson Watson (1924) admitted to “going beyond my facts” when offering his famous boast: “Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I’ll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors.”



operant conditioning a type of learning in which behavior is strengthened if followed by a reinforcer or diminished if followed by a punisher.

law of effect Thorndike's principle that behaviors followed by favorable consequences become more likely, and that behaviors followed by unfavorable consequences become less likely.

operant chamber in operant conditioning research, a chamber (also known as a *Skinner box*) containing a bar or key that an animal can manipulate to obtain a food or water reinforcer; attached devices record the animal's rate of bar pressing or key pecking.

reinforcement in operant conditioning, any event that *strengthens* the behavior it follows.

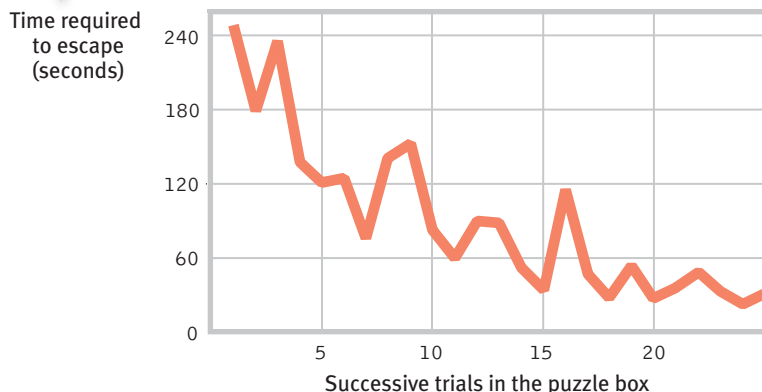
shaping an operant conditioning procedure in which reinforcers guide behavior toward closer and closer approximations of the desired behavior.



Eric Isselée/Shutterstock

FIGURE 7.8

Cat in a puzzle box Thorndike used a fish reward to entice cats to find their way out of a puzzle box (right) through a series of maneuvers. The cats' performance tended to improve with successive trials (left), illustrating Thorndike's *law of effect*. (Adapted from Thorndike, 1898.)



Operant Conditioning



7-5: What is operant conditioning, and how is operant behavior reinforced and shaped?

It's one thing to classically condition a dog to salivate at the sound of a tone, or a child to fear moving cars. To teach an elephant to walk on its hind legs or a child to say *please*, we turn to operant conditioning.

Classical conditioning and operant conditioning are both forms of associative learning, yet their difference is straightforward:

- **Classical conditioning** forms associations between stimuli (a CS and the US it signals). It also involves *respondent behavior*—actions that are automatic responses to a stimulus (such as salivating in response to meat powder and later in response to a tone).
- In **operant conditioning**, organisms associate their own actions with consequences. Actions followed by reinforcers increase; those followed by punishers often decrease. Behavior that *operates* on the environment to *produce* rewarding or punishing stimuli is called *operant behavior*.

RETRIEVE IT

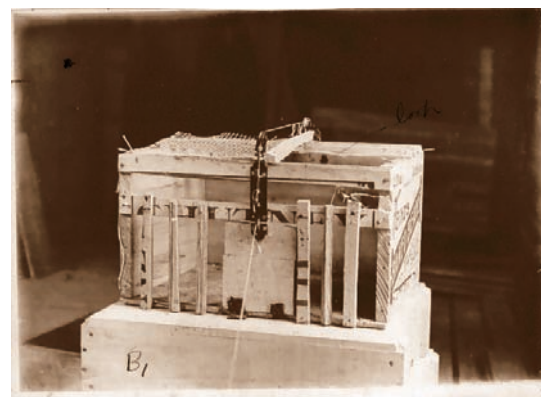
- With _____ conditioning, we learn associations between events we do not control.
- With _____ conditioning, we learn associations between our behavior and resulting events.

ANSWERS: classical; operant

Skinner's Experiments

B. F. Skinner (1904–1990) was a college English major and an aspiring writer who, seeking a new direction, studied psychology in graduate school. He went on to become modern behaviorism's most influential and controversial figure. Skinner's work elaborated on what psychologist Edward L. Thorndike (1874–1949) called the **law of effect**: Rewarded behavior is likely to recur (**FIGURE 7.8**). Using Thorndike's law of effect as a starting point, Skinner developed a behavioral technology that revealed principles of *behavior control*. These principles also enabled him to teach pigeons such unpigeon-like behaviors as walking in a figure 8, playing Ping-Pong, and keeping a missile on course by pecking at a screen target.

For his pioneering studies, Skinner designed an **operant chamber**, popularly known as a *Skinner box* (**FIGURE 7.9**). The box has a bar (a lever) that an animal presses (or a key [a disc] the animal pecks) to release a reward of food or water. It also has a device that records these responses. This design creates a stage on which rats and



Yale University Library

others animals act out Skinner's concept of **reinforcement**: any event that strengthens (increases the frequency of) a preceding response. What is reinforcing depends on the animal and the conditions. For people, it may be praise, attention, or a paycheck. For hungry and thirsty rats, food and water work well. Skinner's experiments have done far more than teach us how to pull habits out of a rat. They have explored the precise conditions that foster efficient and enduring learning.

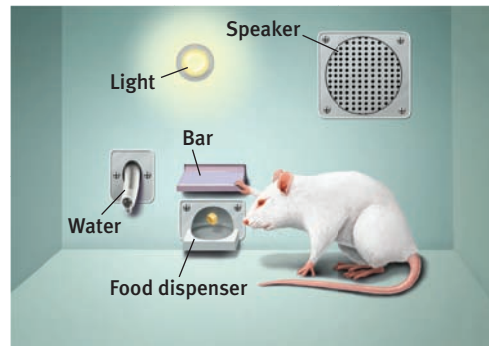


FIGURE 7.9

A Skinner box Inside the box, the rat presses a bar for a food reward. Outside, a measuring device (not shown here) records the animal's accumulated responses.

Shaping Behavior

Imagine that you wanted to condition a hungry rat to press a bar. Like Skinner, you could tease out this action with **shaping**, gradually guiding the rat's actions toward the desired behavior. First, you would watch how the animal naturally behaves, so that you could build on its existing behaviors. You might give the rat a bit of food each time it approaches the bar. Once the rat is approaching regularly, you would give the food only when it moves close to the bar, then closer still. Finally, you would require it to touch the bar to get food. With this method of *successive approximations*, you reward responses that are ever-closer to the final desired behavior, and you ignore all other responses. By making rewards contingent on desired behaviors, researchers and animal trainers gradually shape complex behaviors.

Shaping can also help us understand what nonverbal organisms perceive. Can a dog distinguish red and green? Can a baby hear the difference between lower- and higher-pitched tones? If we can shape them to respond to one stimulus and not to another, then we know they can perceive the difference. Such experiments have even shown that some animals can form concepts. When experimenters reinforced pigeons for pecking after seeing a human face, but not after seeing other images, the pigeons' behavior showed that they could recognize human faces (Herrnstein & Loveland, 1964). In this experiment, the human face was a *discriminative stimulus*. Like a green traffic light, discriminative stimuli signal that a response will be reinforced. After being trained to discriminate among classes of events or objects—flowers, people, cars, chairs—pigeons were usually able to identify the category in which a new pictured object belonged (Bhatt et al., 1988; Wasserman, 1993). They have even been trained to discriminate between the music of Bach and Stravinsky (Porter & Neuringer, 1984).

In everyday life, we continually reinforce and shape others' behavior, said Skinner, though we may not mean to do so. Billy's whining, for example, annoys his parents, but look how they typically respond:

BILLY: *Could you tie my shoes?*

FATHER: *(Continues reading paper.)*

BILLY: *Dad, I need my shoes tied.*

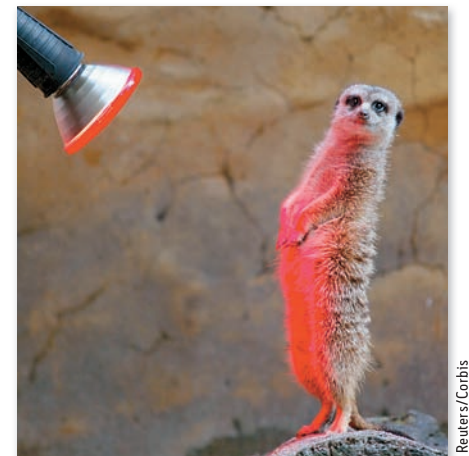
FATHER: *Uh, yeah, just a minute.*

BILLY: *DAAAAD! TIE MY SHOES!*

FATHER: *How many times have I told you not to whine? Now, which shoe do we do first?*

Billy's whining is reinforced, because he gets something desirable—his dad's attention. Dad's response is reinforced because it gets rid of something aversive—Billy's whining.

Or consider a teacher who pastes gold stars on a wall chart beside the names of children scoring 100 percent on spelling tests. As everyone can then see, some children consistently do perfect work. The others, who take the same test and may have worked harder than the academic all-stars, get no rewards. The teacher would be better advised to apply the principles of operant conditioning—to reinforce all spellers for gradual improvements (successive approximations toward perfect spelling of words they find challenging).



Reinforcers vary with circumstances

What is reinforcing (a heat lamp) to one animal (a cold meerkat) may not be to another (an over-heated child). What is reinforcing in one situation (a cold snap at the Taronga Zoo in Sydney) may not be in another (a sweltering summer day).

positive reinforcement increasing behaviors by presenting positive reinforcers. A positive reinforcer is any stimulus that, when *presented* after a response, strengthens the response.

negative reinforcement increasing behaviors by stopping or reducing negative stimuli. A negative reinforcer is any stimulus that, when *removed* after a response, strengthens the response. (*Note:* Negative reinforcement is not punishment.)

primary reinforcer an innately reinforcing stimulus, such as one that satisfies a biological need.

conditioned reinforcer a stimulus that gains its reinforcing power through its association with a primary reinforcer; also known as a *secondary reinforcer*.

Types of Reinforcers



7-6: How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

Up to now, we've mainly been discussing **positive reinforcement**, which strengthens a response by *presenting* a typically pleasurable stimulus after a response. But, as we saw in the whining Billy story, there are *two* basic kinds of reinforcement (**TABLE 7.1**). **Negative reinforcement** *strengthens* a response by *reducing or removing* something negative. Billy's whining was *positively* reinforced, because Billy got something desirable—his father's attention. His dad's response to the whining (tying Billy's shoes) was negatively reinforced, because it ended an aversive event—Billy's whining. Similarly, taking aspirin may relieve your headache, and hitting *snooze* will silence your annoying alarm. These welcome results provide negative reinforcement and increase the odds that you will repeat these behaviors. For drug addicts, the negative reinforcement of ending withdrawal pangs can be a compelling reason to resume using (Baker et al., 2004). Note that *negative reinforcement is not punishment*. (Some friendly advice: Mentally repeat the last five words.) Rather, negative reinforcement *removes* a punishing (aversive) event.

Table 7.1
Ways to Increase Behavior

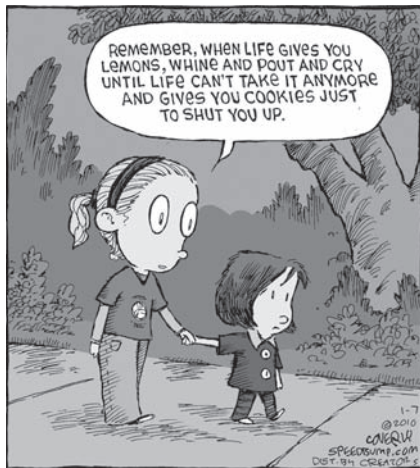
Operant Conditioning Term	Description	Examples
<i>Positive reinforcement</i>	Add a desirable stimulus	Pet a dog that comes when you call it; pay the person who paints your house.
<i>Negative reinforcement</i>	Remove an aversive stimulus	Take painkillers to end pain; fasten seat belt to end loud beeping.

Sometimes negative and positive reinforcement coincide. Imagine a worried student who, after goofing off and getting a bad exam grade, studies harder for the next exam. This increased effort may be *negatively* reinforced by reduced anxiety, and *positively* reinforced by a better grade. Whether it works by reducing something aversive, or by giving something desirable, *reinforcement is any consequence that strengthens behavior*.

RETRIEVE IT

- How is operant conditioning at work in this cartoon?

ANSWER: If the child follows her older friend's instructions, she will negatively reinforce her caregivers by ceasing her cries when they grant her wishes. Her caregivers will positively reinforce her whines with a treat.



Dave Coverly/Dist. by Creators Syndicate, Inc.

Primary and Conditioned Reinforcers Getting food when hungry or having a painful headache go away is innately satisfying. These **primary reinforcers** are unlearned. **Conditioned reinforcers**, also called *secondary reinforcers*, get their power through learned association with primary reinforcers. If a rat in a Skinner box learns that a light reliably signals a food delivery, the rat will work to turn on the light. The light has become a conditioned reinforcer. Our lives are filled with conditioned reinforcers—money, good grades, a pleasant tone of voice—each of which has been linked with more basic rewards.

Immediate and Delayed Reinforcers Let's return to the imaginary shaping experiment in which you were conditioning a rat to press a bar. Before performing this “wanted” behavior, the hungry rat will engage in a sequence of “unwanted” behaviors—scratching, sniffing, and moving around. If you present food immediately after any one

of these behaviors, the rat will likely repeat that rewarded behavior. But what if the rat presses the bar while you are distracted, and you delay giving the reinforcer? If the delay lasts longer than about 30 seconds, the rat will not learn to press the bar. You will have reinforced other incidental behaviors—more sniffing and moving—that intervened between the bar press and the reinforcer.

Unlike rats, humans do respond to delayed reinforcers: the paycheck at the end of the week, the good grade at the end of the semester, the trophy at the end of the season. Indeed, to function effectively we must learn to delay gratification. In laboratory testing, some 4-year-olds showed this ability. In choosing a candy, they preferred having a big reward tomorrow to munching on a small one right away. Learning to control our impulses in order to achieve more valued rewards is a big step toward maturity (Logue, 1998a,b). No wonder children who make such choices have tended to become socially competent and high-achieving adults (Mischel et al., 1989).

To our detriment, small but immediate consequences (the enjoyment of watching late-night TV, for example) are sometimes more alluring than big but delayed consequences (feeling alert tomorrow). For many teens, the immediate gratification of risky, unprotected sex in passionate moments prevails over the delayed gratifications of safe sex or saved sex. And for many people, the immediate rewards of today's gas-guzzling vehicles, air travel, and air conditioning prevail over the bigger future consequences of global climate change, rising seas, and extreme weather.

Reinforcement Schedules



7-7: How do different reinforcement schedules affect behavior?

In most of our examples, the desired response has been reinforced every time it occurs. This is **continuous reinforcement**. But **reinforcement schedules** vary. Continuous reinforcement is the best choice for mastering a behavior because learning occurs rapidly—but extinction also occurs rapidly. When reinforcement stops—when we stop delivering food after the rat presses the bar—the behavior soon stops. If a normally dependable candy machine fails to deliver a chocolate bar twice in a row, we stop putting money into it (although a week later we may exhibit spontaneous recovery by trying again).

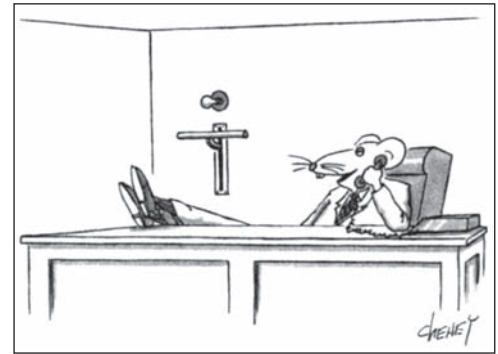
Real life rarely provides continuous reinforcement. Salespeople do not make a sale with every pitch. But they persist because their efforts are occasionally rewarded. This persistence is typical with **partial (intermittent) reinforcement** schedules, in which responses are sometimes reinforced, sometimes not. Learning is slower to appear, but *resistance to extinction* is greater than with continuous reinforcement. Imagine a pigeon that has learned to peck a key to obtain food. If you gradually phase out the food delivery until it occurs only rarely, in no predictable pattern, the pigeon may peck 150,000 times without a reward (Skinner, 1953). Slot machines reward gamblers in much the same way—occasionally and unpredictably. And like pigeons, slot players keep trying, time and time again. With intermittent reinforcement, hope springs eternal.

Lesson for parents: Partial reinforcement also works with children. *Occasionally* giving in to children's tantrums for the sake of peace and quiet intermittently reinforces the tantrums. This is the very best procedure for making a behavior persist.

Skinner (1961) and his collaborators compared four schedules of partial reinforcement. Some are rigidly fixed, some unpredictably variable.

Fixed-ratio schedules reinforce behavior after a set number of responses. Coffee shops may reward us with a free drink after every 10 purchased. In the laboratory, rats may be reinforced on a fixed ratio of, say, one food pellet for every 30 responses. Once conditioned, animals will pause only briefly after a reinforcer before returning to a high rate of responding (**FIGURE 7.10** on the next page).

Variable-ratio schedules provide reinforcers after a seemingly unpredictable number of responses. This is what slot-machine players and fly-casting anglers



“Oh, not bad. The light comes on, I press the bar, they write me a check. How about you?”

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continuous reinforcement reinforcing the desired response every time it occurs.

reinforcement schedule a pattern that defines how often a desired response will be reinforced.

partial (intermittent) reinforcement reinforcing a response only part of the time; results in slower acquisition of a response but much greater resistance to extinction than does continuous reinforcement.

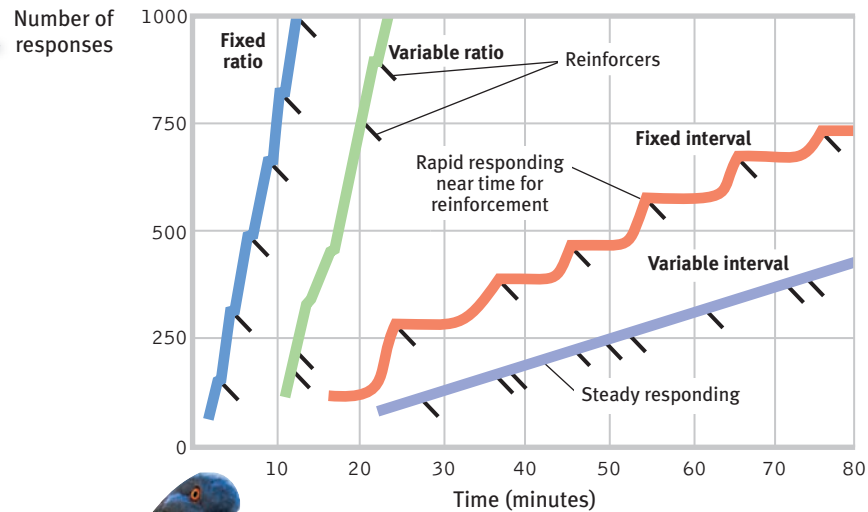
fixed-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified number of responses.

variable-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response after an unpredictable number of responses.

FIGURE 7.10**Intermittent reinforcement schedules**

Skinner's laboratory pigeons produced these response patterns to each of four reinforcement schedules. (Reinforcers are indicated by diagonal marks.) For people, as for pigeons, reinforcement linked to number of responses (a *ratio schedule*) produces a higher response rate than reinforcement linked to amount of time elapsed (an *interval schedule*). But the predictability of the reward also matters. An unpredictable (*variable*) schedule produces more consistent responding than does a predictable (*fixed*) schedule.

Adapted from "Teaching Machines" by B. F. Skinner. Copyright © 1961, Scientific American, Inc. All Rights Reserved.



Vitaly Titov & Maria Sidelnikova/Shutterstock

experience—unpredictable reinforcement—and what makes gambling and fly fishing so hard to extinguish even when both are getting nothing for something. Because reinforcers increase as the number of responses increases, variable-ratio schedules produce high rates of responding.

Fixed-interval schedules reinforce the first response after a fixed time period. Animals on this type of schedule tend to respond more frequently as the anticipated time for reward draws near. People check more frequently for the mail as the delivery time approaches. A hungry child jiggles the Jell-O more often to see if it has set. Pigeons peck keys more rapidly as the time for reinforcement draws nearer (see Figure 7.10).

Variable-interval schedules reinforce the first response after *varying* time periods. Like the message that finally rewards persistence in rechecking for a Facebook or an e-mail response, variable-interval schedules tend to produce slow, steady responding. This makes sense, because there is no knowing when the waiting will be over (**TABLE 7.2**).

In general, response rates are higher when reinforcement is linked to the number of responses (a ratio schedule) rather than to time (an interval schedule). But responding is more consistent when reinforcement is unpredictable (a variable schedule) than when it is predictable (a fixed schedule). Animal behaviors differ, yet Skinner (1956) contended that the reinforcement principles of operant conditioning are universal. It matters little, he said, what response, what reinforcer, or what species you use. The effect of a given reinforcement schedule is pretty much the same: "Pigeon, rat, monkey, which is which? It doesn't matter. . . . Behavior shows astonishingly similar properties."

"The charm of fishing is that it is the pursuit of what is elusive but attainable, a perpetual series of occasions for hope."

Scottish author John Buchan (1875–1940)

Table 7.2
Schedules of Reinforcement

	Fixed	Variable
Ratio	<i>Every so many:</i> reinforcement after every <i>n</i> th behavior, such as buy 10 coffees, get 1 free, or pay per product unit produced	<i>After an unpredictable number:</i> reinforcement after a random number of behaviors, as when playing slot machines or fly casting
Interval	<i>Every so often:</i> reinforcement for behavior after a fixed time, such as Tuesday discount prices	<i>Unpredictably often:</i> reinforcement for behavior after a random amount of time, as in checking for a Facebook response

fixed-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed.

variable-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals.

RETRIEVE IT

- Telemarketers are reinforced by which schedule? People checking the oven to see if the cookies are done are on which schedule? Airline frequent-flyer programs that offer a free flight after every 25,000 miles of travel are using which reinforcement schedule?

ANSWERS: Telemarketers are reinforced on a variable-ratio schedule (after a varying number of calls). Cookie checkers are reinforced on a fixed-interval schedule. Frequent-flyer programs use a fixed-ratio schedule.

Punishment



7-8: How does punishment differ from negative reinforcement, and how does punishment affect behavior?

Reinforcement increases a behavior; **punishment** does the opposite. A *punisher* is any consequence that *decreases* the frequency of a preceding behavior (**TABLE 7.3**). Swift and sure punishers can powerfully restrain unwanted behavior. The rat that is shocked after touching a forbidden object and the child who is burned by touching a hot stove will learn not to repeat those behaviors. Some punishments, though unintentional, are nevertheless quite effective: A dog that has learned to come running at the sound of an electric can opener will stop coming if its owner runs the machine to attract the dog and banish it to the basement.

Criminal behavior, much of it impulsive, is also influenced more by swift and sure punishers than by the threat of severe sentences (Darley & Alter, 2011). Thus, when Arizona introduced an exceptionally harsh sentence for first-time drunk drivers, the drunk-driving rate changed very little. But when Kansas City police started patrolling a high crime area to increase the sureness and swiftness of punishment, that city's crime rate dropped dramatically.

How should we interpret the punishment studies in relation to parenting practices? Many psychologists and supporters of nonviolent parenting have noted four major drawbacks of physical punishment (Gershoff, 2002; Marshall, 2002):

1. *Punished behavior is suppressed, not forgotten.* This temporary state may (negatively) reinforce parents' punishing behavior. The child swears, the parent swats, the parent hears no more swearing and feels the punishment successfully stopped the behavior. No wonder spanking has been a hit with so many U.S. parents of 3- and 4-year-olds—more than 9 in 10 of whom acknowledged spanking their children (Kazdin & Benjet, 2003).
2. *Punishment teaches discrimination among situations.* In operant conditioning, *discrimination* occurs when an organism learns that certain responses, but not others, will be reinforced. Did the punishment effectively end the child's swearing? Or did the child simply learn that it's not okay to swear around the house, though okay elsewhere?
3. *Punishment can teach fear.* In operant conditioning, *generalization* occurs when an organism's response to similar stimuli is also reinforced. A punished child may associate fear not only with the undesirable behavior but also with the person who



David Strickler/The Image Works

Children see, children do? Children who often experience physical punishment tend to display more aggression.

Table 7.3
Ways to Decrease Behavior

Type of Punisher	Description	Examples
<i>Positive punishment</i>	Administer an aversive stimulus	Spray water on a barking dog; give a traffic ticket for speeding.
<i>Negative punishment</i>	Withdraw a rewarding stimulus	Take away a teen's driving privileges; revoke a library card for nonpayment of fines.

punishment an event that tends to *decrease* the behavior it follows.

delivered the punishment or the place it occurred. Thus, children may learn to fear a punishing teacher and try to avoid school, or may become more anxious (Gershoff et al., 2010). For such reasons, most European countries and most U.S. states now ban hitting children in schools and child-care institutions (www.stophitting.com). Twenty-nine countries further outlaw hitting by parents, providing children the same legal protection given to spouses.

4. *Physical punishment may increase aggression by modeling aggression as a way to cope with problems.* Studies find that spanked children are at increased risk for aggression (and depression and low self-esteem). We know, for example, that many aggressive delinquents and abusive parents come from abusive families (Straus & Gelles, 1980; Straus et al., 1997). Some researchers have noted a problem with this logic. Well, yes, they've said, physically punished children may be more aggressive, for the same reason that people who have undergone psychotherapy are more likely to suffer depression—because they had preexisting problems that triggered the treatments (Larzelere, 2000, 2004). Which is the chicken and which is the egg? Correlations don't hand us an answer.

If one adjusts for preexisting antisocial behavior, then an occasional single swat or two to misbehaving 2- to 6-year-olds looks more effective (Baumrind et al., 2002; Larzelere & Kuhn, 2005). That is especially so if two other conditions are met:

1. The swat is used only as a backup when milder disciplinary tactics, such as a time-out (removing them from reinforcing surroundings) fail.
2. The swat is combined with a generous dose of reasoning and reinforcing.

Other researchers remain unconvinced. After controlling for prior misbehavior, they report that more frequent spankings of young children predict future aggressiveness (Grogan-Kaylor, 2004; Taylor et al., 2010).

Parents of delinquent youths are often unaware of how to achieve desirable behaviors without screaming or hitting their children (Patterson et al., 1982). Training programs can help transform dire threats (“You clean up your room this minute or no dinner!”) into positive incentives (“You're welcome at the dinner table after you get your room cleaned up”). Stop and think about it. Aren't many threats of punishment just as forceful, and perhaps more effective, when rephrased positively? Thus, “If you don't get your homework done, there'll be no car” would better be phrased as . . .

In classrooms, too, teachers can give feedback on papers by saying, “No, but try this . . .” and “Yes, that's it!” Such responses reduce unwanted behavior while reinforcing more desirable alternatives. Remember: *Punishment tells you what not to do; reinforcement tells you what to do.*

What punishment often teaches, said Skinner, is how to avoid it. Most psychologists now favor an emphasis on reinforcement.

RETRIEVE IT

- Fill in the blanks below with one of the following terms: positive reinforcement (PR), negative reinforcement (NR), positive punishment (PP), and negative punishment (NP). I have provided the first answer (PR) for you.

Type of Stimulus	Give It	Take It Away
Desired (for example, a teen's use of the car):	1. PR	2.
Undesired/aversive (for example, an insult):	3.	4.

ANSWERS: 1. PR (positive reinforcement); 2. NP (negative punishment); 3. PP (positive punishment); 4. NR (negative reinforcement)

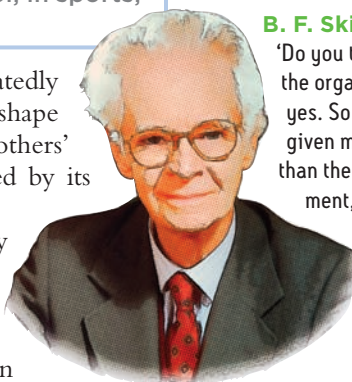
Skinner's Legacy



7-9: Why did Skinner's ideas provoke controversy, and how might his operant conditioning principles be applied at school, in sports, at work, and at home?

B. F. Skinner stirred a hornet's nest with his outspoken beliefs. He repeatedly insisted that external influences (not internal thoughts and feelings) shape behavior. And he urged people to use operant principles to influence others' behavior at school, work, and home. Knowing that behavior is shaped by its results, he said we should use rewards to evoke more desirable behavior.

Skinner's critics objected, saying that he dehumanized people by neglecting their personal freedom and by seeking to control their actions. Skinner's reply: External consequences already haphazardly control people's behavior. Why not administer those consequences toward human betterment? Wouldn't reinforcers be more humane than the punishments used in homes, schools, and prisons? And if it is humbling to think that our history has shaped us, doesn't this very idea also give us hope that we can shape our future?



B. F. Skinner "I am sometimes asked, 'Do you think of yourself as you think of the organisms you study?' The answer is yes. So far as I know, my behavior at any given moment has been nothing more than the product of my genetic endowment, my personal history, and the current setting" (1983).

Bachrach/Getty Images

Applications of Operant Conditioning

In later chapters we will see how psychologists apply operant conditioning principles to help people reduce high blood pressure or gain social skills. Reinforcement technologies have also been used in schools, sports, workplaces, and homes (Flora, 2004).

At School More than a generation ago, Skinner envisioned a day when teaching machines and textbooks would shape learning in small steps, immediately reinforcing correct responses. He believed such machines and texts would revolutionize education and free teachers to focus on each student's special needs.

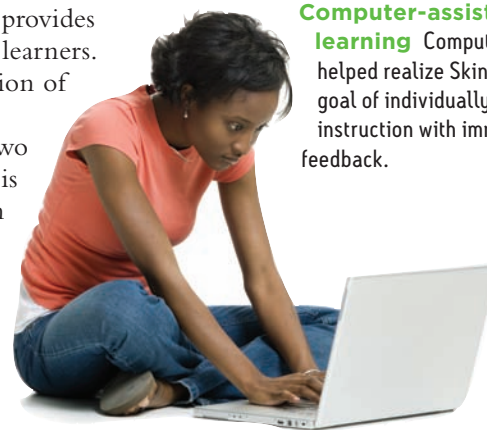
Stand in Skinner's shoes for a moment and imagine two math teachers, each with a class of students ranging from whiz kids to slow learners. Teacher A gives the whole class the same lesson, knowing that the bright kids will breeze through the math concepts, and the slower ones will be frustrated and fail. Teacher B, faced with a similar class, paces the material according to each student's rate of learning and provides prompt feedback, with positive reinforcement, to both the slow and the fast learners. Thinking as Skinner did, how might you achieve the individualized instruction of Teacher B?

Computers were Skinner's final hope. "Good instruction demands two things," he said. "Students must be told immediately whether what they do is right or wrong and, when right, they must be directed to the step to be taken next." Thus, the computer could be Teacher B—pacing math drills to the student's rate of learning, quizzing the student to find gaps in understanding, giving immediate feedback, and keeping flawless records. To the end of his life, Skinner (1986, 1988, 1989) believed his ideal was achievable. The predicted education revolution has not occurred, partly because the early teaching machines often trained rote learning, not deep processing. Today's interactive student software, web-based learning, and online testing bring us closer to achieving Skinner's ideal.

In Sports The key to shaping behavior in athletic performance, as elsewhere, is first reinforcing small successes and then gradually increasing the challenge. Golf students can learn putting by starting with very short putts, and eventually, as they build mastery, stepping back farther and farther. Novice batters can begin with half swings at an oversized

Operant conditioning may also be effectively applied in behavior modification therapies (also known as applied behavior analysis). See Chapter 15 for more on this topic.

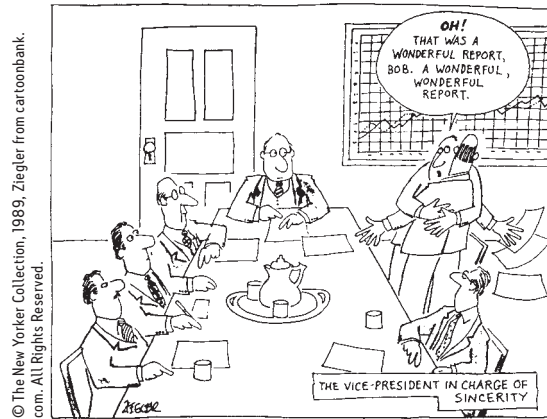
Computer-assisted learning Computers have helped realize Skinner's goal of individually paced instruction with immediate feedback.



Lauren Burke/Getty Images

respondent behavior behavior that occurs as an automatic response to some stimulus.

ball pitched from 10 feet away, giving them the immediate pleasure of smacking the ball. As the hitters' confidence builds with their success and they achieve mastery at each level, the pitcher gradually moves back—to 15, then 22, 30, and 40.5 feet—and eventually introduces a standard baseball and pitching distance. Compared with children taught by conventional methods, those trained by this behavioral method have shown faster skill improvement (Simek & O'Brien, 1981, 1988).



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At Work Knowing that reinforcers influence productivity, many organizations have invited employees to share the risks and rewards of company ownership. Others have focused on reinforcing a job well done. Rewards are most likely to increase productivity if the desired performance is well defined and achievable. The message for managers? *Reward specific, achievable behaviors, not vaguely defined “merit.”*

Operant conditioning also reminds us that reinforcement should be *immediate*. IBM legend Thomas Watson understood. When he observed an achievement, he wrote the employee a check on the spot (Peters & Waterman, 1982). But rewards need not be material,

or lavish. An effective manager may simply walk the floor and sincerely affirm people for good work, or write notes of appreciation for a completed project. As Skinner said, “How much richer would the whole world be if the reinforcers in daily life were more effectively contingent on productive work?”

At Home Parent-training researchers have pointed out how much parents can learn from operant conditioning practices. By saying, “Get ready for bed” and then caving in to protests or defiance, parents reinforce such whining and arguing (Wierson & Forehand, 1994). Exasperated, they may then yell or gesture menacingly. When the child, now frightened, obeys, that reinforces the parents' angry behavior. Over time, a destructive parent-child relationship develops.

To disrupt this cycle, parents should remember that basic rule of shaping: *Notice people doing something right and affirm them for it.* Give children attention and other reinforcers when they are behaving *well*. Target a specific behavior, reward it, and watch it increase. When children misbehave or are defiant, don't yell at them or hit them. Simply explain the misbehavior and give them a time-out.

Finally, we can use operant conditioning in our own lives (see Close-Up: Training Our Partners). To reinforce your own desired behaviors (perhaps to exercise more often) and extinguish the undesired ones (to stop smoking, for example), psychologists suggest taking these steps:

1. *State your goal in measurable terms, and announce it.* You might, for example, aim to boost your study time by an hour a day and share that goal with some close friends.
2. *Monitor how often you engage in your desired behavior.* You might log your current study time, noting under what conditions you do and don't study. (When I began writing textbooks, I logged how I spent my time each day and was amazed to discover how much time I was wasting.)
3. *Reinforce the desired behavior.* To increase your study time, give yourself a reward (a snack or some activity you enjoy) only after you finish your extra hour of study. Agree with your friends that you will join them for weekend activities only if you have met your realistic weekly studying goal.
4. *Reduce the rewards gradually.* As your new behaviors become more habitual, give yourself a mental pat on the back instead of a cookie.



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“I wrote another five hundred words.
Can I have another cookie?”

Training Our Partners

By Amy Sutherland

For a book I was writing about a school for exotic animal trainers, I started commuting from Maine to California, where I spent my days watching students do the seemingly impossible: teaching hyenas to pirouette on command, cougars to offer their paws for a nail clipping, and baboons to skateboard.

I listened, rapt, as professional trainers explained how they taught dolphins to flip and elephants to paint. Eventually it hit me that the same techniques might work on that stubborn but lovable species, the American husband.

The central lesson I learned from exotic animal trainers is that I should reward behavior I like and ignore behavior I don't. After all, you

don't get a sea lion to balance a ball on the end of its nose by nagging. The same goes for the American husband.

Back in Maine, I began thanking Scott if he threw one dirty shirt into the hamper. If he threw in two, I'd kiss him. Meanwhile, I would step over any soiled clothes on the floor without one sharp word, though I did sometimes kick them under the bed. But as he basked in my appreciation, the piles became smaller.

I was using what trainers call "approximations," rewarding the small steps toward learning a whole new behavior. . . . Once I started thinking this way, I couldn't stop. At the school in California, I'd be scribbling notes on how to

walk an emu or have a wolf accept you as a pack member, but I'd be thinking, "I can't wait to try this on Scott. . . ."

After two years of exotic animal training, my marriage is far smoother, my husband much easier to love. I used to take his faults personally; his dirty clothes on the floor were an affront, a symbol of how he didn't care enough about me. But thinking of my husband as an exotic species gave me the distance I needed to consider our differences more objectively.

Excerpted with permission from Sutherland, A., (2006, June 25). What Shamu taught me about a happy marriage, *New York Times*.

RETRIEVE IT

- Ethan constantly misbehaves at preschool even though his teacher scolds him repeatedly. Why does Ethan's misbehavior continue, and what can his teacher do to stop it?

ANSWER: If Ethan is seeking attention, the teacher's scolding may be reinforcing rather than punishing. To change Ethan's behavior, his teacher could offer reinforcement (such as praise) each time he behaves well. The teacher might encourage Ethan toward increasingly appropriate behavior through shaping, or by rephrasing rules as rewards instead of punishments. ("You can have a snack if you play nicely with the other children" [reward] rather than "You will not get a snack if you misbehave!" [punishment]).

Contrasting Classical and Operant Conditioning



7-10: How does operant conditioning differ from classical conditioning?

Both classical and operant conditioning are forms of *associative learning*. Both involve *acquisition*, *extinction*, *spontaneous recovery*, *generalization*, and *discrimination*. But these two forms of learning also differ. Through classical (Pavlovian) conditioning, we associate different stimuli we do not control, and we respond automatically (**respondent behaviors**) (TABLE 7.4). Through operant conditioning, we associate our own

Table 7.4

Comparison of Classical and Operant Conditioning

	Classical Conditioning	Operant Conditioning
<i>Basic idea</i>	Organism associates events	Organism associates behavior and resulting events
<i>Response</i>	Involuntary, automatic	Voluntary, operates on environment
<i>Acquisition</i>	Associating events; NS is paired with US and becomes CS	Associating response with a consequence (reinforcer or punisher)
<i>Extinction</i>	CR decreases when CS is repeatedly presented alone	Responding decreases when reinforcement stops
<i>Spontaneous recovery</i>	The reappearance, after a rest period, of an extinguished CR	The reappearance, after a rest period, of an extinguished response
<i>Generalization</i>	The tendency to respond to stimuli similar to the CS	Organism's response to similar stimuli is also reinforced
<i>Discrimination</i>	The learned ability to distinguish between a CS and other stimuli that do not signal a US	Organism learns that certain responses, but not others, will be reinforced

operant behavior behavior that operates on the environment, producing consequences.

“O! This learning, what a thing it is.”

William Shakespeare, The Taming of the Shrew, 1597

behaviors that act on our environment to produce rewarding or punishing stimuli (**operant behaviors**) with their consequences.

As we shall next see, our biology and cognitive processes influence both classical and operant conditioning.

RETRIEVE IT

- Salivating in response to a tone paired with food is a(n) _____ behavior; pressing a bar to obtain food is a(n) _____ behavior.

ANSWERS: respondent; operant

Biology, Cognition, and Learning

From drooling dogs, running rats, and pecking pigeons we have learned much about the basic processes of learning. But conditioning principles don't tell us the whole story. Today's learning theorists recognize that learning is the product of the interaction of biological, psychological, and social-cultural influences (**FIGURE 7.11**).

Biological Constraints on Conditioning

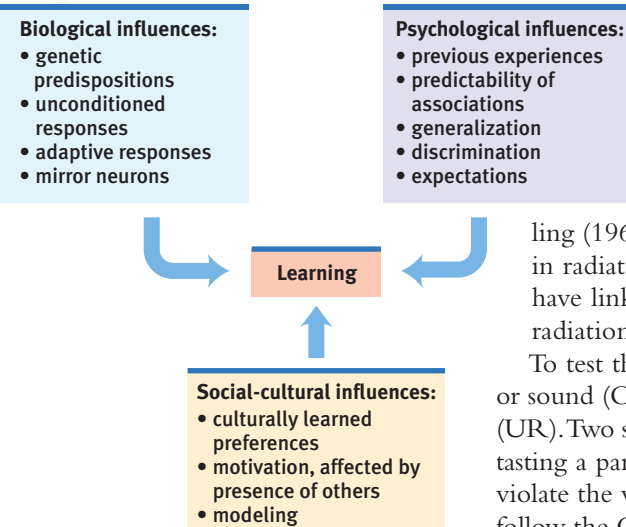


7-11: How do biological constraints affect classical and operant conditioning?

Ever since Charles Darwin, scientists have assumed that all animals share a common evolutionary history and thus share commonalities in their makeup and functioning. Pavlov and Watson, for example, believed the basic laws of learning were essentially similar in all animals. So it should make little difference whether one studied pigeons or people. Moreover, it seemed that any natural response could be conditioned to any neutral stimulus.

FIGURE 7.11

Biopsychosocial influences on learning Our learning results not only from environmental experiences, but also from cognitive and biological influences.



Limits on Classical Conditioning

In 1956, learning researcher Gregory Kimble proclaimed, “Just about any activity of which the organism is capable can be conditioned and . . . these responses can be conditioned to any stimulus that the organism can perceive” (p. 195). Twenty-five years later, he humbly acknowledged that “half a thousand” scientific reports had proven him wrong (Kimble, 1981). More than the early behaviorists realized, an animal's capacity for conditioning is constrained by its biology. Each species' predispositions prepare it to learn the associations that enhance its survival. Environments are not the whole story.

John Garcia was among those who challenged the prevailing idea that all associations can be learned equally well. While researching the effects of radiation on laboratory animals, Garcia and Robert Koelling (1966) noticed that rats began to avoid drinking water from the plastic bottles in radiation chambers. Could classical conditioning be the culprit? Might the rats have linked the plastic-tasting water (a CS) to the sickness (UR) triggered by the radiation (US)?

To test their hunch, Garcia and Koelling exposed the rats to a particular taste, sight, or sound (CS) and later also to radiation or drugs (US) that led to nausea and vomiting (UR). Two startling findings emerged: First, even if sickened as late as several hours after tasting a particular novel flavor, the rats thereafter avoided that flavor. This appeared to violate the widely held belief that for conditioning to occur, the US must immediately follow the CS.

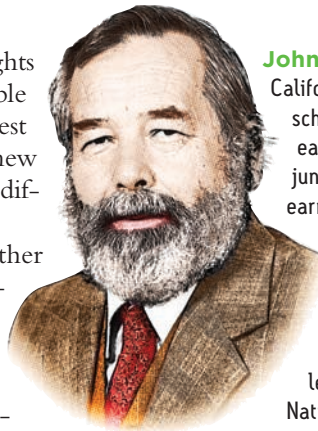
Second, the sickened rats developed aversions to tastes but not to sights or sounds. This contradicted the behaviorists' idea that any perceivable stimulus could serve as a CS. But it made adaptive sense. For rats, the easiest way to identify tainted food is to taste it; if sickened after sampling a new food, they thereafter avoid it. This response, called *taste aversion*, makes it difficult to eradicate a population of "bait-shy" rats by poisoning.

Humans, too, seem biologically prepared to learn some associations rather than others. If you become violently ill four hours after eating contaminated mussels, you will probably develop an aversion to the taste of mussels but usually not to the sight of the associated restaurant, its plates, the people you were with, or the music you heard there. (In contrast, birds, which hunt by sight, appear biologically primed to develop aversions to the *sight* of tainted food [Nicolaus et al., 1983].)

Garcia and Koelling's taste-aversion research is but one instance in which psychological experiments that began with the discomfort of some laboratory animals ended by enhancing the welfare of many others. In one conditioned taste-aversion study, coyotes and wolves were tempted into eating sheep carcasses laced with a sickening poison. Thereafter, they developed an aversion to sheep meat; two wolves later penned with a live sheep seemed actually to fear it (Gustavson et al., 1974, 1976). These studies not only saved the sheep from their predators, but also saved the sheep-shunning coyotes and wolves from angry ranchers and farmers who had wanted to destroy them. Similar applications have prevented baboons from raiding African gardens, raccoons from attacking chickens, ravens and crows from feeding on crane eggs, and Mexican wolves from preying on sheep. In all these cases, research helped preserve both the prey and their predators, who occupy an important ecological niche (Dingfelder, 2010; Garcia & Gustavson, 1997).

Such research supports Darwin's principle that natural selection favors traits that aid survival. Our ancestors who readily learned taste aversions were unlikely to eat the same toxic food again and were more likely to survive and leave descendants. Nausea, like anxiety, pain, and other bad feelings, serves a good purpose. Like a car's low-oil warning light, each alerts the body to a threat (Neese, 1991).

The tendency to learn behaviors favored by natural selection may help explain why we humans seem to be naturally disposed to learn associations between the color red and sexuality. Female primates display red when nearing ovulation. In human females, enhanced bloodflow produces the red blush of flirtation and sexual excitation. Does the frequent pairing of red and sex—with Valentine's hearts, red-light districts, and red lipstick—naturally enhance men's attraction to women? Experiments (FIGURE 7.12) have suggested that, without men's awareness, it does (Elliot & Niesta, 2008).



John Garcia As the laboring son of California farmworkers, Garcia attended school only in the off-season during his early childhood years. After entering junior college in his late twenties, and earning his Ph.D. in his late forties, he received the American Psychological Association's Distinguished Scientific Contribution Award "for his highly original, pioneering research in conditioning and learning." He was also elected to the National Academy of Sciences.

Courtesy of John Garcia



Taste aversion If you became violently ill after eating mussels, you probably would have a hard time eating them again. Their smell and taste would have become a CS for nausea. This learning occurs readily because our biology prepares us to learn taste aversions to toxic foods.

Antonio S./Shutterstock

Animal taste aversion As an alternative to killing wolves and coyotes that preyed on sheep, some ranchers have sickened the animals with lamb laced with a drug.



blickwinke/Alamy



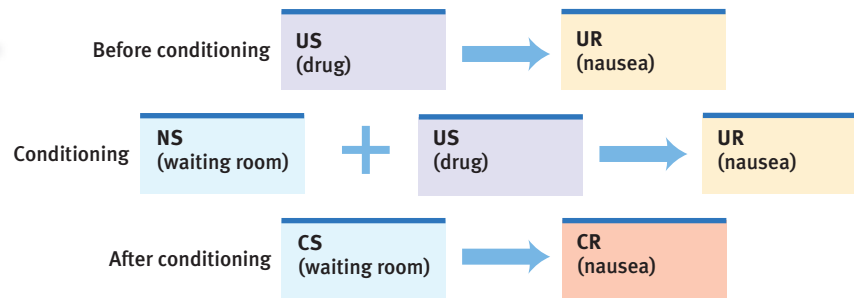
FIGURE 7.12
Romantic red
In a series of experiments that controlled for other factors (such as the brightness of the image), men found women more attractive and sexually desirable when framed in red (Elliot & Niesta, 2008).

"All animals are on a voyage through time, navigating toward futures that promote their survival and away from futures that threaten it. Pleasure and pain are the stars by which they steer."

Psychologists Daniel T. Gilbert and Timothy D. Wilson, "Prospection: Experiencing the Future," 2007

Courtesy of Kathryn Brownson, Hope College

FIGURE 7.13
Nausea conditioning in cancer patients



A genetic predisposition to associate a CS with a US that follows predictably and immediately is adaptive: Causes often immediately precede effects. Often, but not always, as we saw in the taste-aversion findings. At such times, our predispositions can trick us. When chemotherapy triggers nausea and vomiting more than an hour following treatment, cancer patients may over time develop classically conditioned nausea (and sometimes anxiety) to the sights, sounds, and smells associated with the clinic (**FIGURE 7.13**) (Hall, 1997). Merely returning to the clinic's waiting room or seeing the nurses can provoke these conditioned feelings (Burish & Carey, 1986; Davey, 1992). Under normal circumstances, such revulsion to sickening stimuli would be adaptive.

"Once bitten, twice shy."

G. F. Northall, Folk-Phrases, 1894

RETRIEVE IT

- How did Garcia and Koelling's taste-aversion studies help disprove Gregory Kimble's early claim that "just about any activity of which the organism is capable can be conditioned to any stimulus that the organism can perceive"? Explain.

ANSWER: Garcia and Koelling demonstrated that rats may learn an aversion to tastes, on which their survival depends, but not to sights or sounds.

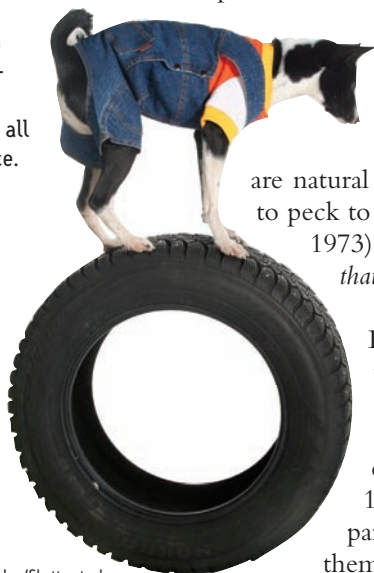
Limits on Operant Conditioning

As with classical conditioning, nature sets limits on each species' capacity for operant conditioning. Mark Twain (1835–1910) said it well: "Never try to teach a pig to sing. It wastes your time and annoys the pig."

We most easily learn and retain behaviors that reflect our biological predispositions. Thus, using food as a reinforcer, you could easily condition a hamster to dig or to rear up, because these are among the animal's natural food-searching behaviors. But you won't be so successful if you use food as a reinforcer to shape face washing and other hamster behaviors that aren't normally associated with food or hunger (Shettleworth, 1973). Similarly, you could easily teach pigeons to flap their wings to avoid being shocked, and to peck to obtain food: Fleeing with their wings and eating with their beaks are natural pigeon behaviors. However, pigeons would have a hard time learning to peck to avoid a shock, or to flap their wings to obtain food (Foree & LoLordo, 1973). The principle: *Biological constraints predispose organisms to learn associations that are naturally adaptive.*

In the early 1940s, University of Minnesota graduate students Marian Breland and Keller Breland witnessed the power of operant conditioning while working with their mentor, B. F. Skinner (1961; Bailey & Gillasp, 2005). Impressed with his results, they began training dogs, cats, chickens, parakeets, turkeys, pigs, ducks, and hamsters. The rest is history. The company they formed spent the next half-century training more than 15,000 animals from 140 species for movies, traveling shows, amusement parks, corporations, and the government. And along the way, the Brelands themselves mentored others, including Sea World's first director of training.

Natural athletes Animals can most easily learn and retain behaviors that draw on their biological predispositions, such as dogs' inborn tendency to rely on all four feet for mobility and balance.



Marina Jay/Shutterstock

In their early training days, the Brelands presumed that operant principles would work on almost any response an animal could make. But they, too, learned about biological constraints. In one act, pigs trained to pick up large wooden “dollars” and deposit them in a piggy bank began to drift back to their natural ways. They dropped the coin, pushed it with their snouts as pigs are prone to do, picked it up again, and then repeated the sequence—delaying their food reinforcer. This *instinctive drift* occurred as the animals reverted to their biologically predisposed patterns.

cognitive map a mental representation of the layout of one’s environment. For example, after exploring a maze, rats act as if they have learned a cognitive map of it.

For more information on animal behavior, see books by (I am not making this up) Robin Fox and Lionel Tiger.

Cognition’s Influence on Conditioning



7-12: How do cognitive processes affect classical and operant conditioning?

Cognition and Classical Conditioning

In their dismissal of “mentalistic” concepts such as consciousness, Pavlov and Watson underestimated the importance not only of biological constraints, but also the effects of cognitive processes (thoughts, perceptions, expectations). The early behaviorists believed that rats’ and dogs’ learned behaviors could be reduced to mindless mechanisms, so there was no need to consider cognition. But Robert Rescorla and Allan Wagner (1972) showed that an animal can learn the *predictability* of an event. If a shock always is preceded by a tone, and then may also be preceded by a light that accompanies the tone, a rat will react with fear to the tone but not to the light. Although the light is always followed by the shock, it adds no new information; the tone is a better predictor. The more predictable the association, the stronger the conditioned response. It’s as if the animal learns an *expectancy*, an awareness of how likely it is that the US will occur.

Classical conditioning treatments that ignore cognition often have limited success. For example, people receiving therapy for alcohol dependence may be given alcohol spiked with a nauseating drug. Will they then associate alcohol with sickness? If classical conditioning were merely a matter of “stamping in” stimulus associations, we might hope so, and to some extent this does occur (as we will see in Chapter 15). However, one’s awareness that the nausea is induced by the drug, not the alcohol, often weakens the association between drinking alcohol and feeling sick. So, even in classical conditioning, it is (especially with humans) not simply the CS-US association but also the thought that counts.

“All brains are, in essence, anticipation machines.”

Daniel C. Dennett, *Consciousness Explained*, 1991

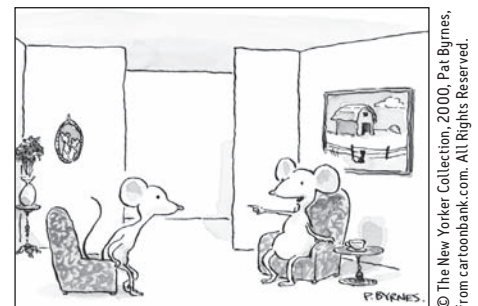
Cognition and Operant Conditioning

B. F. Skinner granted the biological underpinnings of behavior and the existence of private thought processes. Nevertheless, many psychologists criticized him for discounting cognition’s importance.

A mere eight days before dying of leukemia in 1990, Skinner stood before the American Psychological Association convention. In this final address, he again resisted the growing belief that cognitive processes have a necessary place in the science of psychology and even in our understanding of conditioning. He viewed “cognitive science” as a throwback to early twentieth-century introspectionism. For Skinner, thoughts and emotions were behaviors that follow the same laws as other behaviors.

Nevertheless, the evidence of cognitive processes cannot be ignored. For example, animals on a fixed-interval reinforcement schedule respond more and more frequently as the time approaches when a response will produce a reinforcer. Although a strict behaviorist would object to talk of “expectations,” the animals behave as if they expected that repeating the response would soon produce the reward.

Evidence of cognitive processes has also come from studying rats in mazes. Rats exploring a maze, given no obvious rewards, seem to develop a **cognitive map**, a mental



“Bathroom? Sure, it’s just down the hall to the left, jog right, left, another left, straight past two more lefts, then right, and it’s at the end of the third corridor on your right.”

© The New Yorker Collection, 2000, Pat Byrnes, from cartoonbank.com. All Rights Reserved.

latent learning learning that occurs but is not apparent until there is an incentive to demonstrate it.

intrinsic motivation a desire to perform a behavior effectively for its own sake.

extrinsic motivation a desire to perform a behavior to receive promised rewards or avoid threatened punishment.

observational learning learning by observing others.

modeling the process of observing and imitating a specific behavior.

representation of the maze. When an experimenter then places food in the maze's goal box, these rats run the maze as quickly and efficiently as other rats that were previously reinforced with food for this result. Like people sightseeing in a new town, the exploring rats seemingly experienced **latent learning** during their earlier tours. That learning became apparent only when there was some incentive to demonstrate it. Children, too, may learn from watching a parent but demonstrate the learning only much later, as needed. The point to remember: *There is more to learning than associating a response with a consequence; there is also cognition.* In Chapter 9 we will encounter more striking evidence of animals' cognitive abilities in solving problems and in using aspects of language.

The cognitive perspective has also shown us the limits of rewards: Promising people a reward for a task they already enjoy can backfire. Excessive rewards can destroy **intrinsic motivation**—the desire to perform a behavior effectively for its own sake. In experiments, children have been promised a payoff for playing with an interesting puzzle or toy. Later, they played with the toy *less* than other unpaid children did (Deci et al., 1999; Tang & Hall, 1995). Likewise, rewarding children with toys or candy for reading diminishes the time they spend reading (Marinak & Gambrell, 2008). It is as if they think, “If I have to be bribed into doing this, it must not be worth doing for its own sake.”

To sense the difference between intrinsic motivation and **extrinsic motivation** (behaving in certain ways to gain external rewards or avoid threatened punishment), think about your experience in this course. Are you feeling pressured to finish this reading before a deadline? Worried about your grade? Eager for the credits that will count toward graduation? If *Yes*, then you are extrinsically motivated (as, to some extent, almost all students must be). Are you also finding the material interesting? Does learning it make you feel more competent? If there were no grade at stake, might you be curious enough to want to learn the material for its own sake? If *Yes*, intrinsic motivation also fuels your efforts.

Youth sports coaches who aim to promote enduring interest in an activity, not just to pressure players into winning, should focus on the intrinsic joy of playing and of reaching one's potential (Deci & Ryan, 1985, 2009). Giving people choices also enhances their intrinsic motivation (Patall et al., 2008). Nevertheless, rewards used to signal a job well done (rather than to bribe or control someone) can be effective (Boggiano et al., 1985). “Most improved player” awards, for example, can boost feelings of competence and increase enjoyment of a sport. Rightly administered, rewards can raise performance and spark creativity (Eisenberger & Aselage, 2009; Henderlong & Lepper, 2002). And extrinsic rewards (such as the admissions scholarships and jobs that often follow good grades) are here to stay. **TABLE 7.5** compares the biological and cognitive influences on classical and operant conditioning.



Will and Demi McIntyre/Photo Researchers

Latent learning Animals, like people, can learn from experience, with or without reinforcement. In a classic experiment, rats in one group repeatedly explored a maze, always with a food reward at the end. Rats in another group explored the maze with no food reward. But once given a food reward at the end, rats in the second group thereafter ran the maze as quickly as (and even faster than) the always-rewarded rats. (From Tolman & Honzik, 1930.)

Table 7.5
Biological and Cognitive Influences on Conditioning

	Classical Conditioning	Operant Conditioning
<i>Biological predispositions</i>	Natural predispositions constrain what stimuli and responses can easily be associated.	Organisms best learn behaviors similar to their natural behaviors; unnatural behaviors instinctively drift back toward natural ones.
<i>Cognitive processes</i>	Organisms develop expectation that CS signals the arrival of US.	Organisms develop expectation that a response will be reinforced or punished; they also exhibit latent learning, without reinforcement.

RETRIEVE IT

- Instinctive drift and latent learning are examples of what important idea?

ANSWER: The success of operant conditioning is affected not just by environmental cues, but also by biological and cognitive factors.

Learning by Observation



7-13: What is observational learning, and how do some scientists believe it is enabled by mirror neurons?

Cognition is certainly a factor in **observational learning**, in which higher animals, especially humans, learn without direct experience, by watching and imitating others. A child who sees his sister burn her fingers on a hot stove learns not to touch it. We learn our native languages and various other specific behaviors by observing and imitating others, a process called **modeling**.

Albert Bandura was the pioneering researcher of observational learning. Picture this scene from one of his experiments (Bandura et al., 1961): A preschool child is working on a drawing, while an adult in another part of the room is building with Tinkertoys. As the child watches, the adult gets up and for nearly 10 minutes pounds, kicks, and throws around the room a large inflated Bobo doll, yelling, “Sock him in the nose. . . . Hit him down. . . . Kick him.”

The child is then taken to another room filled with appealing toys. Soon the experimenter returns and tells the child she has decided to save these good toys “for the other children.” She takes the now-frustrated child to a third room containing a few toys, including a Bobo doll. Left alone, what does the child do?

Compared with children not exposed to the adult model, those who viewed the model’s actions were more likely to lash out at the doll. Observing the aggressive outburst apparently lowered their inhibitions. But *something more* was also at work, for the children imitated the very acts they had observed and used the very words they had heard (**FIGURE 7.14**).

That “something more,” Bandura suggested, was this: By watching a model, we experience *vicarious reinforcement* or *vicarious punishment*, and we learn to anticipate a behavior’s consequences in situations like those we are observing. We are especially likely to learn from people we perceive as similar to ourselves, or as successful, or as admirable. fMRI scans show that when people observe someone winning a reward (and especially when it’s someone likable and similar to themselves) their own brain reward systems activate, much as if they themselves had won the reward (Mobbs et al., 2009). When we identify with someone, we experience their outcomes vicariously. Lord Chesterfield (1694–1773) had the idea: “We are, in truth, more than half what we are by imitation.”



Albert Bandura “The Bobo doll follows me wherever I go. The photographs are published in every introductory psychology text and virtually every undergraduate takes introductory psychology. I recently checked into a Washington hotel. The clerk at the desk asked, ‘Aren’t you the psychologist who did the Bobo doll experiment?’ I answered, ‘I am afraid that will be my legacy.’ He replied, ‘That deserves an upgrade. I will put you in a suite in the quiet part of the hotel’” (2005).

Courtesy of Albert Bandura, Stanford University

FIGURE 7.14
The famous Bobo doll experiment
Notice how the children’s actions directly imitate the adult’s.



Mirror neurons at work?



"Your back is killing me!"

"Children need models more than they need critics."

Joseph Joubert, *Pensées*, 1842

Mirrors and Imitation in the Brain

On a 1991 hot summer day in Parma, Italy, a lab monkey awaited its researchers' return from lunch. The researchers had implanted wires next to its motor cortex, in a frontal lobe brain region that enabled the monkey to plan and enact movements. The monitoring device would alert the researchers to activity in that region of the monkey's brain. When the monkey moved a peanut into its mouth, for example, the device would buzz. That day, as one of the researchers reentered the lab, ice cream cone in hand, the monkey stared at him. As the researcher raised the cone to lick it, the monkey's monitor buzzed—as if the motionless monkey had itself moved (Blakeslee, 2006; Iacoboni, 2008, 2009).

The same buzzing had been heard earlier, when the monkey watched humans or other monkeys move peanuts to their mouths. The flabbergasted researchers, led by Giacomo Rizzolatti (2002, 2006), had, they believed, stumbled onto a previously unknown type of neuron. These presumed **mirror neurons** may provide a neural basis for everyday imitation and observational learning. When a monkey grasps, holds, or tears something, these neurons fire. And they likewise fire when the monkey observes another doing so. When one monkey sees, its neurons mirror what another monkey does.

In humans, imitation is pervasive. Our catchphrases, hem lengths, ceremonies, foods, traditions, vices, and fads all spread by one person copying another. Imitation shapes even very young humans' behavior (Bates & Byrne, 2010). Shortly after birth, a baby may imitate an adult who sticks out his tongue. By 8 to 16 months, infants imitate various novel gestures (Jones, 2007). By age 12 months (**FIGURE 7.15**), they look where an adult is looking (Meltzoff et al., 2009). And by age 14 months, children imitate acts modeled on TV (Meltzoff, 1988; Meltzoff & Moore, 1989, 1997). Even as 2½-year-olds, when many of their mental abilities are near those of adult chimpanzees, young humans surpass chimps at social tasks such as imitating another's solution to a problem (Herrmann et al., 2007). Children see, children do.

So strong is the human predisposition to learn from watching adults that 2- to 5-year-old children *overimitate*. Whether living in urban Australia or rural Africa, they copy even irrelevant adult actions. Before reaching for a toy in a plastic jar, they will first stroke the jar with a feather if that's what they have observed (Lyons et al., 2007). Or, imitating an adult, they will wave a stick over a box and then use the stick to push on a knob that opens the box—when all they needed to do to open the box was to push on the knob (Nielsen & Tomaselli, 2010).

Humans, like monkeys, have brains that support empathy and imitation. Researchers cannot insert experimental electrodes in human brains, but they can use fMRI scans to see brain activity associated with performing and with observing actions. So, is the human capacity to simulate another's action and to share in another's experience due to specialized mirror neurons? Or is it due to distributed brain networks? That issue is currently being debated (Gallese et al., 2011; Iacoboni, 2008, 2009; Mukamel et al., 2010). Regardless, children's brains enable their empathy and their ability to infer another's mental state, an ability known as *theory of mind*.

FIGURE 7.15

Imitation This 12-month-old infant sees an adult look left, and immediately follows her gaze. (From Meltzoff et al., 2009.)



Meltzoff, A. N., Kuhl, P. K., Movellan, J., & Sejnowski, T. J. (2009). Foundations for a new science of learning. *Science*, 325, 284–288

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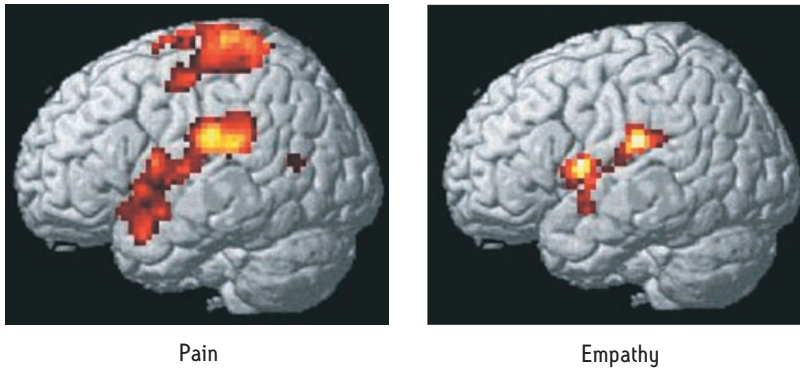


FIGURE 7.16
Experienced and imagined pain in the brain Brain activity related to actual pain (left) is mirrored in the brain of an observing loved one (right). Empathy in the brain shows up in emotional brain areas, but not in the somatosensory cortex, which receives the physical pain input.

The brain's response to observing others makes emotions contagious. Through its neurological echo, our brain simulates and vicariously experiences what we observe. So real are these mental instant replays that we may misremember an action we have observed as an action we have performed (Lindner et al., 2010). But through these reenactments, we grasp others' states of mind. Observing others' postures, faces, voices, and writing styles, we unconsciously synchronize our own to theirs—which helps us feel what they are feeling (Bernieri et al., 1994; Ireland & Pennebaker, 2010). We find ourselves yawning when they yawn, laughing when they laugh.

When observing movie characters smoking, smokers' brains spontaneously simulate smoking, which helps explain their cravings (Wagner et al., 2011). Seeing a loved one's pain, our faces mirror the other's emotion. But as **FIGURE 7.16** shows, so do our brains. In this fMRI scan, the pain imagined by an empathic romantic partner triggered some of the same brain activity experienced by the loved one who actually had the pain (Singer et al., 2004). Even fiction reading may trigger such activity, as we mentally simulate (and vicariously experience) the feelings and actions described (Mar & Oatley, 2008; Speer et al., 2009). The bottom line: *Brain activity underlies our intensely social nature.*

Applications of Observational Learning

So the big news from Bandura's studies and the mirror–neuron research is that we look, we mentally imitate, and we learn. Models—in our family, our neighborhood, or on TV—may have effects, good and bad.

Prosocial Effects



7-14: What is the impact of prosocial modeling and of antisocial modeling?

The good news is that **prosocial** (positive, helpful) models can have prosocial effects. Many business organizations effectively use *behavior modeling* to help new employees learn communication, sales, and customer service skills (Taylor et al., 2005). Trainees gain these skills faster when they are able to observe the skills being modeled effectively by experienced workers (or actors simulating them).

People who exemplify nonviolent, helpful behavior can also prompt similar behavior in others. India's Mahatma Gandhi and America's Martin Luther King, Jr., both drew on the power of modeling, making nonviolent action a powerful force for social change in both countries. Parents are also powerful models. European Christians who risked their lives to rescue Jews from the Nazis usually had a close relationship with at least one parent who modeled a strong moral or humanitarian concern; this was also true for U.S. civil rights activists in the 1960s (London, 1970; Oliner & Oliner, 1988). The observational learning of morality begins early. Socially responsive toddlers who readily

mirror neurons frontal lobe neurons that some scientists believe fire when performing certain actions or when observing another doing so. The brain's mirroring of another's action may enable imitation and empathy.

prosocial behavior positive, constructive, helpful behavior. The opposite of antisocial behavior.

Model of giving Children, such as this boy volunteering with his dad for a neighborhood revitalization project, learn positive behaviors and attitudes from the prosocial models in their lives. As the sixteenth-century proverb states, “Example is better than precept.”



Jeff Greenberg/Photo Edit

imitated their parents tended to become preschoolers with a strong internalized conscience (Forman et al., 2004).

Models are most effective when their actions and words are consistent. Sometimes, however, models say one thing and do another. To encourage children to read, read to them and surround them with books and people who read. To increase the odds that your children will practice your religion, worship and attend religious activities with them. Many parents seem to operate according to the principle “Do as I say, not as I do.” Experiments suggest that children learn to do both (Rice & Grusec, 1975; Rushton, 1975). Exposed to a hypocrite, they tend to imitate the hypocrisy—by doing what the model did and saying what the model said.

Antisocial Effects

The bad news is that observational learning may have *antisocial effects*. This helps us understand why abusive parents might have aggressive children, and why many men who beat their wives had wife-battering fathers (Stith et al., 2000). Critics note that being aggressive could be passed along by parents’ genes. But with monkeys we know it can be environmental. In study after study, young monkeys separated from their mothers and subjected to high levels of aggression grew up to be aggressive themselves (Chamove, 1980). The lessons we learn as children are not easily replaced as adults, and they are sometimes visited on future generations.

TV is a powerful source of observational learning. While watching TV, children may “learn” that bullying is an effective way to control others, that free and easy sex brings pleasure without later misery or disease, or that men should be tough and women gentle. And they have ample time to learn such lessons. During their first 18 years, most children in developed countries spend more time watching TV than they spend in school. In the United States, where 9 in 10 teens watch TV daily, someone who lives to age 75 will have spent 9 years staring at the tube (Gallup, 2002; Kubey & Csikszentmihalyi, 2002). The average teen watches TV more than 4 hours a day, the average adult 3 hours (Robinson & Martin, 2009; Strasburger et al., 2010). With CNN reaching 212 countries, and MTV’s networks broadcasting in 33 languages, television has created a global pop culture.

TV viewers are learning about life from a rather peculiar storyteller, one that reflects the culture’s mythology but not its reality. During the late twentieth century, the average child viewed some 8000 TV murders and 100,000 other acts of violence before finishing elementary school (Huston et al., 1992). Between 1998 and 2006, prime-time violence reportedly increased another 75 percent (PTC, 2007). If we include cable programming and watching movies at home, the violence numbers escalate. An analysis of more than 3000 network and cable programs aired in the 1996–1997 season revealed that nearly 6 in 10 featured violence, that 74 percent of the violence went unpunished, that 58 percent did not show the victims’ pain, that nearly half the incidents involved “justified” violence, and that nearly half involved an attractive perpetrator. These conditions define the recipe for the *violence-viewing effect* described in many studies (Donnerstein, 1998, 2011). To read more about this effect, see *Thinking Critically About: Does Viewing Media Violence Trigger Violent Behavior?*

“The problem with television is that the people must sit and keep their eyes glued to a screen: The average American family hasn’t time for it. Therefore the showmen are convinced that . . . television will never be a serious competitor of [radio] broadcasting.”

New York Times, 1939

THINKING CRITICALLY ABOUT:

Does Viewing Media Violence Trigger Violent Behavior?

Was the judge who in 1993 tried two British 10-year-olds for their murder of a 2-year-old right to suspect that the pair had been influenced by “violent video films”? Were the American media right to think that the teen assassins who killed 13 of their Columbine High School classmates had been influenced by repeated exposure to *Natural Born Killers* and splatter games such as *Doom*? To understand whether violence viewing leads to violent behavior, researchers have done some 600 correlational and experimental studies (Anderson & Gentile, 2008; Comstock, 2008; Murray, 2008).

Correlational studies do support this link:

- In the United States and Canada, homicide rates doubled between 1957 and 1974, just when TV was introduced and spreading. Moreover, census regions with later dates for TV service also had homicide rates that jumped later.
- White South Africans were first introduced to TV in 1975. A similar near-doubling of the homicide rate began after 1975 (Centerwall, 1989).
- Elementary schoolchildren heavily exposed to media violence (via TV, videos, and video games) have also tended to get into more fights (FIGURE 7.17). As teens, such children are also at greater risk for violent behavior (Boxer et al., 2009).

But as we know from Chapter 1, correlation need not mean causation. So correlational studies like these do not prove that viewing violence *causes* aggression (Ferguson, 2009; Freedman, 1988; McGuire, 1986). Maybe aggressive children prefer violent programs. Maybe abused or neglected children are both more aggressive and more often left in front of the TV. Maybe violent programs reflect, rather than affect, violent trends.

To pin down causation, psychologists have experimented. They randomly assigned some viewers to observe violence and others to watch entertaining nonviolence. Does viewing cruelty prepare people, when irritated, to react more cruelly? To some extent, it does. This is especially so when an attractive person commits seemingly justified, realistic violence that goes unpunished and causes no visible pain or harm (Donnerstein, 1998, 2011).

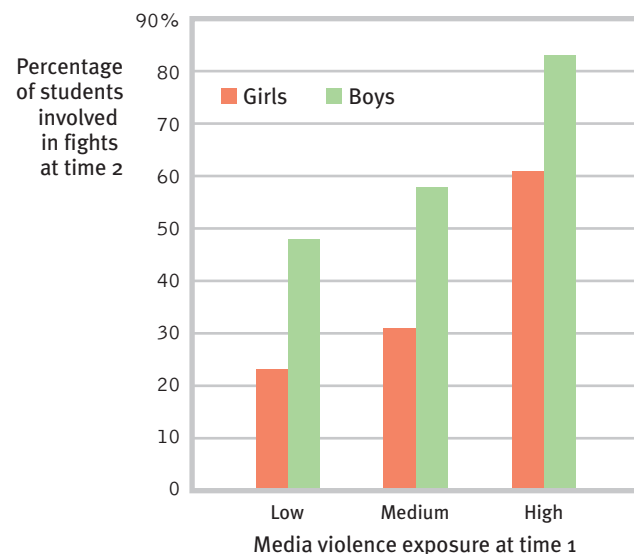
The violence-viewing effect seems to stem from at least two factors. One is *imitation* (Geen & Thomas, 1986). Children as young as 14 months will imitate acts they observe on TV (Meltzoff & Moore, 1989, 1997). As they watch, their brains simulate the behavior, and after this inner rehearsal they become more likely to act it out. Thus, in one experiment, violent play increased sevenfold immediately after children viewed *Power Rangers* episodes (Boyatzis et al., 1995). As happened in the Bobo doll experiment, children often precisely imitated the models' violent acts—in this case, flying karate kicks.

Prolonged exposure to violence also *desensitizes* viewers. They become more indifferent to it when later viewing a brawl, whether on TV or in real life (Fanti et al., 2009; Rule & Ferguson, 1986). Adult males who spent three evenings watching sexually violent movies became progressively less bothered by the rapes and slashings. Compared with those in a control group, the film watchers later expressed less sympathy for domestic violence victims, and they rated the victims' injuries as less severe (Mullin & Linz, 1995). Likewise, moviegoers were less likely to help an injured woman pick up her crutches if they had just watched a violent rather than a nonviolent movie (Bushman & Anderson, 2009).

Drawing on such findings, the American Academy of Pediatrics (2009) has advised pediatricians that “media violence can contribute to aggressive behavior, desensitization to violence, nightmares, and fear of being harmed.” Indeed, an evil psychologist could hardly imagine a better way to make people indifferent to brutality than to expose them to a graded series of scenes, from fights to killings to the mutilations in slasher movies (Donnerstein et al., 1987). Watching cruelty fosters indifference.

“Thirty seconds worth of glorification of a soap bar sells soap. Twenty-five minutes worth of glorification of violence sells violence.”

U.S. Senator Paul Simon, Remarks to the Communitarian Network, 1993



Stanislav Sointsev/Getty Images

FIGURE 7.17

Heavy exposure to media violence predicted future aggressive behavior Researchers studied more than 400 third- to fifth-graders. After controlling for existing differences in hostility and aggression, the researchers reported increased aggression in those heavily exposed to violent TV, videos, and video games (Gentile et al., 2004).

RETRIEVE IT

- Jason's parents and older friends all smoke, but they advise him not to. Juan's parents and friends don't smoke, but they say nothing to deter him from doing so. Will Jason or Juan be more likely to start smoking?

ANSWERS: Jason may be more likely to smoke, because observational learning studies suggest that children tend to do as others do and say what they say.

TV's greatest effect may stem from what it displaces. Children and adults who spend four hours a day watching TV spend four fewer hours in active pursuits—talking, studying, playing, reading, or socializing with friends. What would you have done with your extra time if you had never watched TV, and how might you therefore be different?

Our knowledge of learning principles comes from the work of thousands of investigators. This chapter has focused on the ideas of a few pioneers—Ivan Pavlov, John Watson, B. F. Skinner, and Albert Bandura. They illustrate the impact that can result from single-minded devotion to a few well-defined problems and ideas. These researchers defined the issues and impressed on us the importance of learning. As their legacy demonstrates, intellectual history is often made by people who risk going to extremes in pushing ideas to their limits (Simonton, 2000).

RETRIEVE IT

- Match the examples (1–5) to the appropriate underlying learning principle (a–e):

- | | |
|---------------------------|-------------------------------|
| a. Classical conditioning | d. Observational learning |
| b. Operant conditioning | e. Biological predispositions |
| c. Latent learning | |

1. Knowing the way from your bed to the bathroom in the dark
2. Your little brothers getting in a fight after watching a violent action movie
3. Salivating when you smell brownies in the oven
4. Disliking the taste of chili after being violently sick a few hours after eating chili
5. Your dog racing to greet you on your arrival home

ANSWERS: 1. c, 2. d, 3. a, 4. e, 5. b

CHAPTER REVIEW

Learning

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

How Do We Learn?

7-1: What is learning, and what are some basic forms of learning?

Classical Conditioning

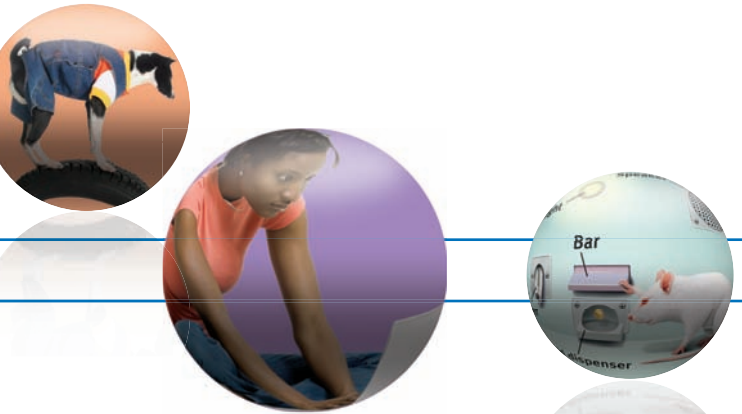
7-2: What are the basic components of classical conditioning, and what was behaviorism's view of learning?

7-3: In classical conditioning, what are the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination?

7-4: Why does Pavlov's work remain so important, and what have been some applications of his work to human health and well-being?

Operant Conditioning

7-5: What is operant conditioning, and how is operant behavior reinforced and shaped?



7-6: How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

7-7: How do different reinforcement schedules affect behavior?

7-8: How does punishment differ from negative reinforcement, and how does punishment affect behavior?

7-9: Why did Skinner's ideas provoke controversy, and how might his operant conditioning principles be applied at school, in sports, at work, and at home?

7-10: How does operant conditioning differ from classical conditioning?

Biology, Cognition, and Learning

7-11: How do biological constraints affect classical and operant conditioning?

7-12: How do cognitive processes affect classical and operant conditioning?

Learning by Observation

7-13: What is observational learning, and how do some scientists believe it is enabled by mirror neurons?

7-14: What is the impact of prosocial modeling and of antisocial modeling?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

learning, p. 238

associative learning, p. 238

stimulus, p. 238

cognitive learning, p. 239

classical conditioning, p. 239

behaviorism, p. 240

neutral stimulus (NS), p. 240

unconditioned response (UR), p. 240

unconditioned stimulus (US), p. 240

conditioned response (CR), p. 240

conditioned stimulus (CS), p. 240

acquisition, p. 241

extinction, p. 242

spontaneous recovery, p. 242

generalization, p. 243

discrimination, p. 244

operant conditioning, p. 246

law of effect, p. 246

operant chamber, p. 246

reinforcement, p. 247

shaping, p. 247

positive reinforcement, p. 248

negative reinforcement, p. 248

primary reinforcer, p. 248

conditioned reinforcer, p. 248

continuous reinforcement, p. 249

reinforcement schedule, p. 249

partial (intermittent) reinforcement,
p. 249

fixed-ratio schedule, p. 249

variable-ratio schedule, p. 249

fixed-interval schedule, p. 250

variable-interval schedule, p. 250

punishment, p. 251

respondent behavior, p. 255

operant behavior, p. 256

cognitive map, p. 259

latent learning, p. 260

intrinsic motivation, p. 260

extrinsic motivation, p. 260

observational learning, p. 261

modeling, p. 261

mirror neurons, p. 262

prosocial behavior, p. 263

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Learning is defined as “the process of acquiring through experience new and relatively enduring _____ or _____.”
- Two forms of associative learning are classical conditioning, in which the organism associates _____, and operant conditioning, in which the organism associates _____.
 - two or more responses; a response and consequence
 - two or more stimuli; two or more responses
 - two or more stimuli; a response and consequence
 - two or more responses; two or more stimuli
- In Pavlov's experiments, the tone started as a neutral stimulus, and then became a(n) _____ stimulus.
- Dogs have been taught to salivate to a circle but not to a square. This process is an example of _____.
- After Watson and Rayner classically conditioned Little Albert to fear a white rat, the child later showed fear in response to a rabbit, a dog, and a sealskin coat. This illustrates
 - extinction.
 - generalization.
 - spontaneous recovery.
 - discrimination between two stimuli.
- “Sex sells!” is a common saying in advertising. Using classical conditioning terms, explain how sexual images in advertisements can condition your response to a product.
- Thorndike's law of effect was the basis for _____ work on operant conditioning and behavior control.
- One way to change behavior is to reward natural behaviors in small steps, as they get closer and closer to a desired behavior. This process is called _____.
- Your dog is barking so loudly that it's making your ears ring. You clap your hands, the dog stops barking, your ears stop ringing, and you think to yourself, “I'll have to do that when he barks again.” The end of the barking was for you a
 - positive reinforcer.
 - negative reinforcer.
 - positive punishment.
 - negative punishment.
- How could your psychology instructor use negative reinforcement to encourage your attentive behavior during class?
- Reinforcing a desired response only some of the times it occurs is called _____ reinforcement.
- A restaurant is running a special deal. After you buy four meals at full price, your fifth meal will be free. This is an example of a _____ schedule of reinforcement.
 - fixed-ratio
 - variable-ratio
 - fixed-interval
 - variable-interval
- The partial reinforcement schedule that reinforces a response after unpredictable time periods is a _____-_____ schedule.
- A medieval proverb notes that “a burnt child dreads the fire.” In operant conditioning, the burning would be an example of a
 - primary reinforcer.
 - negative reinforcer.
 - punisher.
 - positive reinforcer.
- Which research showed that conditioning can occur even when the unconditioned stimulus (US) does not immediately follow the neutral stimulus (NS)?
 - The Little Albert experiment
 - Pavlov's experiments with dogs
 - Watson's behaviorism studies
 - Garcia and Koelling's taste-aversion studies

16. Taste-aversion research has shown that some animals develop aversions to certain tastes but not to sights or sounds. This finding supports
- Pavlov's demonstration of generalization.
 - Darwin's principle that natural selection favors traits that aid survival.
 - Watson's belief that psychologists should study observable behavior, not mentalistic concepts.
 - the early behaviorists' view that any organism can be conditioned to any stimulus.
17. Evidence that cognitive processes play an important role in learning comes in part from studies in which rats
- spontaneously recover previously learned behavior.
 - develop cognitive maps.
 - exhibit respondent behavior.
 - generalize responses.
18. Rats that explored a maze without any reward were later able to run the maze as well as other rats that had received food rewards for running the maze. The rats that had learned without reinforcement demonstrated _____.
19. Children learn many social behaviors by imitating parents and other models. This type of learning is called _____.
20. According to Bandura, we learn by watching models because we experience _____ reinforcement or _____ punishment.
21. Parents are most effective in getting their children to imitate them if
- their words and actions are consistent.
 - they have outgoing personalities.
 - one parent works and the other stays home to care for the children.
 - they carefully explain why a behavior is acceptable in adults but not in children.
22. Some scientists believe that the brain has _____ neurons that enable observation and imitation.
23. Most experts agree that repeated viewing of TV violence
- makes all viewers significantly more aggressive.
 - has little effect on viewers.
 - dulls viewers' sensitivity to violence.
 - makes viewers angry and frustrated.

Find answers to these questions in Appendix E, in the back of the book.



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STUDYING MEMORY

Memory Models

BUILDING MEMORIES: ENCODING

Dual-Track Memory: Effortful Versus Automatic Processing

Automatic Processing and Implicit Memories

Effortful Processing and Explicit Memories

MEMORY STORAGE

Retaining Information in the Brain

Synaptic Changes

RETRIEVAL: GETTING INFORMATION OUT

Measuring Retention

Retrieval Cues

FORGETTING

Forgetting and the Two-Track Mind

Encoding Failure

Storage Decay

Retrieval Failure

MEMORY CONSTRUCTION ERRORS

Misinformation and Imagination Effects

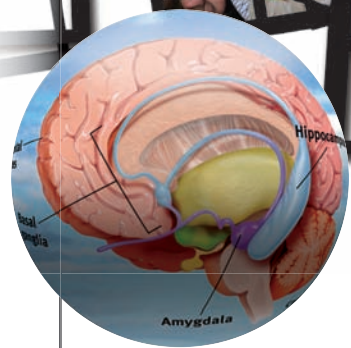
Source Amnesia

Discerning True and False Memories

Children's Eyewitness Recall

Repressed or Constructed Memories of Abuse?

IMPROVING MEMORY





CHAPTER 8

Memory

This ninth edition Memory chapter is co-authored by Janie Wilson, Professor of Psychology at Georgia Southern University and Vice President for Programming of the Society for the Teaching of Psychology.

Be thankful for memory. We take it for granted, except when it malfunctions. But it is our memory that accounts for time and defines our life. It is our memory that enables us to recognize family, speak our language, find our way home, and locate food and water. It is our memory that enables us to enjoy an experience and then mentally replay and enjoy it again. And it is our memory that occasionally pits us against those whose offenses we cannot forget.

In large part, we are what we remember. Without memory—our storehouse of accumulated learning—there would be no savoring of past joys, no guilt or anger over painful recollections. We would instead live in an enduring present, each moment fresh.

But each person would be a stranger, every language foreign, every task—dressing, cooking, biking—a new challenge. You would even be a stranger to yourself, lacking that continuous sense of self that extends from your distant past to your momentary present.



memory the persistence of learning over time through the storage and retrieval of information.

recall a measure of memory in which the person must retrieve information learned earlier, as on a fill-in-the-blank test.

recognition a measure of memory in which the person need only identify items previously learned, as on a multiple-choice test.

relearning a measure of memory that assesses the amount of time saved when learning material again.

Studying Memory



8-1: What is memory, and how is it measured?

Memory is learning that has persisted over time; it is information that has been acquired, stored, and can be retrieved. To a psychologist, evidence that learning persists includes these three *measures of retention*, which we will explore later in the chapter:

- **recall**—retrieving information that is not currently in your conscious awareness but that was learned at an earlier time. A fill-in-the-blank question tests your recall.
- **recognition**—identifying items previously learned. A multiple-choice question tests your recognition.
- **relearning**—learning something more quickly when you learn it a second or later time. When you study for a final exam or engage a language used in early childhood, you will relearn the material more easily than you did initially.

Research on memory's extremes has helped us understand how memory works. At age 92, my father suffered a small stroke that had but one peculiar effect. He was as mobile as before. His genial personality was intact. He knew us and enjoyed poring over family photo albums and reminiscing about his past. But he had lost most of his ability to lay down new memories of conversations and everyday episodes. He could not tell me what day of the week it was, or what he'd had for lunch. Told repeatedly of his brother-in-law's death, he was surprised and saddened each time he heard the news.

At the other extreme are people who would be gold medal winners in a memory Olympics. Russian journalist Shereshevskii, or S, had merely to listen while other reporters scribbled notes (Luria, 1968). You and I could parrot back a string of about 7—maybe even 9—digits. S could repeat up to 70, if they were read about 3 seconds apart in an otherwise silent room. Moreover, he could recall digits or words backward as easily as forward. His accuracy was unerring, even when recalling a list as much as 15 years later. “Yes, yes,” he might recall. “This was a series you gave me once when we were in your apartment. . . . You were sitting at the table and I in the rocking chair. . . . You were wearing a gray suit. . . .”

Amazing? Yes, but consider your own impressive memory. You remember countless voices, sounds, and songs; tastes, smells, and textures; faces, places, and happenings. Imagine viewing more than 2500 slides of faces and places for 10 seconds each. Later, you see 280 of these slides, paired with others you've never seen. Actual participants in this experiment recognized 90 percent of the slides they had viewed in the first round (Haber, 1970). In a follow-up experiment, people exposed to 2800 images for only 3 seconds each spotted the repeats with 82 percent accuracy (Konkle et al., 2010).

Or imagine yourself looking at a picture fragment, such as the one in **FIGURE 8.1**. Also imagine that you had seen the complete picture for a couple of seconds 17 years earlier. This, too, was a real experiment, and participants who had previously seen the complete drawings were more likely to identify the objects than were members of a control group (Mitchell, 2006). Moreover, the picture memory reappeared even for those who did not consciously recall participating in the long-ago experiment!

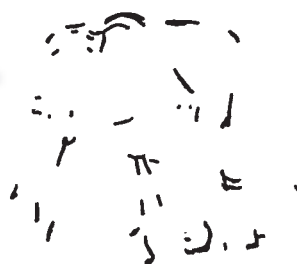
How do we accomplish such memory feats? How does our brain pluck information out of the world around us and tuck that information away for later use? How can we remember things we have not thought about for years, yet forget the name of someone we met a minute ago? How are memories stored in our brains? Why will you be likely, later in this chapter, to misrecall this sentence: “*The angry rioter threw the rock at the window*”? In this chapter, we'll consider these fascinating questions and more, including tips on how we can improve our own memories.



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FIGURE 8.1

What is this? People who had, 17 years earlier, seen the complete image (in Figure 8.4 when you turn the page) were more likely to recognize this fragment, even if they had forgotten the earlier experience (Mitchell, 2006).



Memory Models



8-2: How do psychologists describe the human memory system?

Architects make miniature house models to help clients imagine their future homes. Similarly, psychologists create memory models to help us think about how our brain forms and retrieves memories. *Information-processing models* are analogies that compare human memory to a computer's operations. Thus, to remember any event, we must

- *get information into our brain*, a process called **encoding**.
- *retain that information*, a process called **storage**.
- *later get the information back out*, a process called **retrieval**.

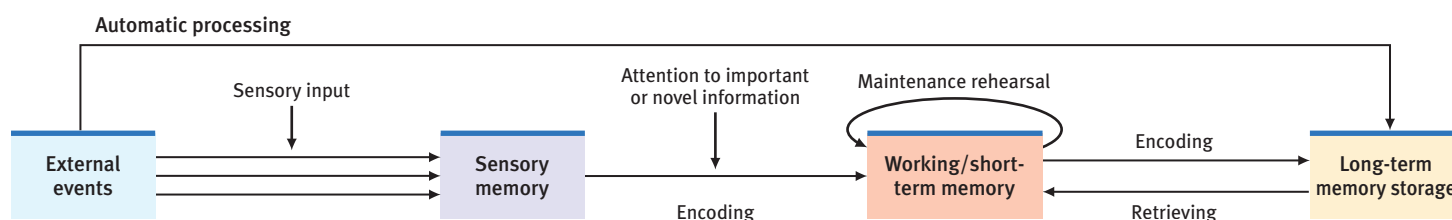
Like all analogies, computer models have their limits. Our memories are less literal and more fragile than a computer's. Moreover, most computers process information sequentially, even while alternating between tasks. Our dual-track brain processes many things simultaneously (some of them unconsciously) by means of *parallel processing*.

To focus on this complex, simultaneous processing, one information-processing model, *connectionism*, views memories as products of interconnected neural networks. Specific memories arise from particular activation patterns within these networks. Every time you learn something new, your brain's neural connections change, forming and strengthening pathways that allow you to interact with and learn from your constantly changing environment.

To explain our memory-forming process, Richard Atkinson and Richard Shiffrin (1968) proposed another model, with three stages:

1. We first record to-be-remembered information as a fleeting **sensory memory**.
2. From there, we process information into **short-term memory**, where we encode it through *rehearsal*.
3. Finally, information moves into **long-term memory** for later retrieval.

Other psychologists have updated this model (**FIGURE 8.2**) to include important newer concepts, including *working memory* and *automatic processing*.



Working Memory

Alan Baddeley and others (Baddeley, 2001, 2002; Engle, 2002) challenged Atkinson and Shiffrin's view of short-term memory as a small, brief storage space for recent thoughts and experiences. Research shows that this stage is not just a temporary shelf for holding incoming information. It's an active desktop where your brain processes information, making sense of new input and linking it with long-term memories. Whether we hear *eye-scream* as "ice cream" or "I scream" will depend on how the context and our experience guide us in interpreting and encoding the sounds. To emphasize the active processing that takes place in this middle stage, psychologists use the term **working memory**. Right now, you are using your working memory to link the information you're reading with your previously stored information (Cowan, 2010; Kail & Hall, 2001).

encoding the processing of information into the memory system—for example, by extracting meaning.

storage the retention of encoded information over time.

retrieval the process of getting information out of memory storage.

sensory memory the immediate, very brief recording of sensory information in the memory system.

short-term memory activated memory that holds a few items briefly, such as seven digits of a phone number while dialing, before the information is stored or forgotten.

long-term memory the relatively permanent and limitless storehouse of the memory system. Includes knowledge, skills, and experiences.

working memory a newer understanding of short-term memory that focuses on conscious, active processing of incoming auditory and visual-spatial information, and of information retrieved from long-term memory.

FIGURE 8.2

A modified three-stage processing model of memory Atkinson and Shiffrin's classic three-step model helps us to think about how memories are processed, but today's researchers recognize other ways long-term memories form. For example, some information slips into long-term memory via a "back door," without our consciously attending to it (*automatic processing*). And so much active processing occurs in the short-term memory stage that many now prefer the term *working memory*.

FIGURE 8.3

Working memory Alan Baddeley's (2002) model of working memory, simplified here, includes *visual* and *auditory rehearsal* of new information. A hypothetical *central executive* (manager) focuses attention and pulls information from long-term memory to help make sense of new information.

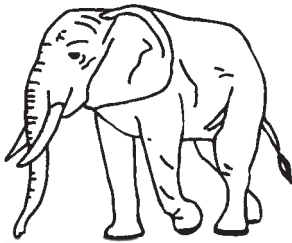
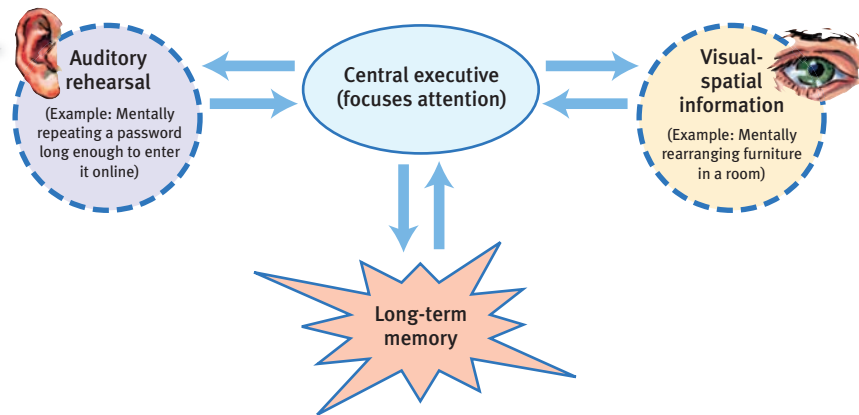


FIGURE 8.4

Now you know People who had seen this complete image were, 17 years later, more likely to recognize the fragment in Figure 8.1.

The pages you are reading may enter working memory through vision. You might also repeat the information using auditory rehearsal. As you integrate these memory inputs with your existing long-term memory, your attention is focused. Baddeley (2002) suggested a *central executive* handles this focused processing (FIGURE 8.3).

Without focused attention, information often fades. In one experiment, people read and typed new information they would later need, such as “An ostrich’s eye is bigger than its brain.” If they knew the information would be available online they invested less energy in remembering, and they remembered the trivia less well (Sparrow et al., 2011). Sometimes Google replaces rehearsal.

RETRIEVE IT

- What two new concepts update the classic Atkinson-Shiffrin three-stage information-processing model?

ANSWER: (1) We form some memories through *automatic processing*, without our awareness. The Atkinson-Shiffrin model focused only on conscious memories. (2) The newer concept of a *working memory* emphasizes the active processing that we now know takes place in Atkinson-Shiffrin’s short-term memory stage.

- What are two basic functions of *working memory*?

ANSWER: (1) Active processing of incoming visual and auditory information, and (2) focusing our spotlight of attention.

Building Memories: Encoding

Dual-Track Memory: Effortful Versus Automatic Processing

explicit memory memory of facts and experiences that one can consciously know and “declare.” (Also called *declarative memory*.)

effortful processing encoding that requires attention and conscious effort.

automatic processing unconscious encoding of incidental information, such as space, time, and frequency, and of well-learned information, such as word meanings.

implicit memory retention independent of conscious recollection. (Also called *nondeclarative memory*.)



8-3: How do explicit and implicit memories differ?

As we have seen throughout this text, our mind operates on two tracks:

- Atkinson and Shiffrin’s model focused on how we process our **explicit memories**—the facts and experiences we can consciously know and declare (thus, also called *declarative memories*). We encode explicit memories through conscious **effortful processing**.
- Behind the scenes, outside the Atkinson-Shiffrin stages, other information skips the conscious encoding track and barges directly into storage. This **automatic processing**, which happens without our awareness, produces **implicit memories** (also called *nondeclarative memories*).

Automatic Processing and Implicit Memories



8-4: What information do we automatically process?

Our implicit memories include *procedural* memory for automatic skills (such as how to ride a bike) and classically conditioned *associations* among stimuli. Visiting your dentist, you may, thanks to a conditioned association linking the dentist's office with the painful drill, find yourself with sweaty palms. You didn't plan to feel that way when you got to the dentist's office; it happened *automatically*.

Without conscious effort you also automatically process information about

- *space*. While studying, you often encode the place on a page where certain material appears; later, when you want to retrieve information about automatic processing, for example, you may visualize the location of that information on this page.
- *time*. While going about your day, you unintentionally note the sequence of its events. Later, realizing you've left your coat somewhere, the event sequence your brain automatically encoded will enable you to retrace your steps.
- *frequency*. You effortlessly keep track of how many times things happen, as when you suddenly realize, *This is the third time I've run into her today*.

Our two-track mind engages in impressively efficient information processing. As one track automatically tucks away many routine details, the other track is free to focus on conscious, effortful processing. This reinforces an important principle introduced in Chapter 6's description of parallel processing: Mental feats such as vision, thinking, and memory may seem to be single abilities, but they are not. Rather, we split information into different components for separate and simultaneous processing.

Effortful Processing and Explicit Memories

Automatic processing happens so effortlessly that it is difficult to shut off. When you see words in your native language, perhaps on the side of a delivery truck, you can't help but read them and register their meaning. *Learning* to read wasn't automatic. You may recall working hard to pick out letters and connect them to certain sounds. But with experience and practice, your reading became automatic. Imagine now learning to read reversed sentences like this:

.citamotua emoceb nac gnissecorp luftroffE

At first, this requires effort, but after enough practice, you would also perform this task much more automatically. We develop many skills in this way. We learn to drive, to text, to speak a new language with effort, but then these tasks become automatic.

Sensory Memory



8-5: How does sensory memory work?

Sensory memory (recall Figure 8.2) feeds our active working memory, recording momentary images of scenes or echoes of sounds. How much of this page could you sense and recall with less exposure than a lightning flash? In one experiment (Sperling, 1960), people viewed three rows of three letters each, for only one-twentieth of a second (FIGURE 8.5). After the nine letters disappeared, they could recall only about half of them.

Was it because they had insufficient time to glimpse them? *No*. The researcher, George Sperling, cleverly demonstrated that people actually *could* see and recall all the letters, but only momentarily. Rather than ask them to recall all nine letters at once, he sounded a high, medium, or low tone immediately *after* flashing the nine letters. This tone directed participants to report only the letters of the top, middle, or bottom row, respectively. Now they rarely missed a letter, showing that all nine letters were momentarily available for recall.

FIGURE 8.5

Momentary photographic memory

When George Sperling flashed a group of letters similar to this for one-twentieth of a second, people could recall only about half the letters. But when signaled to recall a particular row immediately after the letters had disappeared, they could do so with near-perfect accuracy.

K	Z	R
Q	B	T
S	G	N

Sperling's experiment demonstrated **iconic memory**, a fleeting sensory memory of visual stimuli. For a few tenths of a second, our eyes register a photographic or picture-image memory of a scene, and we can recall any part of it in amazing detail. But if Sperling delayed the tone signal by more than half a second, the image faded and participants again recalled only about half the letters. Our visual screen clears quickly, as new images are superimposed over old ones.

We also have an impeccable, though fleeting, memory for auditory stimuli, called **echoic memory** (Cowan, 1988; Lu et al., 1992). Picture yourself in conversation, as your attention veers to the TV. If your mildly irked companion tests you by asking, "What did I just say?" you can recover the last few words from your mind's echo chamber. Auditory echoes tend to linger for 3 or 4 seconds.

The Magical Number Seven has become psychology's contribution to an intriguing list of magic sevens—the seven wonders of the world, the seven seas, the seven deadly sins, the seven primary colors, the seven musical scale notes, the seven days of the week—seven magical sevens.

Capacity of Short-Term and Working Memory



8-6: What is the capacity of our short-term and working memory?

George Miller (1956) proposed that short-term memory can retain about seven information bits (give or take two). Other researchers have confirmed that we can, if nothing distracts us, recall about seven digits, or about six letters or five words (Baddeley et al., 1975). How quickly do our short-term memories disappear? To find out, Lloyd Peterson and Margaret Peterson (1959) asked people to remember three-consonant groups, such as *CHJ*. To prevent rehearsal, the researchers asked them, for example, to start at 100 and count aloud backward by threes. After 3 seconds, people recalled the letters only about half the time; after 12 seconds, they seldom recalled them at all (**FIGURE 8.6**). Without the active processing that we now understand to be a part of our working memory, short-term memories have a limited life.

Working-memory capacity varies, depending on age and other factors. Compared with children and older adults, young adults have more working-memory capacity, so they can use their mental workspace more efficiently. This means their ability to multitask is relatively greater. But whatever our age, we do better and more efficient work when focused, without distractions, on one task at a time. *The bottom line:* It's probably a bad idea to try to watch TV, text your friends, and write a psychology paper all at the same time (Willingham, 2010)!

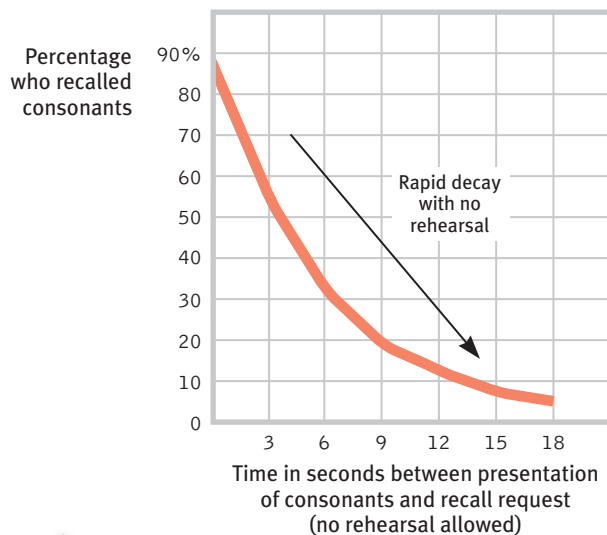


FIGURE 8.6

Short-term memory decay Unless rehearsed, verbal information may be quickly forgotten. (From Peterson & Peterson, 1959; see also Brown, 1958.)

Effortful Processing Strategies



8-7: What are some effortful processing strategies that can help us remember new information?

Research shows that several effortful processing strategies can boost our ability to form new memories. Later, when we try to retrieve a memory, these strategies can make the difference between success and failure.

Chunking Glance for a few seconds at row 1 of **FIGURE 8.7**, then look away and try to reproduce what you saw. Impossible, yes? But you can easily reproduce the second row, which is no less complex. Similarly, you will probably find row 4 much easier to remember than row 3, although both contain the same letters. And you could remember the sixth cluster more easily than the fifth, although both contain the same words. As these units demonstrate, **chunking** information—organizing items into familiar, manageable units—enables us to recall it more easily. Try remembering 43 individual numbers and letters. It would be impossible, unless chunked into, say, seven meaningful chunks, such as “Try remembering 43 individual numbers and letters.”☺

1. $\triangle \cup \mathcal{D} \approx \mathcal{Y} \mathcal{N} \mathcal{I} \mathcal{T}$
2. K L C I S N E

3. KLCISNE NVESE YNA NI CSTTIIH TND0
4. NICKELS SEVEN ANY IN STITCH DONT

5. NICKELS SEVEN ANY IN STITCH DONT
SAVES AGO A SCORE TIME AND
NINE WOODEN FOUR YEARS TAKE

6. DONT TAKE ANY WOODEN NICKELS
FOUR SCORE AND SEVEN YEARS AGO
A STITCH IN TIME SAVES NINE

FIGURE 8.7

Effects of chunking on memory When we organize information into meaningful units, such as letters, words, and phrases, we recall it more easily. (From Hintzman, 1978.)

Chunking usually occurs so naturally that we take it for granted. If you are a native English speaker, you can reproduce perfectly the 150 or so line segments that make up the words in the three phrases of item 6 in Figure 8.7. It would astonish someone unfamiliar with the language. I am similarly awed at a Chinese reader's ability to glance at **FIGURE 8.8** and then reproduce all the strokes; or of a varsity basketball player's recall of the positions of the players after a 4-second glance at a basketball play (Allard & Burnett, 1985). We all remember information best when we can organize it into personally meaningful arrangements.

Mnemonics To help them encode lengthy passages and speeches, ancient Greek scholars and orators also developed **mnemonics** (nih-MON-iks). Many of these memory aids use vivid imagery, because we are particularly good at remembering mental pictures. We more easily remember concrete, visualizable words than we do abstract words. (When I quiz you later, which three of these words—*bicycle*, *void*, *cigarette*, *inherent*, *fire*, *process*—will you most likely recall?) If you still recall the rock-throwing rioter sentence, it is probably not only because of the meaning you encoded but also because the sentence painted a mental image.

The *peg-word system* harnesses our superior visual-imagery skill. This mnemonic requires you to memorize a jingle: "One is a bun; two is a shoe; three is a tree; four is a door; five is a hive; six is sticks; seven is heaven; eight is a gate; nine is swine; ten is a hen." Without much effort, you will soon be able to count by peg words instead of numbers: *bun*, *shoe*, *tree* . . . and then to visually associate the peg words with to-be-remembered items. Now you are ready to challenge anyone to give you a grocery list to remember. Carrots? Stick them into the imaginary bun. Milk? Fill the shoe with it. Paper towels? Drape them over the tree branch. Think *bun*, *shoe*, *tree* and you see their associated images: carrots, milk, paper towels. With few errors, you will be able to recall the items in any order and to name any given item (Bugelski et al., 1968). Memory whizzes understand the power of such systems. A study of star performers in the World Memory Championships showed them not to have exceptional intelligence, but rather to be superior at using mnemonic strategies (Maguire et al., 2003).

Chunking and mnemonic techniques combined can be great memory aids for unfamiliar material. Want to remember the colors of the rainbow in order of wavelength? Think of the mnemonic ROY G. BIV (*red*, *orange*, *yellow*, *green*, *blue*, *indigo*, *violet*). Need to recall the names of North America's five Great Lakes? Just remember HOMES (*Huron*, *Ontario*, *Michigan*, *Erie*, *Superior*). In each case, we chunk information into a more familiar form by creating a word (called an *acronym*) from the first letters of the to-be-remembered items.

Hierarchies When people develop expertise in an area, they process information not only in chunks but also in *hierarchies* composed of a few broad concepts divided and subdivided into narrower concepts and facts. This section, for example, aims to help you organize memory concepts (**FIGURE 8.9** on the next page).

春
夏
秋
冬

FIGURE 8.8

An example of chunking—for those who read Chinese After looking at these characters, can you reproduce them exactly? If so, you are literate in Chinese.

iconic memory a momentary sensory memory of visual stimuli; a photographic or picture-image memory lasting no more than a few tenths of a second.

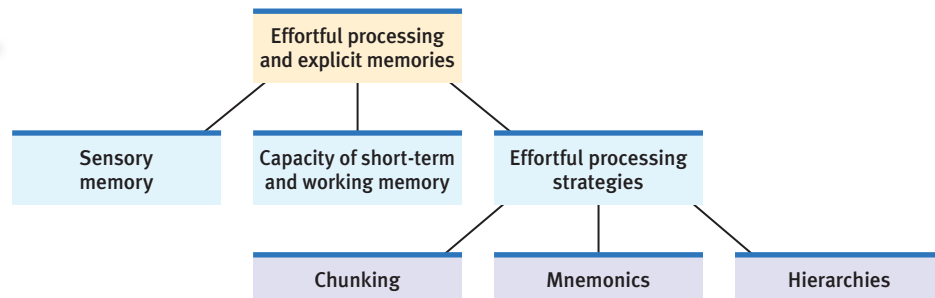
echoic memory a momentary sensory memory of auditory stimuli; if attention is elsewhere, sounds and words can still be recalled within 3 or 4 seconds.

chunking organizing items into familiar, manageable units; often occurs automatically.

mnemonics [nih-MON-iks] memory aids, especially those techniques that use vivid imagery and organizational devices.

FIGURE 8.9

Hierarchies aid retrieval When we organize words or concepts into hierarchical groups, as illustrated here with some of the concepts from this section, we remember them better than when we see them presented randomly.



Organizing knowledge in hierarchies helps us retrieve information efficiently, as Gordon Bower and his colleagues (1969) demonstrated by presenting words either randomly or grouped into categories. When the words were organized into categories, recall was two to three times better. Such results show the benefits of organizing what you study—of giving special attention to the chapter outlines, headings, numbered Learning Objective questions, and Retrieve It and Testing Effect questions. Taking lecture and text notes in outline format—a type of hierarchical organization—may also prove helpful.

Distributed Practice

We retain information (such as classmates' names) better when our encoding is distributed over time. More than 300 experiments over the last century have consistently revealed the benefits of this **spacing effect** (Cepeda et al., 2006). *Massed practice* (cramming) can produce speedy short-term learning and feelings of confidence. But to paraphrase pioneer memory researcher Hermann Ebbinghaus (1885), those who learn quickly also forget quickly. *Distributed practice* produces better long-term recall. After you've studied long enough to master the material, further study becomes inefficient (Rohrer & Pashler, 2007). Better to spend that extra reviewing time later—a day later if you need to remember something 10 days hence, or a month later if you need to remember something 6 months hence (Cepeda et al., 2008).

Spreading your learning over several months, rather than over a shorter term, can help you retain information for a lifetime. In a 9-year experiment, Harry Bahrick and three of his family members (1993) practiced foreign language word translations for a given number of times, at intervals ranging from 14 to 56 days. Their consistent finding: The longer the space between practice sessions, the better their retention up to 5 years later.

One effective way to distribute practice is *repeated self-testing*, a phenomenon that researchers Henry Roediger and Jeffrey Karpicke (2006) have called the **testing effect**. In this text, for example, the Retrieve It and Testing Effect features offer such an opportunity. Better to practice retrieval (as any exam will demand) than merely to reread material (which may lull you into a false sense of mastery).

The point to remember: Spaced study and self-assessment beat cramming and rereading.

“The mind is slow in unlearning what it has been long in learning.”

Roman philosopher Seneca (4 B.C.E.–65 C.E.)

spacing effect the tendency for distributed study or practice to yield better long-term retention than is achieved through massed study or practice.

testing effect enhanced memory after retrieving, rather than simply rereading, information. Also sometimes referred to as a *retrieval practice effect* or *test-enhanced learning*.

shallow processing encoding on a basic level based on the structure or appearance of words.

deep processing encoding semantically, based on the meaning of the words; tends to yield the best retention.

Levels of Processing



8-8: What are the levels of processing, and how do they affect encoding?

Memory researchers have discovered that we process verbal information at different levels, and that depth of processing affects our long-term retention. **Shallow processing** encodes on a very basic level, such as a word's letters or, at a more intermediate level, a word's sound. **Deep processing** encodes *semantically*, based on the meaning of the words. The deeper (more meaningful) the processing, the better our retention.



Making things memorable
 For suggestions of how to apply the *testing effect* to your own learning, watch this 5-minute YouTube animation: youtu.be/rFIK5gutHKM



In one classic experiment, researchers Fergus Craik and Endel Tulving (1975) flashed words at people. Then they asked the viewers a question that would elicit different levels of processing. To experience the task yourself, rapidly answer the following sample questions:



Sample Questions to Elicit Processing	Word Flashed	Yes	No
1. Is the word in capital letters?	CHAIR	_____	_____
2. Does the word rhyme with train?	brain	_____	_____
3. Would the word fit in this sentence? The girl put the _____ on the table.	doll	_____	_____

Which type of processing would best prepare you to recognize the words at a later time? In Craik and Tulving’s experiment, the deeper, semantic processing triggered by the third question yielded a much better memory than did the shallower processing elicited by the second question or the very shallow processing elicited by question 1 (which was especially ineffective).

Making Material Personally Meaningful

If new information is not meaningful or related to our experience, we have trouble processing it. Put yourself in the place of the students whom John Bransford and Marcia Johnson (1972) asked to remember the following recorded passage:

The procedure is actually quite simple. First you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do. . . . After the procedure is completed one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.

When the students heard the paragraph you have just read, without a meaningful context, they remembered little of it. When told the paragraph described washing clothes (something meaningful to them), they remembered much more of it—as you probably could now after rereading it.

Can you repeat the sentence about the rioter that I gave you at this chapter’s beginning? (“The angry rioter threw . . .”) Perhaps, like those in an experiment by William Brewer (1977), you recalled the sentence by the meaning you encoded when you read it (for example, “The angry rioter threw the rock *through* the window”) and not as it was written (“The angry rioter threw the rock *at* the window”). Referring to such mental mismatches, Gordon Bower and Daniel Morrow (1990) have likened our minds to theater directors who, given a raw script, imagine the finished stage production. Asked later

Here is another sentence I will ask you about later: “*The fish attacked the swimmer.*”

what we heard or read, we recall not the literal text but *what we encoded*. Thus, studying for an exam, you may remember your lecture notes rather than the lecture itself.

We can avoid some of these mismatches by rephrasing what we see and hear into meaningful terms. From his experiments on himself, German philosopher Hermann Ebbinghaus (1850–1909) estimated that, compared with learning nonsense material, learning meaningful material required one-tenth the effort. As memory researcher Wayne Wickelgren (1977, p. 346) noted, “The time you spend thinking about material you are reading and relating it to previously stored material is about the most useful thing you can do in learning any new subject matter.”

Psychologist-actor team Helga Noice and Tony Noice (2006) have described how actors inject meaning into the daunting task of learning “all those lines.” They do it by first coming to understand the flow of meaning: “One actor divided a half-page of dialogue into three [intentions]: ‘to flatter,’ ‘to draw him out,’ and ‘to allay his fears.’” With this meaningful sequence in mind, the actor more easily remembered the lines.

We have especially good recall for information we can meaningfully relate to ourselves. Asked how well certain adjectives describe someone else, we often forget them; asked how well the adjectives describe us, we remember the words well. This tendency, called the *self-reference effect*, is especially strong in members of individualistic Western cultures (Symons & Johnson, 1997; Wagar & Cohen, 2003). Information deemed “relevant to me” is processed more deeply and remains more accessible. Knowing this, you can profit from taking time to find personal meaning in what you are studying.

The point to remember: The amount remembered depends both on the time spent learning and on your making it meaningful for deep processing.

RETRIEVE IT

- What is the difference between *automatic* and *effortful* processing, and what are some examples of each?

ANSWER: Automatic processing occurs unconsciously (automatically) for such things as the sequence and frequency of a day's events, and reading and comprehending words in our own language. *Effortful* processing requires attention and awareness and happens, for example, when we work hard to learn new material in class, or new lines for a play.

- At which of Atkinson-Shiffrin's three memory stages would *iconic* and *echoic* memory occur?

ANSWER: sensory memory

- Which strategies are better for long-term retention: cramming and rereading material, or spreading out learning over time and repeatedly testing yourself?

ANSWER: Although cramming may lead to short-term gains in knowledge, distributed practice and repeated self-testing will result in the greatest long-term retention.

- If you try to make the material you are learning personally meaningful, are you processing at a shallow or a deep level? Which level leads to greater retention?

ANSWER: Making material personally meaningful involves processing at a deep level, because you are processing *semantically*—based on the meaning of the words. Deep processing leads to greater retention.

Memory Storage



8-9: What are the capacity and location of our long-term memories?

In Arthur Conan Doyle's *A Study in Scarlet*, Sherlock Holmes offers a popular theory of memory capacity:

I consider that a man's brain originally is like a little empty attic, and you have to stock it with such furniture as you choose. . . . It is a mistake to think that that little room has elastic walls and can distend to any extent. Depend upon it, there comes a time when for every addition of knowledge you forget something that you knew before.

hippocampus a neural center located in the limbic system; helps process explicit memories for storage.

Contrary to Holmes' "memory model," our capacity for storing long-term memories is essentially limitless. Our brains are *not* like attics, which once filled can store more items only if we discard old ones.

Retaining Information in the Brain

I marveled at my aging mother-in-law, a retired pianist and organist. At age 88, her blind eyes could no longer read music. But let her sit at a keyboard and she would flawlessly play any of hundreds of hymns, including ones she had not thought of for 20 years. Where did her brain store those thousands of sequenced notes?

For a time, some surgeons and memory researchers marveled at patients' seeming vivid memories triggered by brain stimulation during surgery. Did this prove that our whole past, not just well-practiced music, is "in there," in complete detail, just waiting to be relived? On closer analysis, the seeming flashbacks appeared to have been invented, not relived (Loftus & Loftus, 1980). In a further demonstration that memories do not reside in single, specific spots, psychologist Karl Lashley (1950) trained rats to find their way out of a maze, then surgically removed pieces of their brain's cortex and retested their memory. No matter which small brain section he removed, the rats retained at least a partial memory of how to navigate the maze.

The point to remember: Despite the brain's vast storage capacity, we do not store information as libraries store their books, in discrete, precise locations. Instead, many parts of the brain interact as we encode, store, and retrieve the information that forms our memories.

Explicit-Memory System: The Frontal Lobes and Hippocampus



8-10: What roles do the frontal lobes and hippocampus play in memory storage?

As with perception, language, emotion, and much more, memory requires brain networks. The network that processes and stores your explicit memories for facts and episodes includes your frontal lobes and hippocampus. When you summon up a mental encore of a past experience, many brain regions send input to your frontal lobes for working memory processing (Fink et al., 1996; Gabrieli et al., 1996; Markowitsch, 1995). The left and right frontal lobes process different types of memories. Recalling a password and holding it in working memory, for example, would activate the left frontal lobe. Calling up a visual party scene would more likely activate the right frontal lobe.

Cognitive neuroscientists have found that the **hippocampus**, a temporal-lobe neural center located in the limbic system, is the brain's equivalent of a "save" button for explicit memories (**FIGURE 8.10**; Anderson et al., 2007). Brain scans, such as PET scans of people recalling words, and autopsies of people who had *amnesia* (memory loss), have revealed that new explicit memories of names, images, and events are laid down via the hippocampus (Squire, 1992).

Damage to this structure therefore disrupts recall of explicit memories. Chickadees and other birds can store food in hundreds of places and return to these unmarked caches months later—but not if their hippocampus has been removed (Kamil & Cheng, 2001; Sherry & Vaccarino, 1989). With left-hippocampus damage, people have trouble remembering verbal information, but they have no trouble recalling visual designs and locations. With right-hippocampus damage, the problem is reversed (Schacter, 1996).

Subregions of the hippocampus also serve different functions. One part is active as people learn to associate names with faces (Zeineh et al., 2003). Another part is active as memory champions engage in spatial mnemonics (Maguire et al., 2003b). The rear area, which processes spatial memory, grows bigger the longer a London cabbie has navigated the maze of streets (Maguire et al., 2003a).

Memories are not permanently stored in the hippocampus. Instead, this structure seems to act as a loading dock where the brain registers and temporarily holds the elements of a remembered episode—its smell, feel, sound, and location. Then, like older files shifted to a basement storeroom, memories migrate for storage elsewhere.

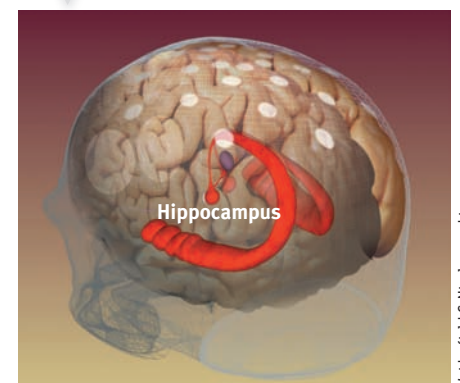
"Our memories are flexible and superimposable, a panoramic blackboard with an endless supply of chalk and erasers."

Elizabeth Loftus and Katherine Ketcham, *The Myth of Repressed Memory*, 1994



FIGURE 8.10

The hippocampus Explicit memories for facts and episodes are processed in the hippocampus and fed to other brain regions for storage.



Hippocampus hero Among animals, one contender for champion memorist would be a mere birdbrain—the Clark’s Nutcracker—which during winter and spring can locate up to 6000 caches of pine seed it had previously buried (Shettleworth, 1993).

© Tim Zurowski/All Canada Photos/Corbis



Sleep supports memory consolidation. During deep sleep, the hippocampus processes memories for later retrieval. After a training experience, the greater the hippocampus activity during sleep, the better the next day’s memory will be (Peigneux et al., 2004). Researchers have watched the hippocampus and brain cortex displaying simultaneous activity rhythms during sleep, as if they were having a dialogue (Euston et al., 2007; Mehta, 2007). They suspect that the brain is replaying the day’s experiences as it transfers them to the cortex for long-term storage. Cortex areas surrounding the hippocampus support the processing and storing of explicit memories (Squire & Zola-Morgan, 1991).

Implicit-Memory System: The Cerebellum and Basal Ganglia



8-11: What roles do the cerebellum and basal ganglia play in our memory processing?

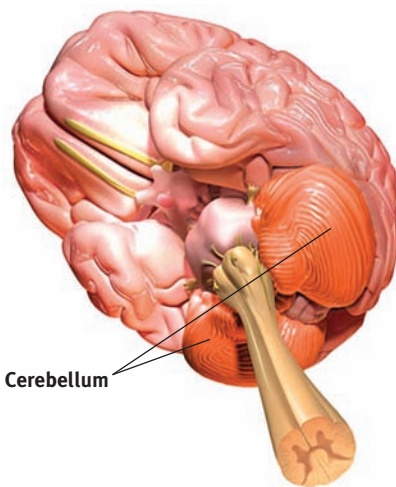


FIGURE 8.11
Cerebellum The cerebellum plays an important part in our forming and storing of implicit memories.

Your hippocampus and frontal lobes are processing sites for your *explicit* memories. But you could lose those areas and still, thanks to automatic processing, lay down *implicit* memories for skills and conditioned associations. Joseph LeDoux (1996) recounted the story of a brain-damaged patient whose amnesia left her unable to recognize her physician as, each day, he shook her hand and introduced himself. One day, she yanked her hand back, for the physician had pricked her with a tack in his palm. The next time he returned to introduce himself she refused to shake his hand but couldn’t explain why. Having been *classically conditioned*, she just wouldn’t do it.

The *cerebellum* plays a key role in forming and storing the implicit memories created by classical conditioning. With a damaged cerebellum, people cannot develop certain conditioned reflexes, such as associating a tone with an impending puff of air—and thus do not blink in anticipation of the puff (Daum & Schugens, 1996; Green & Woodruff-Pak, 2000). When researchers surgically disrupted the function of different pathways in the cerebellum of rabbits, the rabbits became unable to learn a conditioned eyeblink response (Krupa et al., 1993; Steinmetz, 1999). Implicit memory formation needs the cerebellum (**FIGURE 8.11**).

The *basal ganglia*, deep brain structures involved in motor movement, facilitate formation of our procedural memories for skills (Mishkin, 1982; Mishkin et al., 1997). The basal ganglia receive input from the cortex but do not return the favor of sending information back to the cortex for conscious awareness of procedural learning. If you have learned how to ride a bike, thank your basal ganglia.

Our implicit memory system, enabled partly by the cerebellum and basal ganglia, helps explain why the reactions and skills we learned during infancy reach far into our future. Yet as adults, our *conscious* memory of our first three years is blank, an experience called *infantile amnesia*. In one study, events children experienced and discussed with their mothers at age 3 were 60 percent remembered at age 7 but only 34 percent remembered at age 9 (Bauer et al., 2007). Two influences contribute to infantile amnesia: First, we index much of our explicit memory using words that nonspeaking children have not learned. Second, the hippocampus is one of the last brain structures to mature.

RETRIEVE IT

- Which parts of the brain are important for *implicit* memory processing, and which parts play a key role in *explicit* memory processing?

ANSWER: The frontal lobes and hippocampus are important for *explicit* memory formation, and the cerebellum and basal ganglia are key to *implicit* memory processing.

- Your friend has experienced brain damage in an accident. He can remember how to tie his shoes but has a hard time remembering anything told him during a conversation. What’s going on here?

ANSWER: Our *explicit* memories (facts and episodes) differ from our *implicit* memories of skills and procedures. Our implicit memories are processed by more ancient brain areas, which apparently escaped damage during the accident.

flashbulb memory a clear memory of an emotionally significant moment or event.

The Amygdala, Emotions, and Memory



8-12: How do emotions affect our memory processing?

Our emotions trigger stress hormones that influence memory formation. When we are excited or stressed, these hormones make more glucose energy available to fuel brain activity, signaling the brain that something important has happened. Moreover, stress hormones provoke the *amygdala* (two limbic system, emotion-processing clusters) to initiate a memory trace in the frontal lobes and basal ganglia and to boost activity in the brain's memory-forming areas (Buchanan, 2007; Kensinger, 2007) (FIGURE 8.12). The result? Emotional arousal can sear certain events into the brain, while disrupting memory for neutral events around the same time (Birnbaum et al., 2004; Brewin et al., 2007).

Emotions often persist without our conscious awareness of what caused them. In one ingenious experiment, patients with hippocampal damage (which left them unable to form new explicit memories) watched a sad film and later a happy film. After the viewing, they did not consciously recall the films, but the sad or happy emotion persisted (Feinstein et al., 2010).

Significantly stressful events can form almost indelible memories. After traumatic experiences—a wartime ambush, a house fire, a rape—vivid recollections of the horrific event may intrude again and again. It is as if they were burned in: “Stronger emotional experiences make for stronger, more reliable memories,” noted James McGaugh (1994, 2003). This makes adaptive sense. Memory serves to predict the future and to alert us to potential dangers. Conversely, weaker emotions mean weaker memories. People given a drug that blocked the effects of stress hormones later had more trouble remembering the details of an upsetting story (Cahill, 1994).

Emotion-triggered hormonal changes help explain why we long remember exciting or shocking events, such as our first kiss or our whereabouts when learning of a loved one's death. In a 2006 Pew survey, 95 percent of American adults said they could recall exactly where they were or what they were doing when they first heard the news of the 9/11 attack. This perceived clarity of memories of surprising, significant events leads some psychologists to call them **flashbulb memories**. It's as if the brain commands, “Capture this!”

The people who experienced a 1989 San Francisco earthquake did just that. A year and a half later, they had perfect recall of where they had been and what they were doing (verified by their recorded thoughts within a day or two of the quake). Others' memories for the circumstances under which they merely *heard* about the quake were more prone to errors (Neisser et al., 1991; Palmer et al., 1991).

Our flashbulb memories are noteworthy for their vividness and the confidence with which we recall them. But as we relive, rehearse, and discuss them, these memories may come to err, as misinformation seeps in (Conway et al., 2009; Talarico et al., 2003; Talarico & Rubin, 2007).

Synaptic Changes



8-13: How do changes at the synapse level affect our memory processing?

As you read this chapter and think and learn about memory characteristics and processes, your brain is changing. Given increased activity in particular pathways, neural interconnections are forming and strengthening (see Chapter 4).

The quest to understand the physical basis of memory—how information becomes embedded in brain matter—has sparked study of the synaptic meeting places where neurons communicate with one another via their neurotransmitter messengers. Eric Kandel and James Schwartz (1982) observed synaptic changes during learning in the sending neurons of the California sea slug, *Aplysia*, a simple animal with a mere 20,000

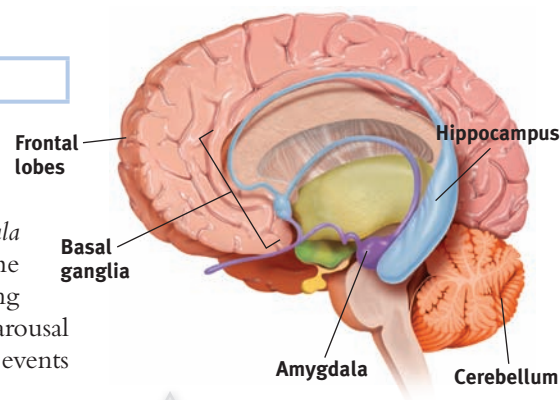


FIGURE 8.12

Review key memory structures in the brain

Frontal lobes and hippocampus: explicit memory formation

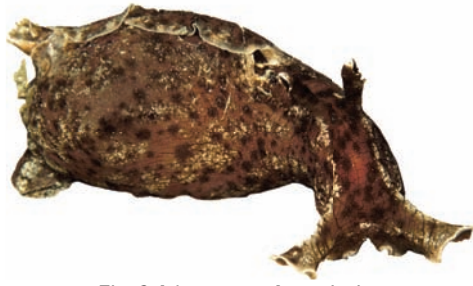
Cerebellum and basal ganglia: implicit memory formation

Amygdala: emotion-related memory formation

Which is more important—your experiences or your memories of them?

“The biology of the mind will be as scientifically important to this [new] century as the biology of the gene [was] to the twentieth century.”

Eric Kandel, acceptance remarks for the 2000 Nobel Prize



Aplysia The California sea slug, which neuroscientist Eric Kandel studied for 45 years, has increased our understanding of the neural basis of learning.

Marty Snyderman/Visuals Unlimited, Inc.

or so unusually large and accessible nerve cells. Chapter 7 noted how the sea slug can be classically conditioned (with electric shock) to reflexively withdraw its gills when squirted with water, much as a shell-shocked soldier jumps at the sound of a snapping twig. By observing the slug's neural connections before and after conditioning, Kandel and Schwartz pinpointed changes. When learning occurs, the slug releases more of the neurotransmitter *serotonin* onto certain neurons. These cells then become more efficient at transmitting signals.

In experiments with people, rapidly stimulating certain memory-circuit connections has increased their sensitivity for hours or even weeks to come. The sending neuron now needs less prompting to release its neurotransmitter, and more connections exist between neurons (**FIGURE 8.13**). This increased efficiency of potential neural firing, called **long-term potentiation (LTP)**, provides a neural basis for learning and remembering associations (Lynch, 2002; Whitlock et al., 2006). Several lines of evidence confirm that LTP is a physical basis for memory:

- Drugs that block LTP interfere with learning (Lynch & Staubli, 1991).
- Mutant mice engineered to lack an enzyme needed for LTP couldn't learn their way out of a maze (Silva et al., 1992).
- Rats given a drug that enhanced LTP learned a maze with half the usual number of mistakes (Service, 1994).
- Injecting rats with a chemical that blocked the preservation of LTP erased recent learning (Pastalkova et al., 2006).

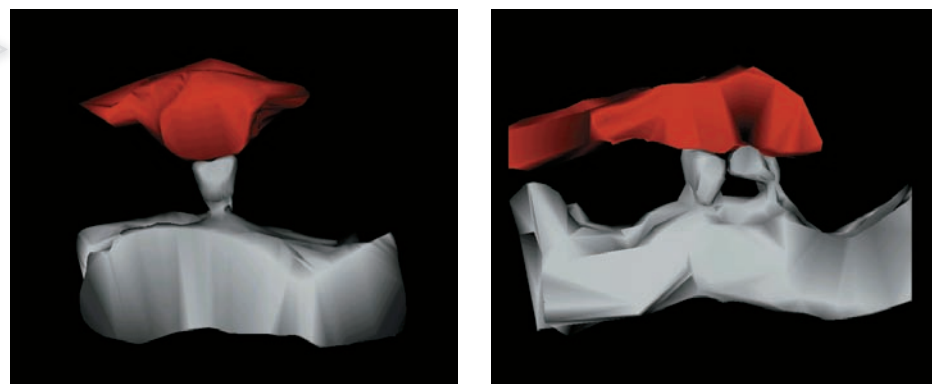
After long-term potentiation has occurred, passing an electric current through the brain won't disrupt old memories. But the current will wipe out very recent memories. Such is the experience both of laboratory animals and of severely depressed people given *electroconvulsive therapy* (see Chapter 15). A blow to the head can do the same. Football players and boxers momentarily knocked unconscious typically have no memory of events just before the knockout (Yarnell & Lynch, 1970). Their working memory had no time to consolidate the information into long-term memory before the lights went out.

Some memory-biology explorers have helped found companies that are competing to develop memory-altering drugs. The target market for memory-boosting drugs includes millions of people with Alzheimer's disease, millions more with *mild cognitive impairment* that often becomes Alzheimer's, and countless millions who would love to turn back the clock on age-related memory decline. From expanding memories perhaps will come bulging profits.

In your lifetime, will you have access to safe and legal drugs that boost your fading memory without nasty side effects and without cluttering your mind with trivia best forgotten? That question has yet to be answered. But in the meantime, one safe and free memory enhancer is already available on your college campus: effective study

FIGURE 8.13

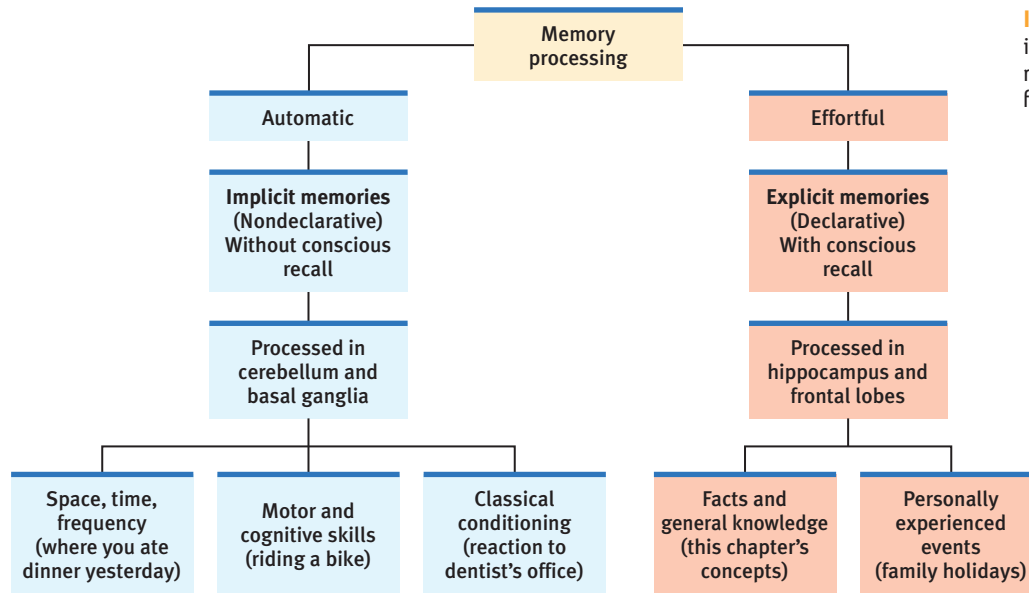
Doubled receptor sites Electron microscope image (a) shows just one receptor site (gray) reaching toward a sending neuron before long-term potentiation. Image (b) shows that, after LTP, the receptor sites have doubled. This means that the receiving neuron has increased sensitivity for detecting the presence of the neurotransmitter molecules that may be released by the sending neuron. (From Toni et al., 1999.)



(a)

(b)

Both photos: From N. Toni et al., *Nature*, 402, Nov. 25, 1999. Courtesy of Dominique Müller



long-term potentiation (LTP) an increase in a cell's firing potential after brief, rapid stimulation. Believed to be a neural basis for learning and memory.

FIGURE 8.14
Our two memory systems

techniques followed by adequate *sleep!* (You'll find study tips in Chapter 1 and at the end of this chapter, and sleep coverage in Chapter 3.)

FIGURE 8.14 summarizes the brain's two-track memory processing and storage system for implicit (automatic) and explicit (effortful) memories.

RETRIEVE IT

- Which brain area responds to stress hormones by helping to create stronger memories?
ANSWER: the amygdala
- This neural basis for learning and memory, found at the synapses in memory-circuit connections, results from brief, rapid stimulation. It is called _____.
ANSWER: long-term potentiation

Retrieval: Getting Information Out



8-14: How do external cues, internal emotions, and order of appearance influence memory retrieval?

After the magic of brain encoding and storage, we still have the daunting task of retrieving the information. What triggers retrieval? How do psychologists study this phenomenon?

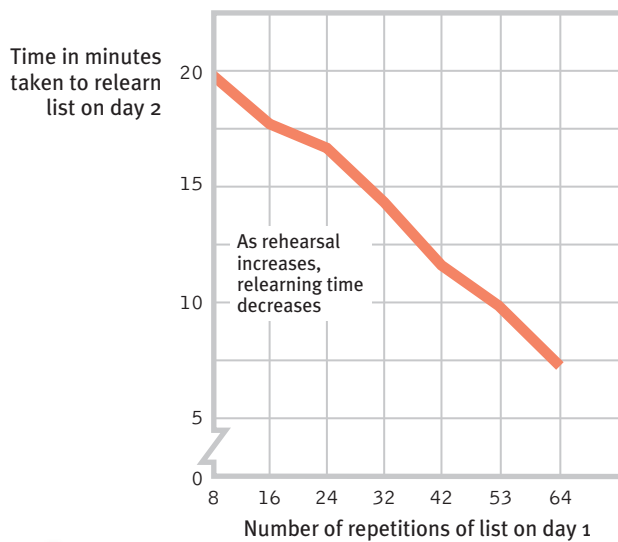
Remembering things past Even if Oprah Winfrey and Brad Pitt had not become famous, their high school classmates would most likely still recognize their yearbook photos.

Measuring Retention

To measure retention of memories, psychologists may test for *recall*, *recognition*, or *relearning* speed. Long after you cannot recall most of the people in your high school graduating class, you may still be able to recognize their yearbook pictures from a photographic lineup and pick their names from a list of names. In one experiment, people who had graduated 25 years earlier could not recall many of their old classmates, but they could recognize 90 percent of their pictures and names (Bahrick et al., 1975). If you are like most students, you, too, could probably recognize more names of Snow White's Seven Dwarfs than you could recall (Miserandino, 1991).



Both Photos Spanky's Yearbook Archive

**FIGURE 8.15****Ebbinghaus' retention curve**

Ebbinghaus found that the more times he practiced a list of nonsense syllables on day 1, the fewer repetitions he required to relearn it on day 2. Speed of relearning is one measure of memory retention. (From Baddeley, 1982.)

Our recognition memory is impressively quick and vast. “Is your friend wearing a new or old outfit?” “Old.” “Is this 5-second movie clip from a film you’ve ever seen?” “Yes.” “Have you ever seen this person before—this minor variation on the same old human features (two eyes, one nose, and so on)?” “No.” Before the mouth can form our answer to any of millions of such questions, the mind knows, and knows that it knows.

Our speed at *relearning* also reveals memory. Hermann Ebbinghaus showed this more than a century ago, in his learning experiments, using nonsense syllables. He randomly selected a sample of syllables, practiced them, and tested himself. To get a feel for his experiments, rapidly read aloud, eight times over, the following list (from Baddeley, 1982), then look away and try to recall the items:

JIH, BAZ, FUB, YOX, SUJ, XIR, DAX, LEQ, VUM, PID, KEL, WAV,
TUV, ZOF, GEK, HIW.

The day after learning such a list, Ebbinghaus could recall few of the syllables. But they weren’t entirely forgotten. As **FIGURE 8.15** portrays, the more frequently he repeated the list aloud on day 1, the fewer repetitions he required to *relearn* the list on day 2. Additional rehearsal (*overlearning*) of verbal information increases retention, especially when practice is distributed over time.

The point to remember: Tests of recognition and of time spent relearning demonstrate that *we remember more than we can recall*.

RETRIEVE IT

- Multiple-choice questions test our

- recall.
- recognition.
- relearning.
- sensory memory.

ANSWER: b

- Fill-in-the blank questions test our _____.

ANSWER: recall

- If you want to be sure to remember what you’re learning for an upcoming test, would it be better to use *recall* or *recognition* to check your memory? Why?

ANSWER: It would be better to test your memory with *recall* (such as with short-answer or fill-in-the-blank self-test questions) rather than *recognition* (such as with multiple-choice questions). Recalling information is harder than recognizing it, so if you can recall it that means your retention of the material is better than if you could only recognize it, and your chances of test success are therefore greater.

Retrieval Cues

Imagine a spider suspended in the middle of her web, held up by the many strands extending outward from her in all directions to different points. If you were to trace a pathway to the spider, you would first need to create a path from one of these anchor points and then follow the strand down into the web.

The process of retrieving a memory follows a similar principle, because memories are held in storage by a web of associations, each piece of information interconnected with others. When you encode into memory a target piece of information, such as the name of the person sitting next to you in class, you associate with it other bits of information about your surroundings, mood, seating position, and so on. These bits can serve as *retrieval cues* that you can later use to access the information. The more retrieval cues you have, the better your chances of finding a route to the suspended memory.

Priming

The best retrieval cues come from associations we form at the time we encode a memory—smells, tastes, and sights that can evoke our memory of the associated person or event. To call up visual cues when trying to recall something, we may mentally place

“Memory is not like a container that gradually fills up; it is more like a tree growing hooks onto which memories are hung.”

Peter Russell, *The Brain Book*, 1979

priming the activation, often unconsciously, of particular associations in memory.

ourselves in the original context. After losing his sight, John Hull (1990, p. 174) described his difficulty recalling such details:

I knew I had been somewhere, and had done particular things with certain people, but where? I could not put the conversations . . . into a context. There was no background, no features against which to identify the place. Normally, the memories of people you have spoken to during the day are stored in frames which include the background.

Often our associations are activated without our awareness. Philosopher-psychologist William James referred to this process, which we call **priming**, as the “wakening of associations.” Seeing or hearing the word *rabbit* primes associations with *hare*, even though we may not recall having seen or heard *rabbit* (FIGURE 8.16).

Priming is often “memoryless memory”—invisible memory, without your conscious awareness. If, walking down a hallway, you see a poster of a missing child, you may then unconsciously be primed to interpret an ambiguous adult-child interaction as a possible kidnapping (James, 1986). Although you no longer have the poster in mind, it predisposes your interpretation.

Priming can influence behaviors as well. In one study, participants primed with money-related words were less likely to help another person when asked (Vohs, 2006). In such cases, money may prime our materialism and self-interest rather than the social norms that encourage us to help (Ariely, 2009).

Context-Dependent Memory

Putting yourself back in the context where you experienced something can prime your memory retrieval. As FIGURE 8.17 illustrates, when scuba divers listened to a word list in two different settings (either 10 feet underwater or sitting on the beach), they recalled more words if retested in the same place (Godden & Baddeley, 1975).

You may have experienced similar context effects. Consider this scenario: While taking notes from this book, you realize you need to sharpen your pencil. You get up and walk into another room, but then you cannot remember why. After returning to your desk it hits you: “I wanted to sharpen this pencil!” What happens to create this frustrating experience? In one context (desk, reading psychology), you realize your pencil needs sharpening. When you go to the other room and are in a different context, you have few cues to lead you back to that thought. When you are once again at your desk, you are back in the context in which you encoded the thought (“*This pencil is dull*”).

In several experiments, Carolyn Rovee-Collier (1993) found that a familiar context could activate memories even in 3-month-olds. After infants learned that kicking a crib mobile would make it move (via a connecting ribbon from the ankle), the infants kicked more when tested again in the same crib with the same bumper than when in a different context.

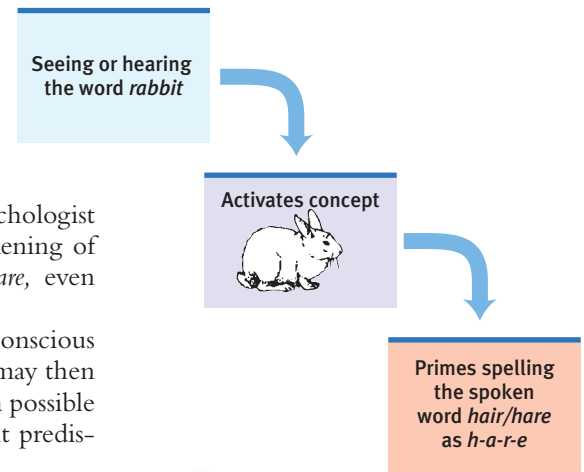
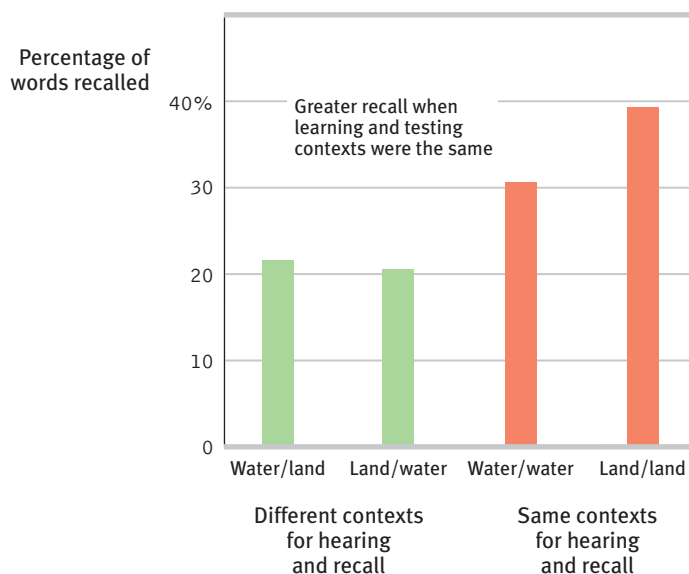


FIGURE 8.16
Priming—awakening associations
 After seeing or hearing *rabbit*, we are later more likely to spell the spoken word as *h-a-r-e*. The spreading of associations unconsciously activates related associations. This phenomenon is called priming. (Adapted from Bower, 1986.)

Ask a friend two rapid-fire questions:
 (a) How do you pronounce the word spelled by the letters *s-h-o-p*?
 (b) What do you do when you come to a green light? If your friend answers “stop” to the second question, you have demonstrated priming.



Fred McConaughy/Photo Researchers

FIGURE 8.17
The effects of context on memory
 In this experiment, words heard underwater were best recalled underwater. Words heard on land were best recalled on land. (Adapted from Godden & Baddeley, 1975.)



©The New Yorker Collection, 2005 David Sipress from cartoonbank.com. All Rights Reserved.

"I can't remember what we're arguing about, either. Let's keep yelling, and maybe it will come back to us."

"When a feeling was there, they felt as if it would never go; when it was gone, they felt as if it had never been; when it returned, they felt as if it had never gone."

George MacDonald,
What's Mine's Mine, 1886

State-Dependent Memory

Closely related to context-dependent memory is *state-dependent memory*. What we learn in one state—be it drunk or sober—may be more easily recalled when we are again in that state. What people learn when drunk they don't recall well in *any* state (alcohol disrupts storage). But they recall it slightly better when again drunk. Someone who hides money when drunk may forget the location until drunk again.

Our mood states provide an example of memory's state dependence. Emotions that accompany good or bad events become retrieval cues (Fiedler et al., 2001). Thus, our memories are somewhat **mood congruent**. If you've had a bad evening—your date never showed, your Toledo Mud Hens hat disappeared, your TV went out 10 minutes before the end of a show—your gloomy mood may facilitate recalling other bad times. Being depressed sours memories by priming negative associations, which we then use to explain our current mood. In many experiments, people put in a buoyant mood—whether under hypnosis or just by the day's events (a World Cup soccer victory for the German participants in one study)—have recalled the world through rose-colored glasses (DeSteno et al., 2000; Forgas et al., 1984; Schwarz et al., 1987). They judged themselves competent and effective, other people benevolent, happy events more likely.

Knowing this mood-memory connection, we should not be surprised that in some studies *currently* depressed people have recalled their parents as rejecting, punitive, and guilt promoting, whereas *formerly* depressed people's recollections more closely resembled the more positive descriptions given by those who never suffered depression (Lewinsohn & Rosenbaum, 1987; Lewis, 1992). Similarly, adolescents' ratings of parental warmth in one week gave little clue to how they would rate their parents six weeks later (Bornstein et al., 1991). When teens were down, their parents seemed inhuman; as their mood brightened, their parents morphed from devils into angels. You and I may nod our heads knowingly. Yet, in a good or bad mood, we persist in attributing to reality our own changing judgments, memories, and interpretations. In a bad mood, we may read someone's look as a glare and feel even worse. In a good mood, we may encode the same look as interest and feel even better. Passions exaggerate.

This retrieval effect helps explain why our moods persist. When happy, we recall happy events and therefore see the world as a happy place, which helps prolong our good mood. When depressed, we recall sad events, which darkens our interpretations of current events. For those of us with a predisposition to depression, this process can help maintain a vicious, dark cycle.

Serial Position Effect

Another memory-retrieval quirk, the **serial position effect**, can leave us wondering why we have large holes in our memory of a list of recent events. Imagine it's your first day in a new job, and your manager is introducing co-workers. As you meet each person, you silently repeat everyone's name, starting from the beginning. As the last person smiles and turns away, you feel confident you'll be able to greet your new co-workers by name the next day.

Don't count on it. Because you have spent more time rehearsing the earlier names than the later ones, those are the names you'll probably recall more easily the next day. In experiments, when people view a list of items (words, names, dates, even odors) and immediately try to recall them in any order, they fall prey to the serial position effect (Reed, 2000). They briefly recall the last items especially quickly and well (a *recency effect*), perhaps because those last items are still in working memory. But after a delay, when they have shifted their attention away from the last items, their recall is best for the first items (a *primacy effect*; see **FIGURE 8.18**).

mood-congruent memory the tendency to recall experiences that are consistent with one's current good or bad mood.

serial position effect our tendency to recall best the last (a *recency effect*) and first items (a *primacy effect*) in a list.

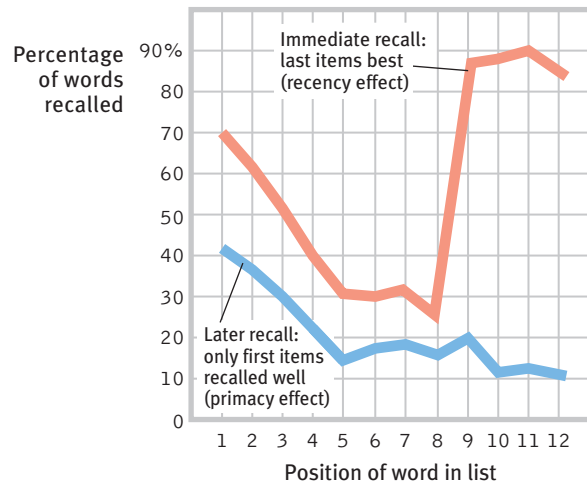


FIGURE 8.18

The serial position effect Immediately after newlyweds Prince William and Kate Middleton made their way through the receiving line of special guests, they would probably have recalled the names of the last few people best. But later they may have been able to recall the first few people best.

RETRIEVE IT

- What is priming?

ANSWER: Priming is the activation (often without our awareness) of associations.

- When we are tested immediately after viewing a list of words, we tend to recall the first and last items best, which is known as the _____ effect.

ANSWER: serial position

Forgetting



8-15: Why do we forget?

Amid all the applause for memory—all the efforts to understand it, all the books on how to improve it—have any voices been heard in praise of forgetting? William James (1890, p. 680) was such a voice: “If we remembered everything, we should on most occasions be as ill off as if we remembered nothing.” To discard the clutter of useless or out-of-date information—where we parked the car yesterday, a friend’s old phone number, restaurant orders already cooked and served—is surely a blessing. The Russian memory whiz S, whom we met at the beginning of this chapter, was haunted by his junk heap of memories. They dominated his consciousness. He had difficulty thinking abstractly—generalizing, organizing, evaluating. After reading a story, he could recite it but would struggle to summarize its gist.

A more recent case of a life overtaken by memory is “A. J.,” whose experience has been studied and verified by a University of California at Irvine research team (Parker et al., 2006). A. J., who has identified herself as Jill Price, compares her memory to “a running movie that never stops. It’s like a split screen. I’ll be talking to someone and seeing something else. . . . Whenever I see a date flash on the television (or anywhere for that matter) I automatically go back to that day and remember where I was, what I was doing, what day it fell on, and on and on and on and on. It is nonstop, uncontrollable, and totally exhausting.” A good memory is helpful, but so is the ability to forget. If a memory-enhancing pill becomes available, it had better not be 100 effective.

More often, however, our unpredictable memory dismays and frustrates us. Memories are quirky. My own memory can easily call up such episodes as that wonderful first kiss with the woman I love, or trivial facts like the air mileage from London to Detroit. Then it abandons me when I discover I have failed to encode, store, or retrieve a student’s name, or where I left my sunglasses.

“Amnesia seeps into the crevices of our brains, and amnesia heals.”

Joyce Carol Oates, “Words Fail, Memory Blurs, Life Wins,” 2001



Robert Hanashiro, USA Today

The woman who can’t forget “A. J.” in real life is Jill Price, who, with writer Bart Davis, told her story in a 2008 published memoir. Price remembers every day of her life since age 14 with detailed clarity, including both the joys and the unforgettable hurts.

Cellist Yo-Yo Ma forgot his 266-year-old, \$2.5 million cello in a New York taxi. (He later recovered it.)

Forgetting and the Two-Track Mind

English novelist and critic C. S. Lewis described the forgetting that plagues us all. We are bombarded every second by sensations, emotions, thoughts . . . nine-tenths of which [we] must simply ignore. The past [is] a roaring cataract of billions upon billions of such moments: Any one of them too complex to grasp in its entirety, and the aggregate beyond all imagination. . . . At every tick of the clock, in every inhabited part of the world, an unimaginable richness and variety of ‘history’ falls off the world into total oblivion.

For some, memory loss is severe and permanent. Consider Henry Molaison (known as “H. M.,” 1926–2008). For 55 years after having brain surgery to stop severe seizures, Molaison was unable to form new conscious memories. He was, as before his surgery, intelligent and did daily crossword puzzles. Yet, reported neuroscientist Suzanne Corkin (2005), “I’ve known H. M. since 1962, and he still doesn’t know who I am.” For about 20 seconds during a conversation he could keep something in mind. When distracted, he would lose what was just said or what had just occurred. Thus, he never figured out how to use a TV remote (Dittrich, 2010).

Molaison suffered from **anterograde amnesia**—he could recall his past, but he could not form new memories. (Those who cannot recall their past—the old information stored in long-term memory—suffer from **retrograde amnesia**.)

Neurologist Oliver Sacks (1985, pp. 26–27) described another patient, Jimmie, who had anterograde amnesia resulting from brain damage. Jimmie had no memories—thus, no sense of elapsed time—beyond his injury in 1945.

When Jimmie gave his age as 19, Sacks set a mirror before him: “Look in the mirror and tell me what you see. Is that a 19-year-old looking out from the mirror?”

Jimmie turned ashen, gripped the chair, cursed, then became frantic: “What’s going on? What’s happened to me? Is this a nightmare? Am I crazy? Is this a joke?” When his attention was diverted to some children playing baseball, his panic ended, the dreadful mirror forgotten.

Sacks showed Jimmie a photo from *National Geographic*. “What is this?” he asked.

“It’s the Moon,” Jimmie replied.

“No, it’s not,” Sacks answered. “It’s a picture of the Earth taken from the Moon.”

“Doc, you’re kidding? Someone would’ve had to get a camera up there!”

“Naturally.”

“Hell! You’re joking—how the hell would you do that?” Jimmie’s wonder was that of a bright young man from nearly 70 years ago reacting with amazement to his travel back to the future.

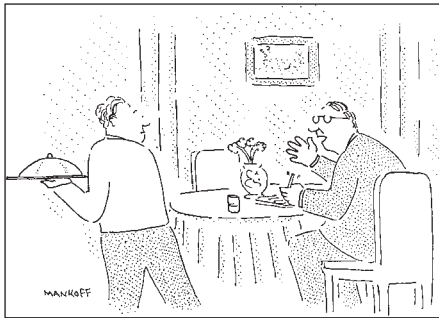
Careful testing of these unique people reveals something even stranger: Although incapable of recalling new facts or anything they have done recently, Molaison, Jimmie, and others with similar conditions can learn nonverbal tasks. Shown hard-to-find figures in pictures (in the *Where’s Waldo?* series), they can quickly spot them again later.

They can find their way to the bathroom, though without being able to tell you where it is. They can learn to read mirror-image writing or do a jigsaw puzzle, and they have even been taught complicated job skills (Schacter, 1992, 1996; Xu & Corkin, 2001). They can be classically conditioned. However, *they do all these things with no awareness of having learned them.*

Molaison and Jimmie lost their ability to form new explicit memories, but their automatic processing ability remained intact. Like Alzheimer’s patients, whose *explicit* memories for new people and events are lost, they can form new *implicit* memories (Lustig & Buckner, 2004). They can learn *how* to do something, but they will have no conscious recall of learning their new skill. Such sad cases confirm that we have two distinct memory systems, controlled by different parts of the brain.

For most of us, forgetting is a less drastic process. Let’s consider some of the reasons we forget.

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“Waiter, I’d like to order, unless I’ve eaten, in which case bring me the check.”

Studying a famous brain Jacopo Annese and other scientists at the University of California, San Diego’s Brain Observatory are preserving Henry Molaison’s brain for the benefit of future generations. Their careful work will result in a freely available online brain atlas.



San Diego Union-Tribune/Newscom

Encoding Failure

Much of what we sense we never notice, and what we fail to encode, we will never remember (FIGURE 8.19). Age can affect encoding efficiency. The brain areas that jump into action when young adults encode new information are less responsive in older adults. This slower encoding helps explain age-related memory decline (Grady et al., 1995).

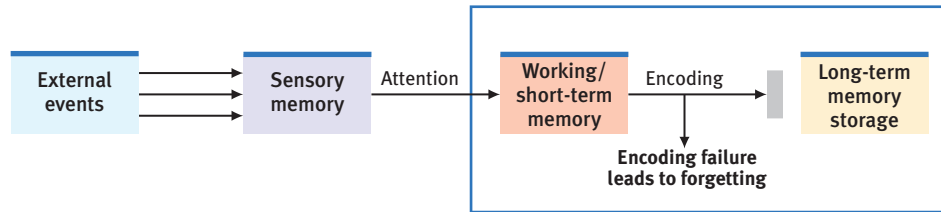


FIGURE 8.19
Forgetting as encoding failure We cannot remember what we have not encoded.

But no matter how young we are, we selectively attend to few of the myriad sights and sounds continually bombarding us. When texting during class, students may fail to encode lecture details that their more attentive classmates are encoding for next week’s test. Without effort, many potential memories never form.

Storage Decay

Even after encoding something well, we sometimes later forget it. To study the durability of stored memories, Ebbinghaus (1885) learned more lists of nonsense syllables and measured how much he retained when relearning each list, from 20 minutes to 30 days later. The result, confirmed by later experiments, was his famous forgetting curve: *The course of forgetting is initially rapid, then levels off with time* (FIGURE 8.20; Wixted & Ebbesen, 1991). Harry Bahrick (1984) found a similar forgetting curve for Spanish vocabulary learned in school. Compared with those just completing a high school or college Spanish course, people 3 years out of school had forgotten much of what they had learned (FIGURE 8.21 on the next page). However, what people remembered then, they still remembered 25 and more years later. Their forgetting had leveled off.

One explanation for these forgetting curves is a gradual fading of the physical memory trace. Cognitive neuroscientists are getting closer to solving the mystery of the physical

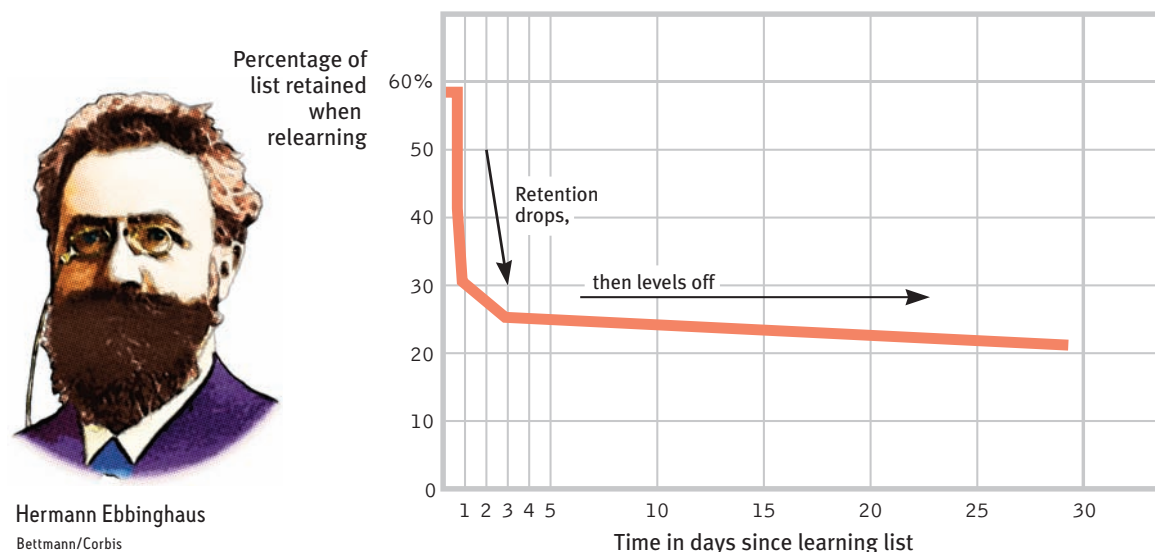


FIGURE 8.20
Ebbinghaus' forgetting curve After learning lists of nonsense syllables, such as YOX and JIH, Ebbinghaus studied how much he retained up to 30 days later. He found that memory for novel information fades quickly, then levels out. (Adapted from Ebbinghaus, 1885.)

Hermann Ebbinghaus
 Bettmann/Corbis

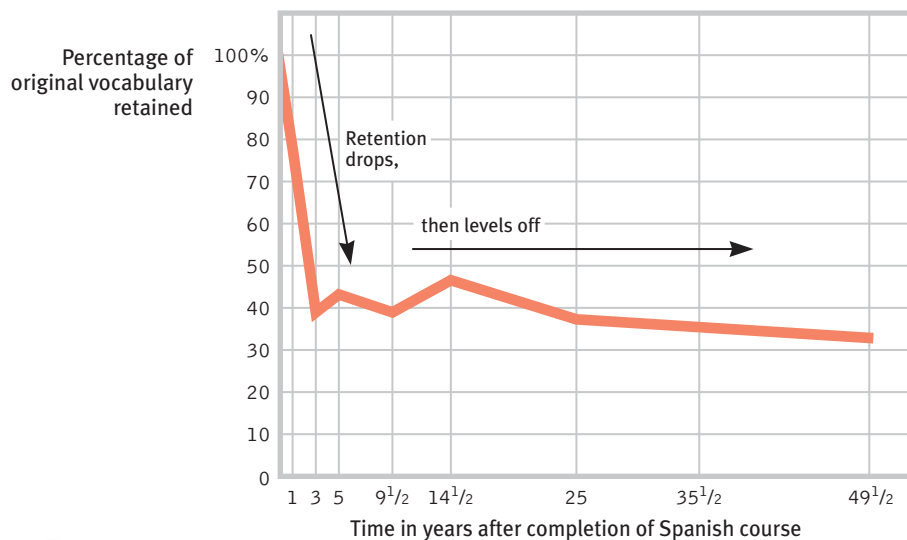


FIGURE 8.21

The forgetting curve for Spanish learned in school Compared with people just completing a Spanish course, those 3 years out of the course remembered much less. Compared with the 3-year group, however, those who studied Spanish even longer ago did not forget much more. (Adapted from Bahrick, 1984.)

Deaf persons fluent in sign language experience a parallel “tip of the fingers” phenomenon (Thompson et al., 2005).

storage of memory and are increasing our understanding of how memory storage could decay. Like books you can’t find in your campus library, memories may be inaccessible for many reasons. Some were never acquired (not encoded). Others were discarded (stored memories decay). And others are out of reach because we can’t retrieve them.

Retrieval Failure

Often, forgetting is not memories faded but memories unretrieved. We store in long-term memory what’s important to us or what we’ve rehearsed. But sometimes important events defy our attempts to access them (**FIGURE 8.22**). How frustrating when a name lies poised on the tip of our tongue, just beyond reach. Given retrieval cues (“*It begins with an M*”), we may easily retrieve the elusive memory. Retrieval problems contribute to the occasional memory failures of older adults, who more frequently are frustrated by tip-of-the-tongue forgetting (Abrams, 2008).

Do you recall the gist of the second sentence I asked you to remember? If not, does the word *shark* serve as a retrieval cue? Experiments show that *shark* (likely what you visualized) more readily retrieves the image you stored than does the sentence’s actual word, *fish* (Anderson et al., 1976). (The sentence was “*The fish attacked the swimmer.*”)

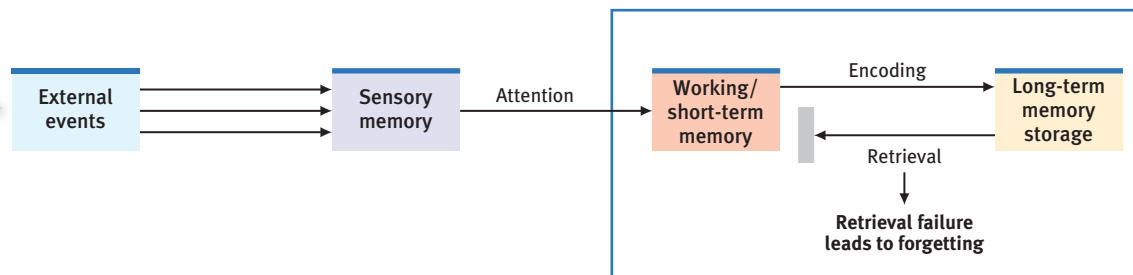
But retrieval problems occasionally stem from interference and, perhaps, from motivated forgetting.



Bill Aron/Photo Edit

FIGURE 8.22

Retrieval failure Sometimes even stored information cannot be accessed, which leads to forgetting.



Interference

As you collect more and more information, your mental attic never fills, but it surely gets cluttered. Sometimes the clutter interferes, as new learning and old collide. **Proactive** (*forward-acting*) **interference** occurs when prior learning disrupts your recall of new information. Your well-rehearsed Facebook password may interfere with your retrieval of your newly learned copy machine code.

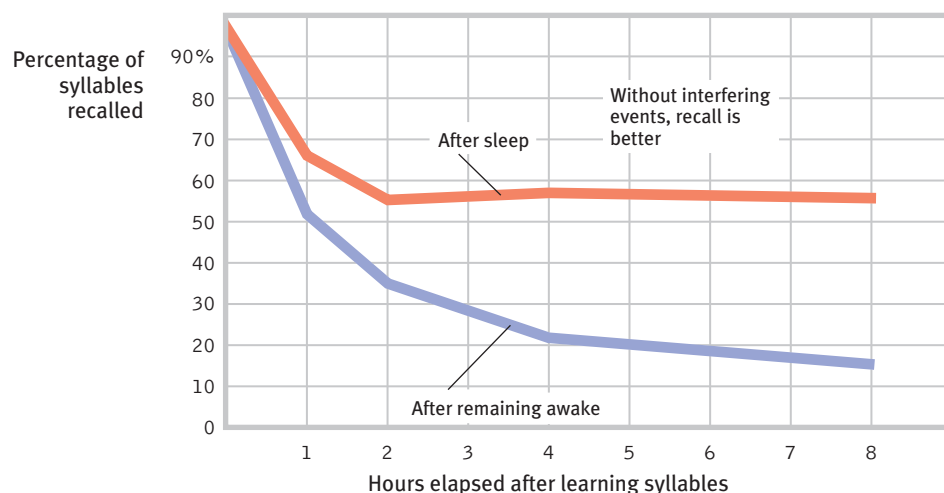


FIGURE 8.23

Retroactive interference More forgetting occurred when a person stayed awake and experienced other new material. (From Jenkins & Dallenbach, 1924.)

Retroactive (*backward-acting*) **interference** occurs when new learning disrupts recall of old information. If someone sings new lyrics to the tune of an old song, you may have trouble remembering the original words. It is rather like a second stone tossed in a pond, disrupting the waves rippling out from the first.

Information presented in the hour before sleep is protected from retroactive interference because the opportunity for interfering events is minimized (Diekelmann & Born, 2010; Nesca & Koulack, 1994). Researchers John Jenkins and Karl Dallenbach (1924) first discovered this in a now-classic experiment. Day after day, two people each learned some nonsense syllables, then tried to recall them after up to eight hours of being awake or asleep at night. As **FIGURE 8.23** shows, forgetting occurred more rapidly after being awake and involved with other activities. The investigators surmised that “forgetting is not so much a matter of the decay of old impressions and associations as it is a matter of interference, inhibition, or obliteration of the old by the new” (1924, p. 612).

The hour before sleep is a good time to commit information to memory (Scullin & McDaniel, 2010), though information presented in the *seconds* just before sleep is seldom remembered (Wyatt & Bootzin, 1994). If you’re considering learning *while* sleeping, forget it. We have little memory for information played aloud in the room during sleep, although the ears do register it (Wood et al., 1992).

Old and new learning do not always compete with each other, of course. Previously learned information (Latin) often facilitates our learning of new information (French). This phenomenon is called *positive transfer*.

Motivated Forgetting

To remember our past is often to revise it. Years ago, the huge cookie jar in our kitchen was jammed with freshly baked chocolate chip cookies. Still more were cooling across racks on the counter. Twenty-four hours later, not a crumb was left. Who had taken them? During that time, my wife, three children, and I were the only people in the house. So while memories were still fresh, I conducted a little memory test. Andy admitted wolfing down as many as 20. Peter thought he had eaten 15. Laura guessed she had stuffed her then-6-year-old body with 15 cookies. My wife, Carol, recalled eating 6, and I remembered consuming 15 and taking 18 more to the office. We sheepishly accepted responsibility for 89 cookies. Still, we had not come close; there had been 160.

Why do our memories fail us? This happens in part because, as Carol Tavris and Elliot Aronson have pointed out, memory is an “unreliable, self-serving historian” (2007, p. 6). Consider one study, in which researchers told some participants about the benefits of frequent toothbrushing. Those individuals then recalled (more than others did) having frequently brushed their teeth in the preceding two weeks (Ross et al., 1981).

proactive interference the disruptive effect of prior learning on the recall of new information.

retroactive interference the disruptive effect of new learning on the recall of old information.



FIGURE 8.24**When do we forget?**

Forgetting can occur at any memory stage. As we process information, we filter, alter, or lose much of it.

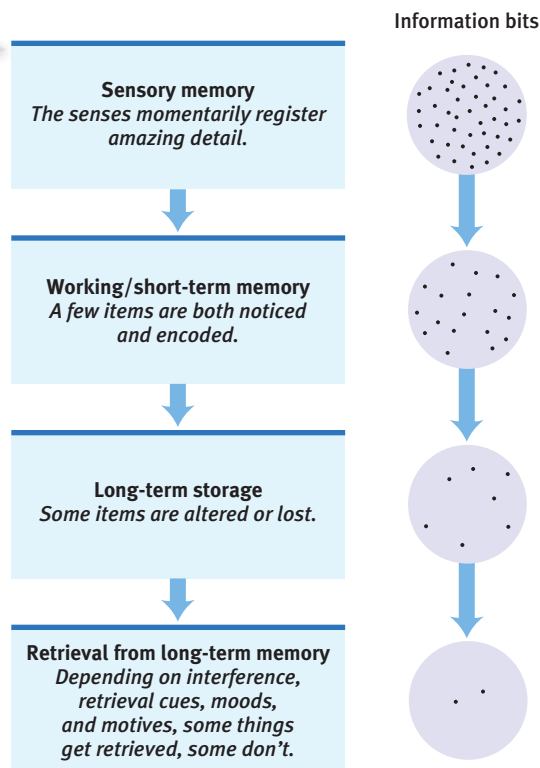


FIGURE 8.24 reminds us that as we process information we filter, alter, or lose much of it. So why were my family and I so far off in our estimates of the cookies we had eaten? Was it an *encoding* problem? (Did we just not notice what we had eaten?) Was it a storage problem? (Might our memories of cookies, like Ebbinghaus' memory of nonsense syllables, have melted away almost as fast as the cookies themselves?) Or was the information still intact but not *retrievable* because it would be embarrassing to remember?¹

Sigmund Freud might have argued that our memory systems self-censored this information. He proposed that we **repress** painful or unacceptable memories to protect our self-concept and to minimize anxiety. But the repressed memory lingers, he believed, and can be retrieved by some later cue or during therapy. Repression was central to Freud's psychoanalytic theory (more on that in Chapter 12) and was a popular idea in mid-twentieth-century psychology and beyond. In one study, 9 in 10 university students agreed that "memories for painful experiences are sometimes pushed into unconsciousness" (Brown et al., 1996). Therapists often assume it. Today, however, increasing numbers of memory researchers think repression rarely, if

ever, occurs. People's efforts to intentionally forget neutral material often succeed, but not when the to-be-forgotten material is emotional (Payne & Corrigan, 2007). Thus, we may have intrusive memories of the very traumatic experiences we would most like to forget.

RETRIEVE IT

- What are three ways we forget, and how does each of these happen?

ANSWER: (1) *Encoding failure*: Unattended information never entered our memory system. (2) *Storage decay*: Information fades from our memory. (3) *Retrieval failure*: We cannot access stored information accurately, sometimes due to interference or motivated forgetting.

Memory Construction Errors



8-16: How do misinformation, imagination, and source amnesia influence our memory construction? How do we decide whether a memory is real or false?



Memory is not precise. Like scientists who infer a dinosaur's appearance from its remains, we infer our past from stored information plus what we later imagined, expected, saw, and heard. We don't just retrieve memories, we reweave them, noted Daniel Gilbert (2006, p. 79): "Information acquired after an event alters memory of the event." We often construct our memories as we encode them, and every time we "replay" a memory, we replace the original with a slightly modified version (Hardt et al., 2010). (Memory researchers call this *reconsolidation*.) So, in a sense, said Joseph LeDoux (2009), "your memory is only as good as your last memory. The fewer times you use it, the more pristine it is." This means that, to some degree, "all memory is false" (Bernstein & Loftus, 2009). Let's examine some of the ways we rewrite our past.

¹ One of my cookie-scarfing sons, on reading this in his father's textbook years later, confessed he had fibbed "a little."

Misinformation and Imagination Effects

In more than 200 experiments, involving more than 20,000 people, Elizabeth Loftus has shown how eyewitnesses reconstruct their memories after a crime or an accident. In one experiment, two groups of people watched a film of a traffic accident and then answered questions about what they had seen (Loftus & Palmer, 1974). Those asked, “How fast were the cars going when they *smashed* into each other?” gave higher speed estimates than those asked, “How fast were the cars going when they *hit* each other?” A week later, when asked whether they recalled seeing any broken glass, people who had heard *smashed* were more than twice as likely to report seeing glass fragments (FIGURE 8.25). In fact, the film showed no broken glass.



repression in psychoanalytic theory, the basic defense mechanism that banishes from consciousness anxiety-arousing thoughts, feelings, and memories.

misinformation effect incorporating misleading information into one’s memory of an event.

FIGURE 8.25

Memory construction In this experiment, people viewed a film of a car accident (left). Those who later were asked a leading question recalled a more serious accident than they had witnessed. (From Loftus & Palmer, 1974.)

In many follow-up experiments around the world, others have witnessed an event, received or not received misleading information about it, and then taken a memory test. The repeated result is a **misinformation effect**: Exposed to misleading information, we tend to misremember. A yield sign becomes a stop sign, hammers become screwdrivers, Coke cans become peanut cans, breakfast cereal becomes eggs, and a clean-shaven man morphs into a man with a mustache (Loftus et al., 1992). So powerful is the misinformation effect that it can influence later attitudes and behaviors (Bernstein & Loftus, 2009).

Just hearing a vivid retelling of an event can implant false memories. One experiment falsely suggested to some Dutch university students that, as children, they became ill after eating spoiled egg salad (Geraerts et al., 2008). After absorbing that suggestion, a significant minority were less likely to eat egg-salad sandwiches, both immediately and four months later.

Even repeatedly *imagining* nonexistent actions and events can create false memories. American and British university students were asked to imagine certain childhood events, such as breaking a window with their hand or having a skin sample removed from a finger. One in four of them later recalled the imagined event as something that had really happened (Garry et al., 1996; Mazzoni & Memon, 2003).

Digitally altered photos have also produced this *imagination inflation*. In experiments, researchers have altered photos from a family album to show some family members taking a hot-air balloon ride. After viewing these photos (rather than photos showing just the balloon), children reported more false memories and indicated high confidence in those memories. When interviewed several days later, they reported even richer details of their false memories (Strange et al., 2007; Wade et al., 2002).

In British and Canadian university surveys, nearly one-fourth of students have reported autobiographical memories that they later realized were not accurate (Mazzoni et al., 2010). I empathize. For decades, my cherished earliest memory was of my parents getting off the bus and walking to our house, bringing my baby brother home from the hospital. When, in middle age, I shared that memory with my father, he assured me they did *not* bring their newborn home on the Seattle Transit System. The human mind, it seems, comes with built-in Photoshop software.

“Memory is insubstantial. Things keep replacing it. Your batch of snapshots will both fix and ruin your memory. . . . You can’t remember anything from your trip except the wretched collection of snapshots.”

Annie Dillard, “To Fashion a Text,” 1988



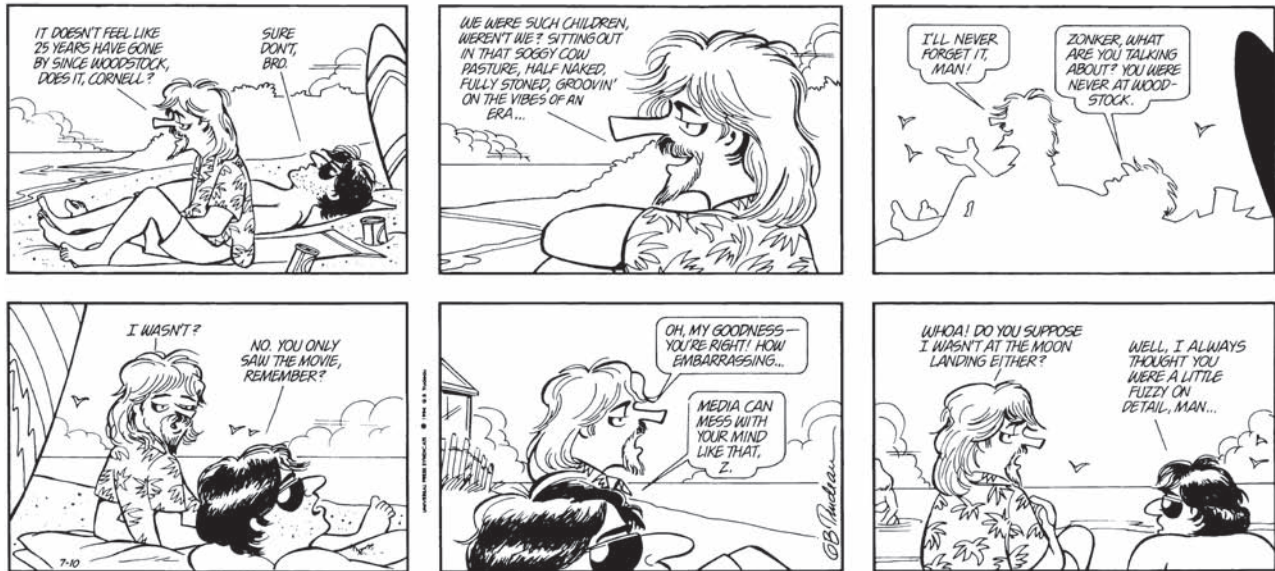
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“It isn’t so astonishing, the number of things I can remember, as the number of things I can remember that aren’t so.”

Mark Twain (1835–1910)

DOONESBURY

By Garth Trudeau DOONESBURY © 1994 G. B. Trudeau. Reprinted with permission of UNIVERSAL PRESS SYNDICATE.



Source Amnesia

Among the frailest parts of a memory is its source. We may recognize someone but have no idea where we have seen the person. We may dream an event and later be unsure whether it really happened. We may misrecall how we learned about something (Henkel et al., 2000). Psychologists are not immune to the process. Famed child psychologist Jean Piaget was startled as an adult to learn that a vivid, detailed memory from his childhood—a nursemaid's thwarting his kidnapping—was utterly false. He apparently constructed the memory from repeatedly hearing the story (which his nursemaid, after undergoing a religious conversion, later confessed had never happened). In attributing his “memory” to his own experiences, rather than to his nursemaid's stories, Piaget exhibited **source amnesia** (also called *source misattribution*). Misattribution is at the heart of many false memories. Authors and songwriters sometimes suffer from it. They think an idea came from their own creative imagination, when in fact they are unintentionally plagiarizing something they earlier read or heard.

Debra Poole and Stephen Lindsay (1995, 2001, 2002) demonstrated source amnesia among preschoolers. They had the children interact with “Mr. Science,” who engaged them in activities such as blowing up a balloon with baking soda and vinegar. Three months later, on three successive days, their parents read them a story describing some things the children had experienced with Mr. Science and some they had not. When a new interviewer asked what Mr. Science had done with them—“Did Mr. Science have a machine with ropes to pull?”—4 in 10 children spontaneously recalled him doing things that had happened only in the story.

Source amnesia also helps explain **déjà vu** (French for “already seen”). Two-thirds of us have experienced this fleeting, eerie sense that “I’ve been in this exact situation before.” It happens most commonly to well-educated, imaginative young adults, especially when tired or stressed (Brown, 2003, 2004; McAneny, 1996). Some wonder, “How could I recognize a situation I’m experiencing for the first time?” Others may think of reincarnation (“I must have experienced this in a previous life”) or precognition (“I viewed this scene in my mind before experiencing it”).

The key to déjà vu seems to be familiarity with a stimulus without a clear idea of where we encountered it before (Cleary, 2008). Normally, we experience a feeling of *familiarity* (thanks to temporal lobe processing) before we consciously remember details (thanks to hippocampus and frontal lobe processing). When these functions (and brain regions) are out of sync, we may experience a feeling of familiarity without conscious recall. Our amazing brains try to make sense of such an improbable situation, and we get

In the discussion of mnemonics, I gave you six words and told you I would quiz you about them later. How many of these words can you now recall? Of these, how many are high-imagery words? How many are low-imagery? (You can check your list against the six inverted words below.)

PROCESS
Bicycle, void, cigarette, inherent, fire,

“Do you ever get that strange feeling of *vujà dé*? Not *déjà vu*; *vujà dé*. It’s the distinct sense that, somehow, something just happened that has never happened before. Nothing seems familiar. And then suddenly the feeling is gone. *Vujà dé*.”

George Carlin (1937–2008), in *Funny Times*, December 2001

an eerie feeling that we're reliving some earlier part of our life. After all, the situation is familiar, even though we have no idea why. Our source amnesia forces us to do our best to make sense of an odd moment.

Discerning True and False Memories

Because the misinformation effect and source amnesia happen outside our awareness, it is nearly impossible to sift suggested ideas out of the larger pool of real memories (Schooler et al., 1986). Perhaps you can recall describing a childhood experience to a friend and filling in memory gaps with reasonable guesses and assumptions. We all do it, and after more retellings, those guessed details—now absorbed into our memories—may feel as real as if we had actually experienced them (Roediger et al., 1993). Much as perceptual illusions may seem like real perceptions, unreal memories *feel* like real memories.

False memories can be very persistent. Imagine that I were to read aloud a list of words such as *candy, sugar, honey, and taste*. Later, I ask you to recognize the presented words from a larger list. If you are at all like the people tested by Henry Roediger and Kathleen McDermott (1995), you would err three out of four times—by falsely remembering a nonpresented similar word, such as *sweet*. We more easily remember the gist than the words themselves.

Memory construction helps explain why 79 percent of 200 convicts exonerated by later DNA testing had been misjudged based on faulty eyewitness identification (Garrett, 2008). It explains why “hypnotically refreshed” memories of crimes so easily incorporate errors, some of which originate with the hypnotist’s leading questions (“*Did you hear loud noises?*”). It explains why dating partners who fell in love have *overestimated* their first impressions of one another (“*It was love at first sight*”), while those who broke up *underestimated* their earlier liking (“*We never really clicked*”) (McFarland & Ross, 1987). How people feel today tends to be how they recall they have always felt (Mazzoni & Vannucci, 2007; and recall from Chapter 1 our tendency to *hindsight bias*). As George Vaillant (1977, p. 197) noted after following adult lives through time, “It is all too common for caterpillars to become butterflies and then to maintain that in their youth they had been little butterflies. Maturation makes liars of us all.”

source amnesia attributing to the wrong source an event we have experienced, heard about, read about, or imagined. (Also called *source misattribution*.) Source amnesia, along with the misinformation effect, is at the heart of many false memories.

déjà vu that eerie sense that “I’ve experienced this before.” Cues from the current situation may subconsciously trigger retrieval of an earlier experience.

Children’s Eyewitness Recall



8-17: How reliable are young children’s eyewitness descriptions, and why are reports of repressed and recovered memories so hotly debated?

If memories can be sincere, yet sincerely wrong, might children’s recollections of sexual abuse be prone to error? “It would be truly awful to ever lose sight of the enormity of child abuse,” observed Stephen Ceci (1993). Yet Ceci and Maggie Bruck’s (1993, 1995) studies of children’s memories have made them aware of how easily children’s memories can be molded. For example, they asked 3-year-olds to show on anatomically correct dolls where a pediatrician had touched them. Of the children who had not received genital examinations, 55 percent pointed to either genital or anal areas.

In other experiments, the researchers studied the effect of suggestive interviewing techniques (Bruck & Ceci, 1999, 2004). In one study, children chose a card from a deck of possible happenings, and an adult then read the card to them. For example, “Think real hard, and tell me if this ever happened to you. Can you remember going to the hospital with a mousetrap on your finger?” In interviews, the same adult repeatedly asked children to think about several real and fictitious events. After 10 weeks of this, a new adult asked the same question. The stunning result: 58 percent of preschoolers produced false (often vivid) stories regarding one or more events they had never experienced (Ceci et al., 1994). Here’s one of those stories:



© Darren Matthews/Alamy

My brother Colin was trying to get Blowtorch [an action figure] from me, and I wouldn't let him take it from me, so he pushed me into the wood pile where the mousetrap was. And then my finger got caught in it. And then we went to the hospital, and my mommy, daddy, and Colin drove me there, to the hospital in our van, because it was far away. And the doctor put a bandage on this finger.

Given such detailed stories, professional psychologists who specialize in interviewing children could not reliably separate the real memories from the false ones. Nor could the children themselves. The above child, reminded that his parents had told him several times that the mousetrap incident never happened—that he had imagined it—protested, “But it really did happen. I remember it!” In another experiment, preschoolers merely overheard an erroneous remark that a magician's missing rabbit had gotten loose in their classroom. Later, when the children were suggestively questioned, 78 percent of them recalled actually seeing the rabbit (Principe et al., 2006). “[The] research leads me to worry about the possibility of false allegations. It is not a tribute to one's scientific integrity to walk down the middle of the road if the data are more to one side,” said Ceci (1993).

Does this mean that children can never be accurate eyewitnesses? No. When questioned about their experiences in neutral words they understood, children often accurately recalled what happened and who did it (Goodman, 2006; Howe, 1997; Pipe, 1996). And when interviewers used less suggestive, more effective techniques, even 4- to 5-year-old children produced more accurate recall (Holliday & Albon, 2004; Pipe et al., 2004). Children were especially accurate when they had not talked with involved adults prior to the interview and when their disclosure was made in a first interview with a neutral person who asked nonleading questions.

Repressed or Constructed Memories of Abuse?

The research on source amnesia and the misinformation effect raises concerns about therapist-guided “recovered” memories. There are two tragedies related to adult recollections of child abuse. One happens when people don't believe abuse survivors who tell their secret. The other happens when innocent people are falsely accused.

Some well-intentioned therapists have reasoned with patients that “people who've been abused often have your symptoms, so you probably were abused. Let's see if, aided by hypnosis or drugs, or helped to dig back and visualize your trauma, you can recover it.” Patients exposed to such techniques may then form an image of a threatening person. With further visualization, the image grows more vivid. The patient ends up stunned, angry, and ready to confront or sue the remembered abuser. The equally stunned and devastated parent or relative vigorously denies the accusation.

Critics are not questioning most therapists' professionalism. Nor are they questioning the accusers' sincerity; even if false, their memories are heartfelt. Critics' charges are specifically directed against clinicians who use “memory work” techniques, such as “guided imagery,” hypnosis, and dream analysis to recover memories. “Thousands of families were cruelly ripped apart,” with “previously loving adult daughters” suddenly accusing fathers (Gardner, 2006).irate clinicians have countered that those who argue that recovered memories of abuse never happen are adding to abused people's trauma and playing into the hands of child molesters.

In an effort to find a sensible common ground that might resolve psychology's “memory war,” professional organizations (the American Medical, American Psychological, and American Psychiatric Associations; the Australian Psychological Society; the British Psychological Society; and the Canadian Psychiatric Association) have convened study panels and issued public statements. Those committed to protecting abused children and those committed to protecting wrongly accused adults have agreed on the following:

- **Sexual abuse happens.** And it happens more often than we once supposed. Although sexual abuse can leave its victims at risk for problems ranging from sexual dysfunction to depression (Freyd et al., 2007), there is no characteristic “survivor syndrome”—no group of symptoms that lets us spot victims of sexual abuse (Kendall-Tackett et al., 1993).

- **Injustice happens.** Some innocent people have been falsely convicted. And some guilty people have evaded responsibility by casting doubt on their truth-telling accusers.
- **Forgetting happens.** Many of those actually abused were either very young when abused or may not have understood the meaning of their experience—circumstances under which forgetting is common. Forgetting isolated past events, both negative and positive, is an ordinary part of everyday life.
- **Recovered memories are commonplace.** Cued by a remark or an experience, we all recover memories of long-forgotten events, both pleasant and unpleasant. What many psychologists debate is twofold: Does the unconscious mind sometimes *forcibly repress* painful experiences? If so, can these experiences be retrieved by certain therapist-aided techniques? (Memories that surface naturally are more likely to be verified [Geraerts et al., 2007].)
- **Memories of things happening before age 3 are unreliable.** We cannot reliably recall happenings from our first three years. As noted earlier, this infantile amnesia happens because our brain pathways have not yet developed enough to form the kinds of memories we will form later in life. Most psychologists—including most clinical and counseling psychologists—therefore doubt “recovered” memories of abuse during infancy (Gore-Felton et al., 2000; Knapp & VandeCreek, 2000). The older a child was when suffering sexual abuse, and the more severe the abuse, the more likely it is to be remembered (Goodman et al., 2003).
- **Memories “recovered” under hypnosis or the influence of drugs are especially unreliable.** Under hypnosis, people will incorporate all kinds of suggestions into their memories, even memories of “past lives.”
- **Memories, whether real or false, can be emotionally upsetting.** Both the accuser and the accused may suffer when what was born of mere suggestion becomes, like an actual trauma, a stinging memory that drives bodily stress (McNally, 2003, 2007). Some people knocked unconscious in unremembered accidents know this all too well. They have later developed stress disorders after being haunted by memories they constructed from photos, news reports, and friends’ accounts (Bryant, 2001).

So, does *repression* of threatening memories ever occur? Or is this concept—the cornerstone of Freud’s theory and of so much popular psychology—misleading? In Chapter 12, we will return to this hotly debated issue. For now, this much appears certain: The most common response to a traumatic experience (witnessing a loved one’s murder, being terrorized by a hijacker or a rapist, losing everything in a natural disaster) is not banishment of the experience into the unconscious. Rather, such experiences are typically etched on the mind as vivid, persistent, haunting memories (Porter & Peace, 2007). As Robert Kraft (2002) said of the experience of those trapped in the Nazi death camps, “Horror sears memory, leaving . . . the consuming memories of atrocity.”

“When memories are ‘recovered’ after long periods of amnesia, particularly when extraordinary means were used to secure the recovery of memory, there is a high probability that the memories are false.”

Royal College of Psychiatrists Working Group on Reported Recovered Memories of Child Sexual Abuse (Brandon et al., 1998)

RETRIEVE IT

- What—given the commonality of source amnesia—might life be like if we remembered all our waking experiences and all our dreams?

ANSWER: Real experiences would be confused with those we dreamed. When meeting someone, we might therefore be unsure whether we were reacting to something they previously did or to something we dreamed they did.

Improving Memory



8-18: How can you use memory research findings to do better in this and other courses?

Biology’s findings benefit medicine. Botany’s findings benefit agriculture. So, too, can psychology’s research on memory benefit education. Here, for easy reference, is a summary of some research-based suggestions that could help you



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Thinking and memory Actively thinking as we read, by rehearsing and relating ideas, and by making the material personally meaningful, yields the best retention.

remember information when you need it. The SQ3R—Survey, Question, Read, Retrieve, Review—study technique introduced in Chapter 1 incorporates several of these strategies:

Rehearse repeatedly. To master material, use distributed (spaced) practice. To learn a concept, give yourself many separate study sessions. Take advantage of life’s little intervals—riding a bus, walking across campus, waiting for class to start. New memories are weak; exercise them and they will strengthen. To memorize specific facts or figures, Thomas Landauer (2001) has advised, “rehearse the name or number you are trying to memorize, wait a few seconds, rehearse again, wait a little longer, rehearse again, then wait longer still and rehearse yet again. The waits should be as long as possible without losing the information.” Reading complex material with minimal rehearsal yields little retention. Rehearsal and critical reflection help more. It pays to study actively.

Make the material meaningful. You can build a network of retrieval cues by taking text and class notes in your own words. Apply the concepts to your own life. Form images. Understand and organize information. Relate the material to what you already know or have experienced. As William James (1890) suggested, “Knit each new thing on to some acquisition already there.” Restate concepts in your own words. Mindlessly repeating someone else’s words won’t supply many retrieval cues. On an exam, you may find yourself stuck when a question uses phrasing different from the words you memorized.

Activate retrieval cues. Mentally re-create the situation and the mood in which your original learning occurred. Jog your memory by allowing one thought to cue the next.

Use mnemonic devices. Associate items with peg words. Make up a story that incorporates vivid images of the items. Chunk information into acronyms. Create rhythmic rhymes (“i before e, except after c”).

Minimize interference. Study before sleep. Do not schedule back-to-back study times for topics that are likely to interfere with each other, such as Spanish and French.

Sleep more. During sleep, the brain reorganizes and consolidates information for long-term memory. Sleep deprivation disrupts this process.

Test your own knowledge, both to rehearse it and to find out what you don’t yet know. Don’t be lulled into overconfidence by your ability to recognize information. Test your recall using the Retrieve It items found throughout each chapter, and the numbered Learning Objective and Testing Effect Questions in the Review sections at the end of each chapter. Outline sections on a blank page. Define the terms and concepts listed at each chapter’s end before turning back to their definitions. Take practice tests; the websites and study guides that accompany many texts, including this one, are a good source for such tests.

RETRIEVE IT

- What are the recommended memory strategies you just read about?

ANSWER: Study repeatedly to boost long-term recall. Schedule spaced (not crammed) study times. Spend more time rehearsing or actively thinking about the material. Make the material personally meaningful, with well-organized and vivid associations. Refresh your memory by returning to contexts and moods to activate retrieval cues. Use mnemonic devices. Minimize interference. Plan for a complete night’s sleep. Test yourself repeatedly—retrieval practice is a proven retention strategy.

CHAPTER REVIEW

Memory

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Studying Memory

- 8-1:** What is memory, and how is it measured?
- 8-2:** How do psychologists describe the human memory system?

Building Memories: Encoding

- 8-3:** How do explicit and implicit memories differ?
- 8-4:** What information do we automatically process?
- 8-5:** How does sensory memory work?
- 8-6:** What is the capacity of our short-term and working memory?
- 8-7:** What are some effortful processing strategies that can help us remember new information?
- 8-8:** What are the levels of processing, and how do they affect encoding?

Memory Storage

- 8-9:** What are the capacity and location of our long-term memories?

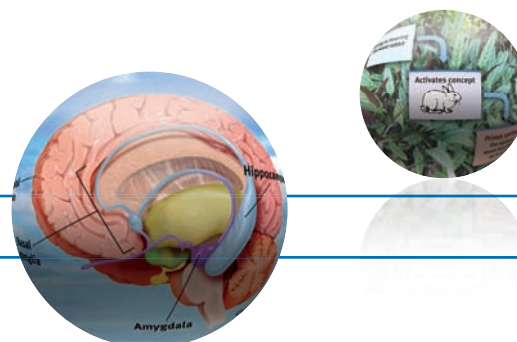
TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

- memory, p. 272
recall, p. 272
recognition, p. 272

- relearning, p. 272
encoding, p. 273
storage, p. 273
retrieval, p. 273
sensory memory, p. 273
short-term memory, p. 273
long-term memory, p. 273

- working memory, p. 273
explicit memory, p. 274
effortful processing, p. 274
automatic processing, p. 274
implicit memory, p. 274
iconic memory, p. 276
echoic memory, p. 276



- 8-10:** What roles do the frontal lobes and hippocampus play in memory storage?
- 8-11:** What roles do the cerebellum and basal ganglia play in our memory processing?
- 8-12:** How do emotions affect our memory processing?
- 8-13:** How do changes at the synapse level affect our memory processing?

Retrieval: Getting Information Out

- 8-14:** How do external cues, internal emotions, and order of appearance influence memory retrieval?

Forgetting

- 8-15:** Why do we forget?

Memory Construction Errors

- 8-16:** How do misinformation, imagination, and source amnesia influence our memory construction? How do we decide whether a memory is real or false?
- 8-17:** How reliable are young children's eyewitness descriptions, and why are reports of repressed and recovered memories so hotly debated?

Improving Memory

- 8-18:** How can you use memory research findings to do better in this and other courses?

chunking, p. 276

mnemonics [nih-MON-iks], p. 277

spacing effect, p. 278

testing effect, p. 278

shallow processing, p. 278

deep processing, p. 278

hippocampus, p. 281

flashbulb memory, p. 283

long-term potentiation (LTP), p. 284

priming, p. 287

mood-congruent memory, p. 288

serial position effect, p. 288

anterograde amnesia, p. 290

retrograde amnesia, p. 290

proactive interference, p. 292

retroactive interference, p. 293

repression, p. 294

misinformation effect, p. 295

source amnesia, p. 296

déjà vu, p. 296

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- A psychologist who asks you to write down as many objects as you can remember having seen a few minutes earlier is testing your _____.
- The psychological terms for taking in information, retaining it, and later getting it back out are _____, _____, and _____.
- The concept of working memory
 - clarifies the idea of short-term memory by focusing on the active processing that occurs in this stage.
 - splits short-term memory into two substages—sensory memory and working memory.
 - splits short-term memory into two areas—working (retrievable) memory and inaccessible memory.
 - clarifies the idea of short-term memory by focusing on space, time, and frequency.
- Sensory memory may be visual (_____ memory) or auditory (_____ memory).
- Our short-term memory for new information is limited to about _____ items.
- Memory aids that use visual imagery (such as peg words) or other organizational devices (such as acronyms) are called _____.
- The hippocampus seems to function as a
 - temporary processing site for explicit memories.
 - temporary processing site for implicit memories.
 - permanent storage area for emotion-based memories.
 - permanent storage area for iconic and echoic memories.
- Amnesia following hippocampus damage typically leaves people unable to learn new facts or recall recent events. However, they may be able to learn new skills, such as riding a bicycle, which is an _____ (explicit/implicit) memory.
- Long-term potentiation (LTP) refers to
 - emotion-triggered hormonal changes.
 - the role of the hippocampus in processing explicit memories.
 - an increase in a cell's firing potential after brief, rapid stimulation.
 - aging people's potential for learning.
- Specific odors, visual images, emotions, or other associations that help us access a memory are examples of
 - relearning.
 - déjà vu.
 - declarative memories.
 - retrieval cues.
- When you feel sad, why might it help to look at pictures that reawaken some of your best memories?
- When tested immediately after viewing a list of words, people tend to recall the first and last items more readily than those in the middle. When retested after a delay, they are most likely to recall
 - the first items on the list.
 - the first and last items on the list.
 - a few items at random.
 - the last items on the list.
- When forgetting is due to encoding failure, meaningless information has not been transferred from
 - the environment into sensory memory.
 - sensory memory into long-term memory.
 - long-term memory into short-term memory.
 - short-term memory into long-term memory.
- Ebbinghaus' "forgetting curve" shows that after an initial decline, memory for novel information tends to
 - increase slightly.
 - decrease noticeably.
 - decrease greatly.
 - level out.

15. The hour before sleep is a good time to memorize information, because going to sleep after learning new material minimizes _____ interference.
16. Freud proposed that painful or unacceptable memories are blocked from consciousness through a mechanism called _____.
17. One reason false memories form is our tendency to fill in memory gaps with our reasonable guesses and assumptions, sometimes based on misinformation. This tendency is an example of
- proactive interference.
 - the misinformation effect.
 - retroactive interference.
 - the forgetting curve.
18. Eliza's family loves to tell the story of how she "stole the show" as a 2-year-old, dancing at her aunt's wedding reception. Even though she was so young, Eliza can recall the event clearly. How is this possible?
19. We may recognize a face at a social gathering but be unable to remember how we know that person. This is an example of _____.
20. When a situation triggers the feeling that "I've been here before," you are experiencing _____.
21. Children can be accurate eyewitnesses if
- interviewers give the children hints about what really happened.
 - a neutral person asks nonleading questions soon after the event, in words the children can understand.
 - the children have a chance to talk with involved adults before the interview.
 - interviewers use precise technical and medical terms.
22. Psychologists involved in the study of memories of abuse tend to DISAGREE about which of the following statements?
- Memories of events that happened before age 3 are not reliable.
 - We tend to repress extremely upsetting memories.
 - Memories can be emotionally upsetting.
 - Sexual abuse happens.

Find answers to these questions in Appendix E, in the back of the book.



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THINKING

Concepts

Problem Solving: Strategies and Obstacles

Forming Good and Bad Decisions and Judgments

THINKING CRITICALLY ABOUT: The Fear Factor—Why We Fear the Wrong Things

Thinking Creatively

CLOSE-UP: Fostering Your Own Creativity

Do Other Species Share Our Cognitive Skills?

LANGUAGE

Language Structure

Language Development

The Brain and Language

Do Other Species Have Language?

THINKING AND LANGUAGE

Language Influences Thinking

Thinking in Images

INTELLIGENCE

What Is Intelligence?

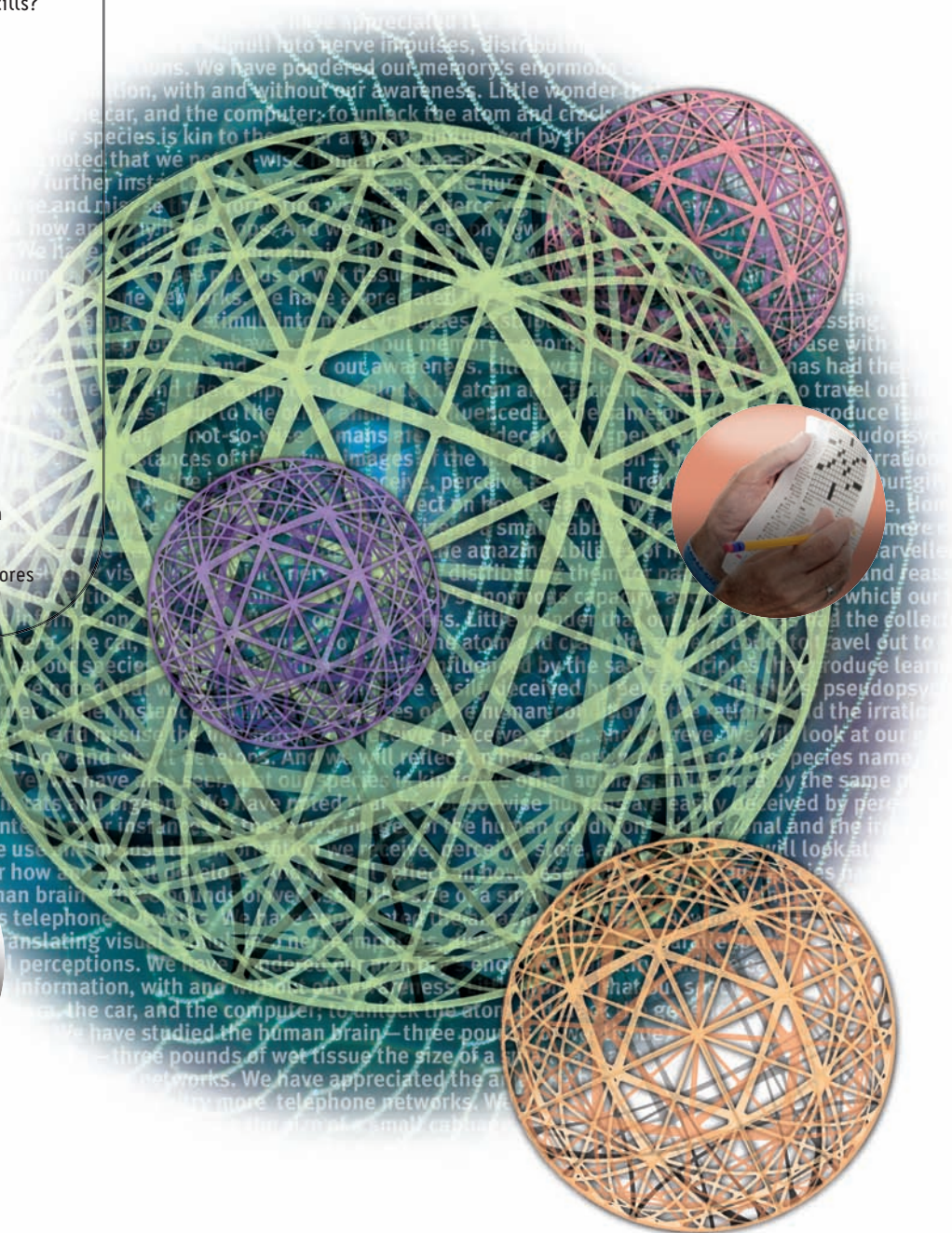
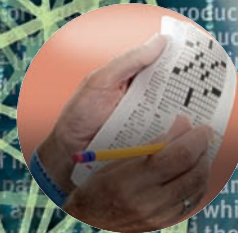
Assessing Intelligence

Aging and Intelligence

CLOSE-UP: Extremes of Intelligence

Genetic and Environmental Influences on Intelligence

Group Differences in Intelligence Test Scores





Thinking, Language, and Intelligence



Throughout history, we humans have both bemoaned our foolishness and celebrated our wisdom. The poet T. S. Eliot was struck by “the hollow men . . . Headpiece filled with straw.” But Shakespeare’s Hamlet extolled the human species as “noble in reason! . . . infinite in faculties! . . . in apprehension how like a god!” In the preceding chapters, we have likewise marveled at both our abilities and our errors.

We have studied the human brain—three pounds of wet tissue the size of a small cabbage, yet containing staggeringly complex circuitry. We have appreciated the amazing abilities of newborns. We have marveled at our sensory system’s translating visual stimuli into nerve impulses, distributing them for parallel processing, and reassembling them into colorful perceptions. We have pondered our memory’s enormous capacity, and the ease with which our two-track mind processes information, with and without our awareness. Little wonder that our species has had the collective genius to invent the camera, the car, and the computer; to unlock the atom and crack the genetic code; to travel out to space and into our brain’s depths.

Yet we have also seen that our species is kin to the other animals, influenced by the same principles that produce learning in rats and pigeons. We have noted that we not-so-wise humans are easily deceived by perceptual illusions, pseudopsychic claims, and false memories.

In this chapter, we encounter further instances of these two images of the human condition—the rational and the irrational. We will consider how we use—and misuse—the information we receive, perceive, store, and retrieve. We will look at our gifts for language and intelligence. And we will reflect on how deserving we are of our species name, *Homo sapiens*—wise human.



Thinking

Concepts



9-1: What is cognition, and what are the functions of concepts?

Psychologists who study **cognition** focus on the mental activities associated with thinking, knowing, remembering, and communicating information. One of these activities is forming **concepts**—mental groupings of similar objects, events, ideas, and people. The concept *chair* includes many items—a baby’s high chair, a reclining chair, a dentist’s chair.

Concepts simplify our thinking. Imagine life without them. We would need a different name for every person, event, object, and idea. We could not ask a child to “throw the ball” because there would be no concept of *throw* or *ball*. Instead of saying, “They were angry,” we would have to describe expressions, intensities, and words. Concepts such as *ball* and *anger* give us much information with little cognitive effort.

We often form our concepts by developing a **prototype**—a mental image or best example of a category (Rosch, 1978). People more quickly agree that “a robin is a bird” than that “a penguin is a bird.” For most of us, the robin is the birdier bird; it more closely resembles our *bird* prototype. And the more closely something matches our prototype of a concept—*bird* or *car*—the more readily we recognize it as an example of the concept.

Once we place an item in a category, our memory of it later shifts toward the category prototype, as it did for Belgian students who viewed ethnically blended faces. For example, when viewing a blended face in which 70 percent of the features were Caucasian and 30 percent were Asian, the students categorized the face as Caucasian (**FIGURE 9.1**). Later, as their memory shifted toward the Caucasian prototype, they were more likely to remember an 80 percent Caucasian face than the 70 percent Caucasian they had actually seen (Corneille et al., 2004). Likewise, if shown a 70 percent Asian face, they later remembered a more prototypically Asian face.

So, too, with gender: People who viewed 70 percent male faces categorized them as male (no surprise there) and then later misremembered them as even more prototypically male (Huart et al., 2005).

Move away from our prototypes, and category boundaries may blur. Is a tomato a fruit? Is a 17-year-old female a girl or a woman? Is a whale a fish or a mammal? Because a whale fails to match our *mammal* prototype, we are slower to recognize it as a mammal. Similarly, when symptoms don’t fit one of our disease prototypes, we are slow to perceive an illness (Bishop, 1991). People whose heart attack symptoms (shortness of breath, exhaustion, a dull weight in the chest) don’t match their *heart attack* prototype (sharp chest pain) may not seek help. And when behaviors don’t fit our *discrimination* prototypes—of White against Black, male against female, young against old—we often fail to notice prejudice. People more easily detect male prejudice against females than female against males or female against females (Inman & Baron, 1996; Marti et al., 2000). Concepts speed and guide our thinking. But they don’t always make us wise.

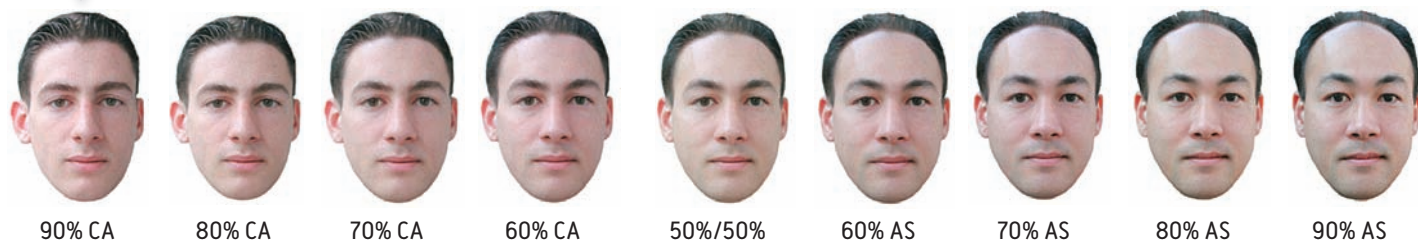
Toying with our prototypes It takes a bit longer to conceptualize a Smart Car as an actual car, because it looks more like a toy than our mental prototype for *car*.



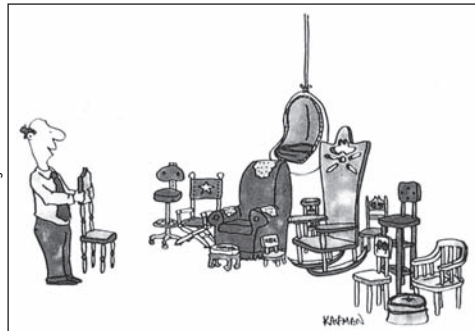
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FIGURE 9.1

Categorizing faces influences recollection Shown a face that was 70 percent Caucasian, people tended to classify the person as Caucasian and to recollect the face as more Caucasian than it was. (From Corneille et al., 2004.)



Courtesy of Olivier Corneille



“Attention, everyone! I’d like to introduce the newest member of our family.”

Problem Solving: Strategies and Obstacles



9-2: What cognitive strategies assist our problem solving, and what obstacles hinder it?

One tribute to our rationality is our problem-solving skill. What's the best route around this traffic jam? How shall we handle a friend's criticism? How can we get in the house without our keys?

Some problems we solve through *trial and error*. Thomas Edison tried thousands of light bulb filaments before stumbling upon one that worked. For other problems, we use **algorithms**, step-by-step procedures that guarantee a solution. But step-by-step algorithms can be laborious and exasperating. To find a word using the 10 letters in *SPLOYOCHYG*, for example, you could try each letter in each of the 10 positions—907,200 permutations in all. Rather than give you a computing brain the size of a beach ball, nature resorts to **heuristics**, simpler thinking strategies. Thus, you might reduce the number of options in the *SPLOYOCHYG* example by grouping letters that often appear together (*CH* and *GY*) and excluding rare letter combinations (such as two *Y*'s together). By using heuristics and then applying trial and error, you may hit on the answer. Have you guessed it?¹

Sometimes we puzzle over a problem and the pieces suddenly fall together in a flash of **insight**—an abrupt, true-seeming, and often satisfying solution (Topolinski & Reber, 2010). Ten-year-old Johnny Appleton's insight solved a problem that had stumped construction workers: how to rescue a young robin from a narrow 30-inch-deep hole in a cement-block wall. Johnny's solution: Slowly pour in sand, giving the bird enough time to keep its feet on top of the constantly rising pile (Ruchlis, 1990).

Teams of researchers have identified brain activity associated with sudden flashes of insight (Kounios & Beeman, 2009; Sandkühler & Bhattacharya, 2008). They gave people a problem: Think of a word that will form a compound word or phrase with each of three other words in a set (such as *pine*, *crab*, and *sauce*), and press a button to sound a bell when you know the answer. (If you need a hint: The word is a fruit.²) EEGs or fMRIs (functional MRIs) revealed the problem solvers' brain activity. In the first experiment, about half the solutions were by a sudden Aha! insight. Before the Aha! moment, the problem solvers' frontal lobes (which are involved in focusing attention) were active, and there was a burst of activity in the right temporal lobe, just above the ear (**FIGURE 9.2** on the next page).

Insight strikes suddenly, with no prior sense of “getting warmer” or feeling close to a solution (Knoblich & Oellinger, 2006; Metcalfe, 1986). When the answer pops into mind (*apple!*), we feel a happy sense of satisfaction. The joy of a joke may similarly lie in our sudden comprehension of an unexpected ending or a double meaning: “You don't need a parachute to skydive. You only need a parachute to skydive twice.”

Insightful as we are, other cognitive tendencies may lead us astray. For example, we more eagerly seek out and favor evidence that supports our ideas than evidence that refutes them (Klayman & Ha, 1987; Skov & Sherman, 1986). In a classic experiment, Peter Wason (1960) demonstrated this tendency, known as **confirmation bias**, by giving British university students the three-number sequence 2-4-6 and asking them to guess the rule he had used to devise the series. (The rule was simple: any three ascending numbers.) Before submitting answers, students generated their own three-number sets and Wason told them whether their sets conformed to his rule. Once *certain* they had the rule, they could announce it. The result? Seldom right but never in doubt. Most students formed a wrong idea (“*Maybe it's counting by twos*”) and then searched only for confirming evidence (by testing 6-8-10, 100-102-104, and so forth).

“Ordinary people,” said Wason (1981), “evade facts, become inconsistent, or systematically defend themselves against the threat of new information relevant to the

cognition the mental activities associated with thinking, knowing, remembering, and communicating.

concept a mental grouping of similar objects, events, ideas, and people.

prototype a mental image or best example of a category. Matching new items to a prototype provides a quick and easy method for sorting items into categories (as when comparing feathered creatures to a prototypical bird, such as a robin).

algorithm a methodical, logical rule or procedure that guarantees solving a particular problem. Contrasts with the usually speedier—but also more error-prone—use of *heuristics*.

heuristic a simple thinking strategy that often allows us to make judgments and solve problems efficiently; usually speedier but also more error prone than *algorithms*.

insight a sudden realization of a problem's solution; contrasts with strategy-based solutions.

confirmation bias a tendency to search for information that supports our preconceptions and to ignore or distort contradictory evidence.



Heuristic searching To search for guava juice, you could search every supermarket aisle (an algorithm), or check the bottled beverage, natural foods, and produce sections (heuristics). The heuristics approach is often speedier, but an algorithmic search guarantees you will find it eventually.

¹ Answer to SPLOYOCHYG anagram: PSYCHOLOGY.

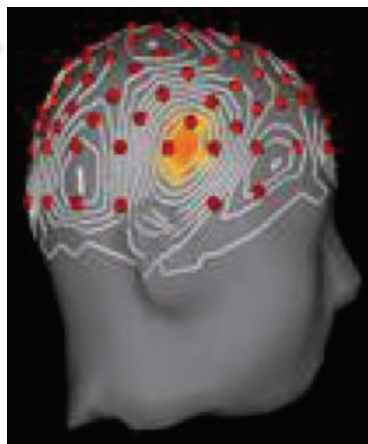
² The word is *apple*: pineapple, crabapple, applesauce.

FIGURE 9.2

The Aha! moment A burst of right temporal lobe EEG activity accompanied insight solutions to word problems (Jung-Beeman et al., 2004). The red dots designate EEG electrodes. The white lines show the distribution of high-frequency activity accompanying insight. The insight-related activity is centered in the right temporal lobe (yellow area).

“The human understanding, when any proposition has been once laid down . . . forces everything else to add fresh support and confirmation.”

Francis Bacon, Novum Organum, 1620



From Mark Jung-Beeman, Northwestern University and John Koumios, Drexel University



From “Problem Solving” by M. Scheerer. Copyright © 1963 by Scientific American, Inc. All rights reserved.

FIGURE 9.3

The matchstick problem How would you arrange six matches to form four equilateral triangles?



© B. Veley. Used by permission.

“The problem is I can’t tell the difference between a deeply wise, intuitive nudge from the Universe and one of my own bone-headed ideas!”

readily than information which contradicted” them. Sources denying such weapons were deemed “either lying or not knowledgeable about Iraq’s problems,” while those sources who reported ongoing WMD activities were seen as “having provided valuable information.”

Once we incorrectly represent a problem, it’s hard to restructure how we approach it. If the solution to the matchstick problem in **FIGURE 9.3** eludes you, you may be experiencing *fixation*—an inability to see a problem from a fresh perspective. (For the solution, turn the page to see **FIGURE 9.6**.)

A prime example of fixation is **mental set**, our tendency to approach a problem with the mind-set of what has worked for us previously. Indeed, solutions that worked in the past often do work on new problems. Consider:

Given the sequence *O-T-T-F-?-?-?*, what are the final three letters?

Most people have difficulty recognizing that the three final letters are *F(ive)*, *S(ix)*, and *S(even)*. But solving this problem may make the next one easier:

Given the sequence *J-F-M-A-?-?-?*, what are the final three letters? (If you don’t get this one, ask yourself what month it is.)

As a *perceptual set* predisposes what we perceive, a mental set predisposes how we think; sometimes this can be an obstacle to problem solving, as when our mental set from our past experiences with matchsticks predisposes us to arrange them in two dimensions.

Forming Good and Bad Decisions and Judgments



9-3: What is intuition, and how can the availability heuristic, overconfidence, belief perseverance, and framing influence our decisions and judgments?

When making each day’s hundreds of judgments and decisions (*Is it worth the bother to take an umbrella? Can I trust this person? Should I shoot the basketball or pass to the player who’s hot?*), we seldom take the time and effort to reason systematically. We just follow our **intuition**, our fast, automatic, unreasoned feelings and thoughts. After interviewing policy makers in government, business, and education, social psychologist Irving Janis (1986) concluded that they “often do not use a reflective problem-solving approach. How do they usually arrive at their decisions? If you ask, they are likely to tell you . . . they do it mostly by *the seat of their pants*.”

The Availability Heuristic

When we need to act quickly, the mental shortcuts we call *heuristics* enable snap judgments. Thanks to our mind’s automatic information processing, intuitive judgments are instantaneous and usually effective. However, research by cognitive psychologists Amos Tversky and Daniel Kahneman (1974) showed how these generally helpful shortcuts



Courtesy of Greymayer Award, University of Louisville and the Tversky family

“In creating these problems, we didn’t set out to fool people. All our problems fooled us, too.”
Amos Tversky (1985)



Courtesy of Greymayer Award, University of Louisville and Daniel Kahneman

“Intuitive thinking [is] fine most of the time. . . . But sometimes that habit of mind gets us in trouble.”
Daniel Kahneman (2005)

mental set a tendency to approach a problem in one particular way, often a way that has been successful in the past.

intuition an effortless, immediate, automatic feeling or thought, as contrasted with explicit, conscious reasoning.

availability heuristic estimating the likelihood of events based on their availability in memory; if instances come readily to mind (perhaps because of their vividness), we presume such events are common.

can lead even the smartest people into dumb decisions.³ The **availability heuristic** operates when we estimate the likelihood of events based on how mentally available they are. Casinos entice us to gamble by signaling even small wins with bells and lights—making them vividly memorable—while keeping big losses soundlessly invisible.

The availability heuristic can distort our judgments of other people, too. Anything that makes information “pop” into mind—its vividness, recency, or distinctiveness—can make it seem commonplace. If someone from a particular ethnic group commits a terrorist act, as happened on September 11, 2001, our readily available memory of the dramatic event may shape our impression of the whole group.

Even during that horrific year, terrorist acts claimed comparatively few lives. Yet when the statistical reality of greater dangers (see **FIGURE 9.4**) was pitted against a single vivid case, the memorable case won: Emotion-laden images of terror exacerbated our fears (Sunstein, 2007).

We often fear the wrong things. We fear flying because we play old films of air disasters in our head. We fear letting our sons and daughters walk to school because we

“Kahneman and his colleagues and students have changed the way we think about the way people think.”

American Psychological Association president, Sharon Brehm, 2007

³ Tversky and Kahneman’s joint work on decision making received the 2002 Nobel Prize; sadly, only Kahneman was alive to receive the honor.

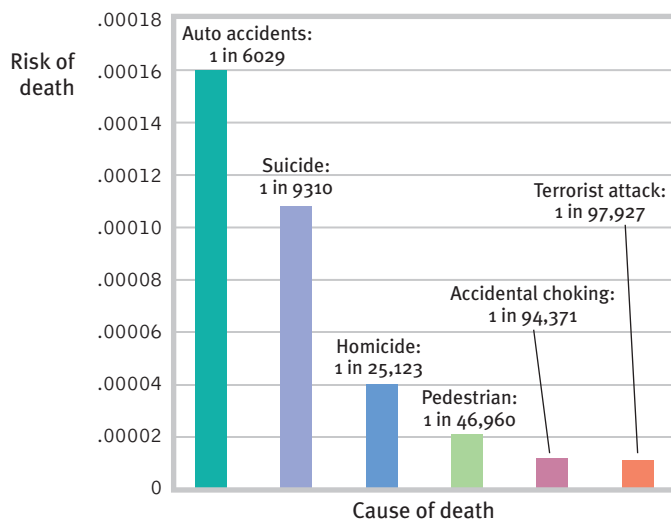


FIGURE 9.4
Risk of death from various causes in the United States, 2001 (Data assembled from various government sources by Randall Marshall et al., 2007.)

THINKING CRITICALLY ABOUT:

The Fear Factor—Why We Fear the Wrong Things

After 9/11, many people feared flying more than driving. In a 2006 Gallup survey, only 40 percent of Americans reported being “not afraid at all” to fly. Yet from 2005 to 2007 Americans were—mile for mile—170 times more likely to die in an automobile or pickup truck crash than on a scheduled flight (National Safety Council, 2010). In 2009 alone, 33,808 Americans were killed in motor vehicle accidents—that’s 650 dead people *each week*. Meanwhile, in 2009 (as in 2007 and 2008), zero died from accidents on scheduled airline flights.

In a late 2001 essay, I calculated that if—because of 9/11—we flew 20 percent less and instead drove half those unflown miles, about 800 more people would die in the year after 9/11 (Myers, 2001). German psychologist Gerd Gigerenzer (2004, 2006) later checked this estimate against actual accident data. (Why didn’t I think of that?) U.S. traffic deaths did indeed increase significantly in the last three months of 2001 (FIGURE 9.5). By the end of 2002, Gigerenzer estimated, 1600

Americans had “lost their lives on the road by trying to avoid the risk of flying.” Despite our greater fear of flying, flying’s greatest danger is, for most people, the drive to the airport.

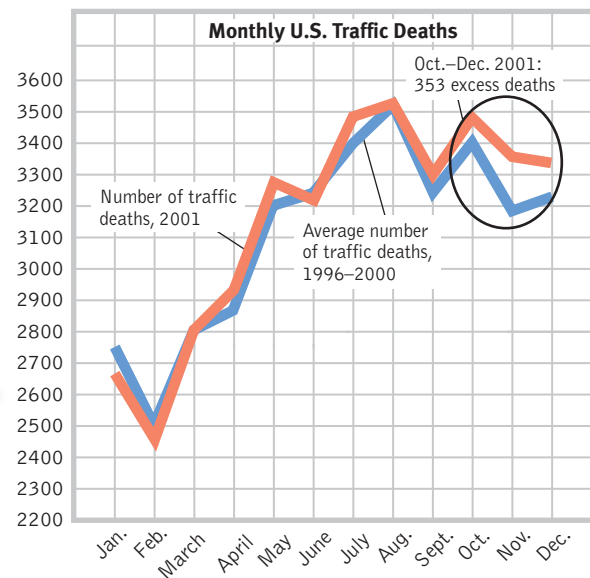
Why do we fear the wrong things? Why do we judge terrorism to be a greater risk than accidents? Psychologists have identified four influences that feed fear and cause us to ignore higher risks:

1. *We fear what our ancestral history has prepared us to fear.* Human emotions were



FIGURE 9.5

Scared onto deadly highways Images of 9/11 etched a sharper image in American minds than did the millions of fatality-free flights on U.S. airlines during 2002 and after. Dramatic events are readily available to memory, and they shape our perceptions of risk. In the three months after 9/11, those faulty perceptions led more Americans to travel, and some to die, by car. (Adapted from Gigerenzer, 2004.)



“Don’t believe everything you think”

Bumper sticker

see mental snapshots of abducted and brutalized children. We fear swimming in ocean waters because we replay *Jaws* with ourselves as victims. Even passing by a person who sneezes and coughs can heighten our perceptions of various health risks (Lee et al., 2010). And so, thanks to such readily available images, we come to fear extremely rare events. Dramatic outcomes make us gasp; probabilities we hardly grasp. (See Thinking Critically About: The Fear Factor.)

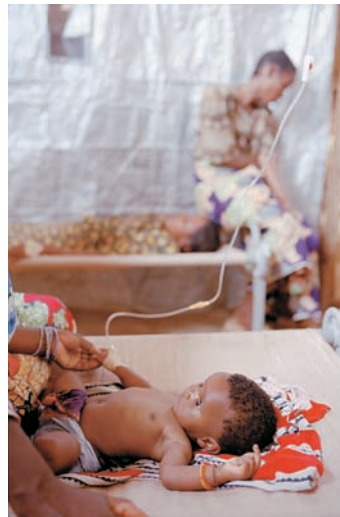
Meanwhile, the lack of comparably available images of global climate change—which some scientists regard as a future “Armageddon in slow motion”—has left most people little concerned (Pew, 2007). The vividness of a recent local cold day reduces their concern about long-term global warming and overwhelms less memorable scientific data (Li et al., 2011).

As of 2012, some 40 nations have sought to harness the positive power of vivid, memorable images by putting eye-catching warnings and graphic photos on cigarette packages (Wilson, 2011). This campaign may work, where others have failed. As psychologist Paul Slovic (2007) points out, we reason emotionally and neglect probabilities. We overfeel and underthink. In one experiment, donations to a starving 7-year-old were greater when her image was *not* accompanied by statistical information about the

overconfidence the tendency to be more confident than correct—to overestimate the accuracy of our beliefs and judgments.

road tested in the Stone Age. Our old brain prepares us to fear yesterday's risks: snakes, lizards, and spiders (which combined now kill a tiny fraction of the number killed by modern-day threats, such as cars and cigarettes). Yesterday's risks also prepare us to fear confinement and heights, and therefore flying.

2. *We fear what we cannot control.* Driving we control; flying we do not.
3. *We fear what is immediate.* The dangers of flying are mostly telescoped into the moments of takeoff and landing. The dangers of driving are diffused across many moments to come, each trivially dangerous.
4. *Thanks to the availability heuristic, we fear what is most readily available in memory.* Powerful, vivid images, like that of United Flight 175 slicing into the World Trade Center, feed our judgments of risk. Thousands of safe car trips have extinguished our anxieties about driving. Similarly, we remember (and fear) widespread disasters (hurricanes, tornadoes, earthquakes) that kill people dramatically, in bunches. But we fear too little the less dramatic threats that claim lives quietly, one by one, continuing into the distant future. Bill Gates has noted that each year a half-million



Ian Berry/Magnum Photos

Dramatic deaths in bunches breed concern and fear The memorable 2010 Haitian earthquake that killed some 250,000 people stirred an outpouring of justified concern. Meanwhile, according to the World Health Organization, a silent earthquake of poverty-related malaria was killing about that many people, mostly in Africa, *every four months*.

.....

children worldwide die from rotavirus. This is the equivalent of four 747s full of children every day, and we hear nothing of it (Glass, 2004).

The news, and our own memorable experiences, can make us disproportionately fearful of infinitesimal risks. As one risk analyst explained, "If it's in the news, don't worry about it. The very definition of *news* is 'something that hardly ever happens'" (Schneier, 2007). Despite people's fear of dying in a terrorist attack on an airplane, the last decade produced one terrorist attempt for every 10.4 million flights—less than one-twentieth the chance of any one of us being struck by lightning (Silver, 2009).

The point to remember: It is perfectly normal to fear purposeful violence from those who hate us. When terrorists strike again, we will all recoil in horror. But smart thinkers will check their fears against the facts and resist those who aim to create a culture of fear. By so doing, we take away the terrorists' most omnipresent weapon: exaggerated fear.

"Fearful people are more dependent, more easily manipulated and controlled, more susceptible to deceptively simple, strong, tough measures and hard-line postures."

Media researcher George Gerbner to U.S. Congressional Subcommittee on Communications, 1981

millions of needy African children like her (Small et al., 2007). "If I look at the mass I will never act," Mother Teresa reportedly said. "If I look at the one, I will." "The more who die, the less we care," noted Slovic (2010).

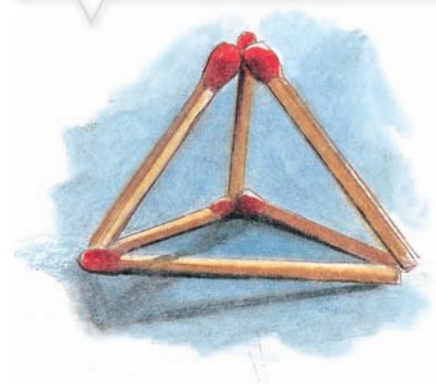
Overconfidence

Sometimes our judgments and decisions go awry simply because we are more confident than correct. Across various tasks, people overestimate their performance (Metcalf, 1998). If 60 percent of people correctly answer a factual question, such as "Is absinthe a liqueur or a precious stone?" they will typically average 75 percent confidence (Fischhoff et al., 1977). (It's a licorice-flavored liqueur.) This tendency to overestimate the accuracy of our knowledge and judgments is **overconfidence**.

It was an overconfident BP that, before its exploded drilling platform spewed oil into the Gulf of Mexico, downplayed safety concerns, and then downplayed the spill's magnitude (Mohr et al., 2010; Urbina, 2010). It is overconfidence that drives stockbrokers and investment managers to market their ability to outperform stock market averages, despite overwhelming evidence to the contrary (Malkiel, 2004). A purchase of stock X, recommended by a broker who judges this to be the time to buy, is usually balanced

FIGURE 9.6

Solution to the matchstick problem To solve this problem, you must view it from a new perspective, breaking the fixation of limiting solutions to two dimensions.





Bianca Moscaletti/Worth Publishers

Predict your own behavior When will you finish reading this chapter?

“When you know a thing, to hold that you know it; and when you do not know a thing, to allow that you do not know it; this is knowledge.”

Confucius (551–479 B.C.E.), Analects

by a sale of stock X by someone who judges this to be the time to sell. Despite their confidence, buyer and seller cannot both be right.

Classrooms are full of overconfident students who expect to finish assignments and write papers ahead of schedule (Buehler et al., 1994). In fact, the projects generally take about twice the number of days predicted.

We also overestimate our future leisure time (Zauberman & Lynch, 2005). Anticipating how much more we will accomplish next month, we happily accept invitations and assignments, only to discover we’re still just as busy when the day rolls around. And believing we will have more money next year, we take out loans or buy on credit. Despite our past overconfident predictions, we remain overly confident of our next prediction.

Overconfidence can have adaptive value. People who err on the side of overconfidence live more happily, make tough decisions more easily, and seem more credible than others (Baumeister, 1989; Taylor, 1989). Moreover, given prompt and clear feedback, as weather forecasters receive after each day’s predictions, we can learn to be more realistic about the accuracy of our judgments (Fischhoff, 1982). The wisdom to know when we know a thing and when we do not is born of experience.

Belief Perseverance

Our overconfidence in our judgments is startling; equally startling is our tendency to cling to our beliefs in the face of contrary evidence. **Belief perseverance** often fuels social conflict, as it did in a classic study of people with opposing views of capital punishment (Lord et al., 1979). Each side studied two supposedly new research findings, one supporting and the other refuting the claim that the death penalty deters crime. Each side was more impressed by the study supporting its own beliefs, and each readily disputed the other study. Thus, showing the pro- and anti-capital-punishment groups the *same* mixed evidence actually *increased* their disagreement.

If you want to rein in belief perseverance, a simple remedy exists: *Consider the opposite*. When the same researchers repeated the capital-punishment study, they asked some participants to be “as *objective* and *unbiased* as possible” (Lord et al., 1984). The plea did nothing to reduce biased evaluations of evidence. They asked another group to consider “whether you would have made the same high or low evaluations had exactly the same study produced results on the *other* side of the issue.” Having imagined and pondered *opposite* findings, these people became much less biased.

The more we come to appreciate why our beliefs might be true, the more tightly we cling to them. Once we have explained to ourselves why we believe a child is “gifted” or has a “learning disability,” or why candidate X or Y will be a better commander-in-chief, or why company Z is a stock worth owning, we tend to ignore evidence undermining our belief. Prejudice persists. Once beliefs form and get justified, it takes more compelling evidence to change them than it did to create them.

The Effects of Framing

Framing, the way we present an issue, sways our decisions and judgments and can be a powerful persuasion tool. Carefully posed options can nudge people toward decisions that could benefit them or society as a whole (Thaler & Sunstein, 2008):

- *Life and death*. Imagine two surgeons explaining a surgery risk. One tells patients that 10 percent of people die during this surgery. The other tells patients that 90 percent will survive. The information is the same. The effect is not. In surveys, both patients and physicians perceive greater risk when they hear that 10 percent will *die* (Marteau, 1989; McNeil et al., 1988; Rothman & Salovey, 1997).
- *Why choosing to be an organ donor depends on where you live*. In many European countries as well as the United States, those renewing their driver’s license can decide whether they want to be organ donors. In some countries, the default option is *Yes*,



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“I’m happy to say that my final judgment of a case is almost always consistent with my prejudgment of the case.”

but people can opt out. Nearly 100 percent of the people in opt-out countries have agreed to be donors. In the United States, Britain, and Germany, the default option is *No*, but people can “opt in.” In these countries, only about 25 percent have agreed to be donors (Johnson & Goldstein, 2003).

- *How to help employees decide to save for their retirement.* A 2006 U.S. pension law recognized the framing effect. Before that law, employees who wanted to contribute to a 401(k) retirement plan typically had to choose a lower take-home pay, which few people will do. Companies can now automatically enroll their employees in the plan but allow them to opt out (which would raise the employees’ take-home pay). In both plans, the decision to contribute is the employee’s. But under the new “opt-out” arrangement, enrollments in one analysis of 3.4 million workers soared from 59 to 86 percent (Rosenberg, 2010).

The point to remember: Framing influences decisions.

belief perseverance clinging to one’s initial conceptions after the basis on which they were formed has been discredited.

framing the way an issue is posed; how an issue is framed can significantly affect decisions and judgments.

The Perils and Powers of Intuition



9-4: How do smart thinkers use intuition?

The perils of intuition—irrational fears, clouded judgment, illogical reasoning—can feed gut fears and prejudices. Irrational thinking can persist even when people are offered extra pay for thinking smart, even when they are asked to justify their answers, and even when they are expert physicians or clinicians (Shafir & LeBoeuf, 2002). So, are our heads indeed filled with straw?

Throughout this book you will see examples of smart intuition. In brief,

- *Intuition is analysis “frozen into habit”* (Simon, 2001). It is implicit knowledge—what we’ve learned but can’t fully explain, such as the tacit expertise chess masters display in “blitz chess,” where after barely more than a glance they intuitively know the right move (Burns, 2004). We see this expertise in seasoned nurses, firefighters, art critics, car mechanics, and hockey players. And in you, too, for anything in which you have developed a special expertise. In each case, what feels like instant intuition is an acquired ability to size up a situation in an eyeblink.
- *Intuition is usually adaptive, enabling quick reactions.* Our fast and frugal heuristics let us intuitively assume that fuzzy looking objects are far away—which they usually are, except on foggy mornings. Our learned associations surface as gut feelings, right or wrong: Seeing a stranger who looks like someone who has harmed or threatened us in the past, we may automatically react warily.
- *Intuition is huge.* Today’s cognitive science offers many examples of unconscious automatic influences on our judgments (Custers & Aarts, 2010). Consider: Most people guess that the more complex the choice, the smarter it is to make decisions rationally rather than intuitively (Inbar et al., 2010). Actually, Dutch psychologists have shown that in making complex decisions, we benefit by letting our brain work on a problem without thinking about it (Strick et al., 2010). In one series of experiments, they showed three groups of people complex information (about apartments or roommates or art posters or soccer matches). They invited one group to state their preference immediately after reading information about each of four options. A second group, given several minutes to analyze the information, made slightly smarter decisions. But wisest of all, in study after study, was the third group, whose attention was distracted for a time, enabling their minds to engage in automatic, unconscious processing of the complex information. Critics of this research remind us that deliberate, conscious thought also is part of smart thinking (González-Vallejo et al., 2008; Lassiter et al., 2009; Newell et al., 2008; Payne et al., 2008). Nevertheless,

Analysis frozen into habit In 1998, World Checkers Champion Ron “Suki” King of Barbados set a new record by simultaneously playing 385 players in 3 hours and 44 minutes. Thus, while his opponents often had hours to plot their game moves, King could only devote about 35 seconds to each game. Yet he still managed to win all 385 games!



Chick sexing When acquired expertise becomes an automatic habit, as it is for experienced chicken sexers, it feels like intuition. At a glance, they just know, yet cannot easily tell you how they know.



Jean-Philippe Ksiązek/AFP

letting a problem “incubate” while we attend to other things can pay dividends (Sio & Ormerod, 2009). Facing a difficult decision involving lots of facts, we’re wise to gather all the information we can, and then say, “Give me some time *not* to think about this.” By taking time to sleep on it, we let our unconscious mental machinery work on, and await, the intuitive result of this automatic processing.

The bottom line: Our two-track mind makes sweet harmony as smart, critical thinking listens to the creative whispers of our vast unseen mind and then evaluates evidence, tests conclusions, and plans for the future.

Thinking Creatively



9-5: What is creativity, and what fosters it?

Creativity is the ability to produce ideas that are both novel and valuable (Hennessey & Amabile, 2010). Consider Princeton mathematician Andrew Wiles’ incredible, creative moment. Pierre de Fermat, a seventeenth-century mischievous genius, had challenged mathematicians of his day to match his solutions to various number theory problems. His most famous challenge—*Fermat’s last theorem*—baffled the greatest mathematical minds, even after a \$2 million prize (in today’s dollars) was offered in 1908 to whoever first created a proof.

Wiles had pondered Fermat’s theorem for more than 30 years and had come to the brink of a solution. One morning, out of the blue, the final “incredible revelation” struck him. “It was so indescribably beautiful; it was so simple and so elegant. I couldn’t understand how I’d missed it. . . . It was the most important moment of my working life” (Singh, 1997, p. 25).

Creativity like Wiles’ is supported by a certain level of *aptitude* (ability to learn). Those who score exceptionally high in quantitative aptitude as 13-year-olds, for example, are more likely to obtain graduate science and math degrees and create published or patented work (Park et al., 2008; Robertson et al., 2010). But creativity is more than school smarts, and it requires a different kind of thinking:

- Aptitude tests, such as the SAT, demand a single correct answer. They require **convergent thinking**.
- Creativity tests (*How many uses can you think of for a brick?*) require expansive, **divergent thinking**.

Robert Sternberg and his colleagues believe creativity has five components (Sternberg, 1988, 2003; Sternberg & Lubart, 1991, 1992):

1. **Expertise**—a well-developed base of knowledge—furnishes the ideas, images, and phrases we use as mental building blocks. “Chance favors only the prepared mind,”

creativity the ability to produce novel and valuable ideas.

convergent thinking narrows the available problem solutions to determine the single best solution.

divergent thinking expands the number of possible problem solutions (creative thinking that diverges in different directions).

observed Louis Pasteur. The more blocks we have, the more chances we have to combine them in novel ways. Wiles' well-developed base of knowledge put the needed theorems and methods at his disposal.

2. **Imaginative thinking skills** provide the ability to see things in novel ways, to recognize patterns, and to make connections. Having mastered a problem's basic elements, we redefine or explore it in a new way. Copernicus first developed expertise regarding the solar system and its planets, and then creatively defined the system as revolving around the Sun, not the Earth. Wiles' imaginative solution combined two partial solutions.
3. **A venturesome personality** seeks new experiences, tolerates ambiguity and risk, and perseveres in overcoming obstacles. Wiles said he labored in near-isolation from the mathematics community partly to stay focused and avoid distraction. Such determination is an enduring trait. As girls, notably creative women were typically "intelligent, hard working, imaginative, and strong willed," noted Sally Reis (2001).
4. **Intrinsic motivation** is being driven more by interest, satisfaction, and challenge than by external pressures (Amabile & Hennessey, 1992). Creative people focus less on extrinsic motivators—meeting deadlines, impressing people, or making money—than on the pleasure and stimulation of the work itself. Asked how he solved such difficult scientific problems, Isaac Newton reportedly answered, "By thinking about them all the time." Wiles concurred: "I was so obsessed by this problem that . . . I was thinking about it all the time—[from] when I woke up in the morning to when I went to sleep at night" (Singh & Riber, 1997).
5. **A creative environment** sparks, supports, and refines creative ideas. Wiles stood on the shoulders of others and collaborated with a former student. After studying the careers of 2026 prominent scientists and inventors, Dean Keith Simonton (1992) noted that the most eminent were mentored, challenged, and supported by their colleagues. Creativity-fostering environments support innovation, team building, and communication (Hülshager et al., 2009). They also support contemplation. After Jonas Salk solved a problem that led to the polio vaccine while in a monastery, he designed the Salk Institute to provide contemplative spaces where scientists could work without interruption (Sternberg, 2006).

For those seeking to boost the creative process, see *Close-Up: Fostering Your Own Creativity*.

CLOSE UP:

Fostering Your Own Creativity

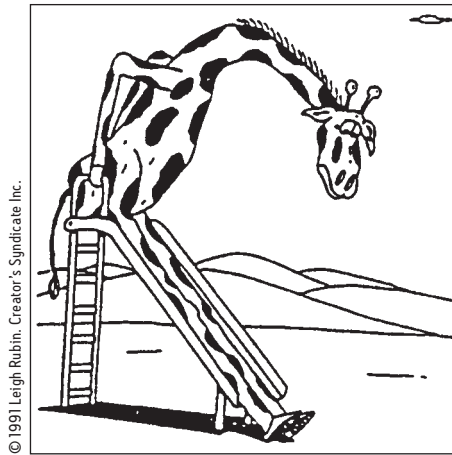
Creative achievement springs from creativity-spawning persons and situations. To grow your own creativity,

- **develop your expertise.** Ask yourself what you care about and most enjoy. Follow your passion and become an expert at something.
- **allow time for incubation.** Given sufficient knowledge available for novel connections, a period of inattention to a problem ("sleeping on it") allows for unconscious processing to form associations (Zhong et al., 2008). So think hard on a problem, then set it aside and come back to it later.
- **set aside time for the mind to roam freely.** Take time away from attention-absorbing television, social networking, and video gaming. Jog, go for a long walk, or meditate.
- **experience other cultures and ways of thinking.** Living abroad sets the creative juices flowing. Even after controlling for other variables, students who have spent time abroad are more adept at working out creative solutions to problems (Leung et al., 2008; Maddux et al., 2009, 2010). Multicultural experiences expose us to multiple perspectives and facilitate flexible thinking.



A creative environment.

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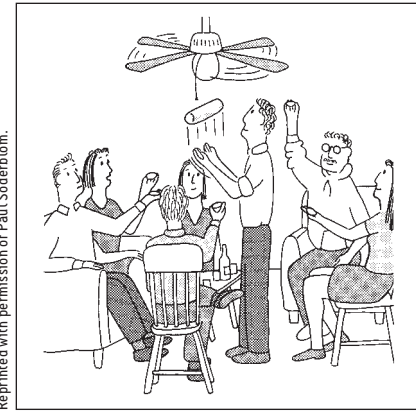
© 1991 Leigh Rubin. Creator's Syndicate Inc.

Imaginative thinking Cartoonists often display creativity as they see things in new ways or make unusual connections.



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“For the love of God, is there a doctor in the house?”



Reprinted with permission of Paul Soderblom.

Everyone held up their crackers as David threw the cheese log into the ceiling fan.

RETRIEVE IT

- Match the process or strategy listed below (1–10) with the descriptions.

- | | | |
|---------------|----------------------|------------------------|
| 1. Algorithm | 5. Fixation | 8. Framing |
| 2. Intuition | 6. Confirmation bias | 9. Belief perseverance |
| 3. Insight | 7. Overconfidence | 10. Creativity |
| 4. Heuristics | | |

- Inability to view problems from a new angle; focuses thinking but hinders creative problem solving.
- Methodical rule or procedure that guarantees the solution but requires time and effort.
- Fast, automatic, effortless feelings and thoughts based on our experience; huge and adaptive but can lead us to overfeel and underthink.
- Simple thinking shortcuts that allow us to act quickly and efficiently but put us at risk for errors.
- Sudden Aha! reaction that provides instant realization of the solution.
- Tendency to search for support for our own views and ignore contradictory evidence.
- Ignoring evidence that proves our beliefs are wrong; closes our mind to new ideas.
- Overestimating the accuracy of our beliefs and judgments; allows us to be happy and to make decisions easily, but puts us at risk for errors.
- Wording a question or statement so that it evokes a desired response; can influence others' decisions and produce a misleading result.
- The ability to produce novel and valuable ideas.

ANSWERS: 1. b, 2. c, 3. e, 4. d, 5. a, 6. f, 7. h, 8. i, 9. g, 10. j

Do Other Species Share Our Cognitive Skills?



9-6: What do we know about animal thinking?

Animals are smarter than we often realize. As the pioneering psychologist Margaret Floy Washburn explained in her 1908 book, *The Animal Mind*, animal consciousness and intelligence can be inferred from their behavior.

Using Concepts and Numbers Even pigeons—mere birdbrains—can sort objects (pictures of cars, cats, chairs, flowers) into categories, or concepts. Shown a picture of a never-before-seen chair, the pigeon will reliably peck a key that represents *chairs*

(Wasserman, 1995). The great apes also form concepts, such as *cat* and *dog*. After monkeys have learned these concepts, certain frontal lobe neurons in their brain fire in response to new “catlike” images, others to new “doglike” images (Freedman et al., 2001).

Until his death in 2007, Alex, an African Grey parrot, categorized and named objects (Pepperberg, 2006, 2009). Among his jaw-dropping numerical skills was the ability to comprehend numbers up to 6. He could speak the number of objects. He could add two small clusters of objects and announce the sum. He could indicate which of two numbers was greater. And he gave correct answers when shown various groups of objects. Asked, for example, “What color four?” (meaning “What’s the color of the objects of which there are four?”), he could speak the answer.



Life on white/Alamy

Displaying Insight Psychologist Wolfgang Köhler (1925) showed that we are not the only creatures to display insight. He placed a piece of fruit and a long stick outside the cage of a chimpanzee named Sultan, beyond his reach. Inside the cage, he placed a short stick, which Sultan grabbed, using it to try to reach the fruit. After several failed attempts, he dropped the stick and seemed to survey the situation. Then suddenly, as if thinking “Aha!” Sultan jumped up and seized the short stick again. This time, he used it to pull in the longer stick—which he then used to reach the fruit. Apes have even exhibited foresight by storing a tool they could use to retrieve food the next day (Mulcahy & Call, 2006).

Using Tools and Transmitting Culture Like humans, many other species invent behaviors and transmit cultural patterns to their peers and offspring (Boesch-Achermann & Boesch, 1993). Forest-dwelling chimpanzees select different tools for different purposes—a heavy stick for making holes, a light, flexible stick for fishing for termites (Sanz et al., 2004). They break off the reed or stick, strip off any leaves, carry it to a termite mound, twist it just so, and carefully remove it. Termites for lunch! (This is very reinforcing for a chimpanzee.) One anthropologist, trying to mimic the animal’s deft fishing moves, failed miserably.

Researchers have found at least 39 local customs related to chimpanzee tool use, grooming, and courtship (Whiten & Boesch, 2001). One group may slurp termites directly from a stick, another group may pluck them off individually. One group may break nuts with a stone hammer, another with a wooden hammer. These group differences, along with differing communication and hunting styles, are the chimpanzee version of cultural diversity.

Other animals have also shown surprising cognitive talents (**FIGURE 9.7** on the next page). In tests, elephants have demonstrated self-awareness and displayed their abilities to learn, remember, discriminate smells, empathize, cooperate, teach, and spontaneously use tools (Byrne et al., 2009). As social creatures, chimpanzees have shown altruism, cooperation, and group aggression. Like humans, they will kill their neighbor to gain land, and they grieve over dead relatives (Anderson et al., 2010; Biro et al., 2010; Mitani et al., 2010).

There is no question that other species display many remarkable cognitive skills. But one big question remains: Do they, like humans, exhibit language? First, let’s consider what language is, and how it develops.



Johan Swanepoel/Alamy

FIGURE 9.7

Tool-using animals (a) New Caledonian crows studied by Christopher Bird and Nathan Emery (2009) quickly learned to raise the water level in a tube and nab a floating worm by dropping stones into the water. Other crows have used twigs to probe for insects, and bent strips of metal to reach food. (b) One male chimpanzee in Sweden's Furuvik Zoo was observed every morning collecting stones into a neat little pile, which later in the day he used as ammunition to pelt visitors (Osvath, 2009). (c) Dolphins form coalitions, cooperatively hunt, and learn tool use from one another (Bearzi & Stanford, 2010). This bottlenose dolphin in Shark Bay, Western Australia, belongs to a small group that uses marine sponges as protective nose guards when probing the sea floor for fish (Krützen et al., 2005).



Chris Bird & Nathan Emery

(a)



Mathias Osvath

(b)



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Language

Imagine an alien species that could pass thoughts from one head to another merely by pulsating air molecules in the space between them. Perhaps these weird creatures could inhabit a future Spielberg movie?

Actually, we are those creatures. When we speak, our brain and voice apparatus conjure up air-pressure waves that we send banging against another's eardrum—enabling us to transfer thoughts from our brain into theirs. As cognitive scientist Steven Pinker (1998) has noted, we sometimes sit for hours “listening to other people make noise as they exhale, because those hisses and squeaks contain *information*.” And thanks to all those funny sounds created in our heads from the air-pressure waves we send out, we get people's attention, we get them to do things, and we maintain relationships (Guerin, 2003). Depending on how you vibrate the air after opening your mouth, you may get slapped or kissed.

But **language** is more than vibrating air. As I create this paragraph, my fingers on a keyboard generate electronic binary numbers that are translated into the squiggles in front of you. When transmitted by reflected light rays into your retina, those squiggles trigger formless nerve impulses that project to several areas of your brain, which integrate the information, compare it to stored information, and decode meaning. Thanks to language, information is moving from my mind to yours. Monkeys mostly know what they see. Thanks to language (spoken, written, or signed), we comprehend much that we've never seen and that our distant ancestors never knew.

If you were able to retain only one cognitive ability, make it language, suggests researcher Lera Boroditsky (2009). Without sight or hearing, you could still have friends, family, and a job. But without language, could you have these things? “Language is so fundamental to our experience, so deeply a part of being human, that it's hard to imagine life without it.”

Language Structure



9-7: What are the structural components of a language?

Consider how we might go about inventing a language. For a spoken language, we would need three building blocks:

language our spoken, written, or signed words and the ways we combine them to communicate meaning.

phoneme in a language, the smallest distinctive sound unit.

morpheme in a language, the smallest unit that carries meaning; may be a word or a part of a word (such as a prefix).

grammar in a language, a system of rules that enables us to communicate with and understand others. In a given language, *semantics* is the set of rules for deriving meaning from sounds, and *syntax* is the set of rules for combining words into grammatically sensible sentences.

- **Phonemes** are the smallest distinctive sound units in a language. To say *bat*, English speakers utter the phonemes *b*, *a*, and *t*. (Phonemes aren't the same as letters. *Chat* also has three phonemes—*ch*, *a*, and *t*.) Linguists surveying nearly 500 languages have identified 869 different phonemes in human speech, but no language uses all of them (Holt, 2002; Maddieson, 1984). English uses about 40; other languages use anywhere from half to more than twice that many. As a general rule, consonant phonemes carry more information than do vowel phonemes. *The treth of thes stetemet shed be evedent from thes bref demenstretien.*
- **Morphemes** are the smallest units that carry meaning in a given language. In English, a few morphemes are also phonemes—the personal pronoun *I* and the article *a*, for instance. But most morphemes combine two or more phonemes. Some, like *bat*, are words. Others—like the prefix *pre-* in *preview* or the suffix *-ed* in *adapted*—are parts of words.
- **Grammar** is the system of rules that enables us to communicate with one another. Grammatical rules guide us in deriving meaning from sounds (*semantics*) and in ordering words into sentences (*syntax*).

Like life constructed from the genetic code's simple alphabet, language is complexity built of simplicity. In English, for example, 40 or so phonemes can be combined to form more than 100,000 morphemes, which alone or in combination produce the 616,500 word forms in the *Oxford English Dictionary*. Using those words, we can then create an infinite number of sentences, most of which (like this one) are original.

RETRIEVE IT

- How many morphemes are in the word *cats*? How many phonemes?

ANSWERS: Two morphemes—*cat* and *s*, and four phonemes—*c*, *a*, *t*, and *s*



"Let me get this straight now. Is what you want to build a jean factory or a gene factory?"

From *The Wall Street Journal*—permission Cartoon Features Syndicate.

Language Development

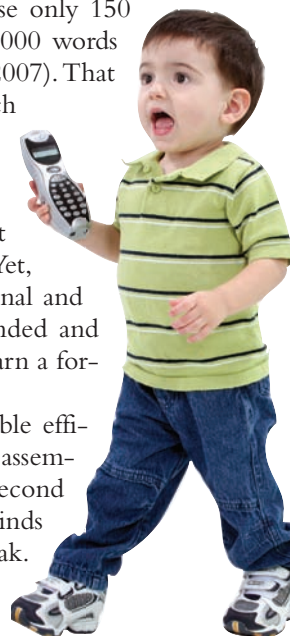


9-8: What are the milestones in language development, and how do we acquire language?

Make a quick guess: How many words did you learn during the years between your first birthday and your high school graduation? Although you use only 150 words for about half of what you say, you probably learned about 60,000 words in your native language during those years (Bloom, 2000; McMurray, 2007). That averages (after age 2) to nearly 3500 words each year, or nearly 10 each day! How you did it—how those 3500 words could so far outnumber the roughly 200 words your schoolteachers consciously taught you each year—is one of the great human wonders.

Could you even state all your language's rules of syntax (the correct way to string words together to form sentences)? Most of us cannot. Yet, before you were able to add $2 + 2$, you were creating your own original and grammatically appropriate sentences. As a preschooler, you comprehended and spoke with a facility that puts to shame college students struggling to learn a foreign language.

We humans have an astonishing facility for language. With remarkable efficiency, we sample tens of thousands of words in our memory, effortlessly assemble them with near-perfect syntax, and spew them out, three words a second (Vigliocco & Hartsuiker, 2002). Seldom do we form sentences in our minds before speaking them. Rather we organize them on the fly as we speak. And while doing all this, we also adapt our utterances to our social and cultural context. Given how many ways there are to mess up, it's amazing that we can master this social dance. So when and how does it happen?



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When Do We Learn Language?

Receptive Language Children’s language development moves from simplicity to complexity. Infants start without language (*in fantis* means “not speaking”). Yet by 4 months of age, babies can recognize differences in speech sounds (Stager & Werker, 1997). They can also read lips: They prefer to look at a face that matches a sound, so we know they can recognize that *ah* comes from wide-open lips and *ee* from a mouth with corners pulled back (Kuhl & Meltzoff, 1982). This marks the beginning of the development of babies’ *receptive language*, their ability to understand what is said to and about them. At 7 months and beyond, babies grow in their power to do what you and I find difficult when listening to an unfamiliar language: to segment spoken sounds into individual words.

Productive Language Babies’ *productive language*, their ability to produce words, matures after their receptive language. Before nurture molds their speech, nature enables a wide range of possible sounds in the **babbling stage**, beginning around 4 months of age. Many of these spontaneously uttered sounds are consonant-vowel pairs formed by simply bunching the tongue in the front of the mouth (*da-da, na-na, ta-ta*) or by opening and closing the lips (*ma-ma*), both of which babies do naturally for feeding (MacNeilage & Davis, 2000). Babbling is not an imitation of adult speech—it includes sounds from various languages, including those not spoken in the household. From this early babbling, a listener could not identify an infant as being, say, French, Korean, or Ethiopian. Deaf infants who observe their deaf parents signing begin to babble more with their hands (Petitto & Marentette, 1991).

By the time infants are about 10 months old, their babbling has changed so that a trained ear can identify the household language (de Boysson-Bardies et al., 1989). Without exposure to other languages, babies lose their ability to hear and produce sounds and tones found outside their native language (Meltzoff et al., 2009; Pallier et al., 2001). Thus, by adulthood, those who speak only English cannot discriminate certain sounds in Japanese speech. Nor can Japanese adults with no training in English hear the difference between the English *r* and *l*. For a Japanese-speaking adult, *la-la-ra-ra* may sound like the same syllable repeated.

Around their first birthday, most enter the **one-word stage**. They have already learned that sounds carry meanings, and if repeatedly trained to associate, say, *fish* with a picture of a fish, 1-year-olds will look at a fish when a researcher says, “Fish, fish! Look at the fish!” (Schafer, 2005). They now begin to use sounds—usually only one barely recognizable syllable, such as *ma* or *da*—to communicate meaning. But family members quickly learn to understand, and gradually the infant’s language conforms more to the family’s language. Across the world, baby’s first words are often nouns that label objects or people (Tardif et al., 2008). At this one-word stage, a single inflected word (“*Doggy!*”) may equal a sentence. (“*Look at the dog out there!*”)

At about 18 months, children’s word learning explodes from about a word per week to a word per day. By their second birthday, most have entered the **two-word stage** (TABLE 9.1). They start uttering two-word sentences in **telegraphic speech**.



© 1994 by Sidney Harris.

“Got idea. Talk better. Combine words.
Make sentences.”

babbling stage beginning at about 4 months, the stage of speech development in which the infant spontaneously utters various sounds at first unrelated to the household language.

one-word stage the stage in speech development, from about age 1 to 2, during which a child speaks mostly in single words.

two-word stage beginning about age 2, the stage in speech development during which a child speaks mostly in two-word statements.

telegraphic speech early speech stage in which a child speaks like a telegram—“go car”—using mostly nouns and verbs.

Table 9.1
Summary of Language Development

Month (approximate)	Stage
4	Babbles many speech sounds (“Ah-goo”).
10	Babbling resembles household language (“Ma-ma”).
12	One-word stage (“Kitty!”).
24	Two-word, telegraphic speech (“Get ball.”).
24+	Language develops rapidly into complete sentences.

Like today's texts or yesterday's telegrams that charged by the word (TERMSACCEPTED. SEND MONEY), a 2-year-old's speech contains mostly nouns and verbs (“Want juice”). (Children recognize noun-verb differences—as shown by their responses to a misplaced noun or verb—earlier than they utter sentences with nouns and verbs [Bernal et al., 2010].) Also like telegrams, a 2-year-old's speech follows rules of syntax, arranging words in a sensible order. English-speaking children typically place adjectives before nouns—*white house* rather than *house white*. Spanish reverses this order, as in *casa blanca*.

Moving out of the two-word stage, children quickly begin uttering longer phrases (Fromkin & Rodman, 1983). If they get a late start on learning a particular language, such as after receiving a cochlear implant or being adopted by a family in another country, their language development still proceeds through the same sequence, although usually at a faster pace (Ertmer et al., 2007; Snedeker et al., 2007). By early elementary school, children understand complex sentences and begin to enjoy the humor conveyed by double meanings: “You never starve in the desert because of all the sand-which-is there.”

RETRIEVE IT

- What is the difference between *receptive* and *productive* language, and when do children normally hit these milestones in language development?

ANSWER: Infants normally start developing *receptive* language skills (ability to understand what is said to and about them) around 4 months of age. Then, starting with babbling at 4 months and beyond, infants normally start building *productive* language skills (ability to produce sounds and eventually words).

Explaining Language Development

The world's 7000 or so languages are structurally very diverse (Evans & Levinson, 2009). Behaviorist B. F. Skinner (1957) believed we can explain this diversity with familiar learning principles, such as *association* (of the sights of things with the sounds of words); *imitation* (of the words and syntax modeled by others); and *reinforcement* (with smiles and hugs when the child says something right). Linguist Noam Chomsky has argued that all languages nonetheless share some basic elements, which he calls *universal grammar*. All human languages, for example, have nouns, verbs, and adjectives as grammatical building blocks. Moreover, said Chomsky, we humans are born with a built-in predisposition to learn grammar rules, which helps explain why preschoolers pick up language so readily and use grammar so well. It happens so naturally—as naturally as birds learn to fly—that training hardly helps.

We are not, however, born with a built-in *specific* language. Europeans and Native Australia–New Zealand populations, though geographically separated for 50,000 years, can readily learn each others' languages (Chater et al., 2009). And whatever language we experience as children, whether spoken or signed, we all readily learn its specific grammar and vocabulary (Bavelier et al., 2003). But no matter what language we learn, we start speaking it mostly in nouns (*kitty*, *da-da*) rather than in verbs and adjectives (Bornstein et al., 2004). Biology and experience work together.

Critical Periods Childhood seems to represent a *critical* (or “sensitive”) *period* for mastering certain aspects of language before the language-learning window closes (Hernandez & Li, 2007). People who learn a second language as adults usually speak it with the accent of their native language, and they also have difficulty mastering the new grammar. In one experiment, Korean and Chinese immigrants considered 276 English sentences (“Yesterday the hunter shoots a deer”) and decided whether they were grammatically correct or incorrect (Johnson & Newport, 1991). All had been in the United States for approximately 10 years: Some had arrived in early childhood, others as adults. As **FIGURE 9.8** on the next page reveals, those who learned their second language early learned it best. The older one is when moving to a new country, the harder it will be to learn its language and to absorb its culture (Cheung et al., 2011; Hakuta et al., 2003).

Creating a language Brought together as if on a desert island (actually a school), Nicaragua's young deaf children over time drew upon sign gestures from home to create their own Nicaraguan Sign Language, complete with words and intricate grammar. Our biological predisposition for language does not create language in a vacuum. But activated by a social context, nature and nurture work creatively together (Osborne, 1999; Sandler et al., 2005; Senghas & Coppola, 2001).



Susan Meiselas/Magnum Photos

“Childhood is the time for language, no doubt about it. Young children, the younger the better, are good at it; it is child's play. It is a onetime gift to the species.”

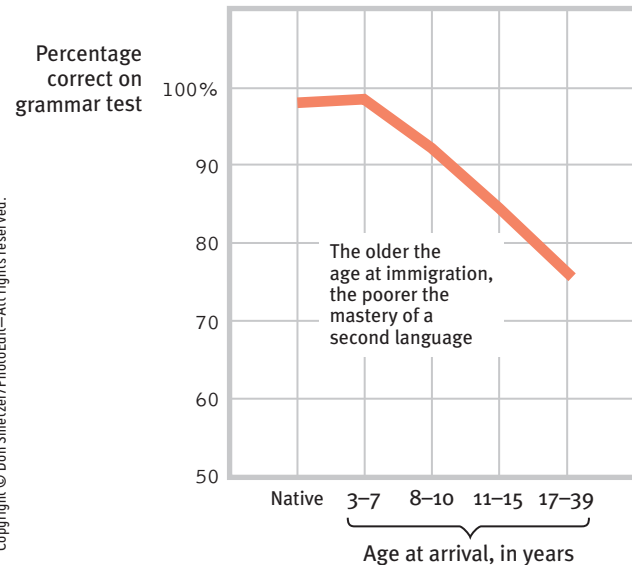
Lewis Thomas, *The Fragile Species*, 1992

FIGURE 9.8**Our ability to learn a new language diminishes with age**

Ten years after coming to the United States, Asian immigrants took an English grammar test. Although there is no sharply defined critical period for second language learning, those who arrived before age 8 understood American English grammar as well as native speakers did. Those who arrived later did not. (From Johnson & Newport, 1991.)



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George Ancona

“Don’t” means “don’t”—no matter how you say it! Deaf children of deaf-signing parents and hearing children of hearing parents have much in common. They develop language skills at about the same rate, and they are equally effective at opposing parental wishes and demanding their way.

aphasia impairment of language, usually caused by left-hemisphere damage either to Broca’s area (impairing speaking) or to Wernicke’s area (impairing understanding).

Broca’s area controls language expression—an area of the frontal lobe, usually in the left hemisphere, that directs the muscle movements involved in speech.

Wernicke’s area controls language reception—a brain area involved in language comprehension and expression; usually in the left temporal lobe.

The window on language learning closes gradually in early childhood. Later-than-usual exposure to language (at age 2 or 3) unleashes the idle language capacity of a child’s brain, producing a rush of language. But by about age 7, those who have not been exposed to either a spoken or a signed language gradually lose their ability to master *any* language.

The impact of early experiences is evident in language learning in the 90+ percent of prelingually deaf children born to hearing-nonsigning parents. These children typically do not experience language during their early years. Natively deaf children who learn sign language after age 9 never learn it as well as those who lose their hearing at age 9 after learning a spoken language such as English. They also never learn English as well as other natively deaf children who learned sign in infancy (Mayberry et al., 2002). Those who learn to sign as teens or adults are like immigrants who learn English after childhood: They can master basic words and learn to order them, but they never become as fluent as native signers in producing and comprehending subtle grammatical differences (Newport, 1990). As a flower’s growth will be stunted without nourishment, so, too, children will typically become linguistically stunted if isolated from language during the critical period for its acquisition.

RETRIEVE IT

- What was the basic disagreement in B. F. Skinner’s and Noam Chomsky’s explanations of language development?

ANSWER: Skinner believed humans learn language as we learn other behaviors—through association, imitation, and reinforcement. Chomsky maintained that all languages share a universal grammar, and humans are biologically predisposed to learn the grammar rules of language.

- Why is it so difficult to learn a new language in adulthood?

ANSWER: Our brain’s critical period for language learning is in childhood, when we can absorb language structure almost effortlessly. As we move past that stage in our brain’s development, our ability to learn a new language diminishes dramatically.

The Brain and Language**9-9: What brain areas are involved in language processing and speech?**

We think of speaking and reading, or writing and reading, or singing and speaking as merely different examples of the same general ability—language. But consider this curious finding: **Aphasia**, an impairment of language, can result from damage to any of several cortical areas. Even more curious, some people with aphasia

can speak fluently but cannot read (despite good vision), while others can comprehend what they read but cannot speak. Still others can write but not read, read but not write, read numbers but not letters, or sing but not speak. These cases suggest that language is complex, and that different brain areas must serve different language functions.

Indeed, in 1865, French physician Paul Broca reported that after damage to an area of the left frontal lobe (later called **Broca's area**) a person would struggle to *speak* words while still being able to sing familiar songs and comprehend speech.

In 1874, German investigator Carl Wernicke discovered that after damage to an area of the left temporal lobe (**Wernicke's area**) people could speak only meaningless words. Asked to describe a picture that showed two boys stealing cookies behind a woman's back, one patient responded: "Mother is away her working her work to get her better, but when she's looking the two boys looking the other part. She's working another time" (Geschwind, 1979). Damage to Wernicke's area also disrupts understanding.

Today's neuroscience has confirmed brain activity in Broca's and Wernicke's areas during language processing (**FIGURE 9.9**). But language functions are distributed across other brain areas as well. Functional MRI scans show that what you experience as a continuous, indivisible stream of experience—language—is actually but the visible tip of a subdivided information-processing iceberg. Different neural networks are activated by nouns and verbs (or objects and actions); by different vowels; and by reading stories of visual versus motor experiences (Shapiro et al., 2006; Speer et al., 2009). If you are bilingual, the neural networks that enable your native language differ from those that enable your second language (Perani & Abutalebi, 2005).

The big point to remember: In processing language, as in other forms of information processing, *the brain operates by dividing its mental functions—speaking, perceiving, thinking, remembering—into subfunctions.* Your conscious experience of reading this page *seems* indivisible, but you are engaging many different neural networks in your brain to compute each word's form, sound, and meaning (Posner & Carr, 1992). We saw this also in Chapter 6, in the discussion of vision, as the brain engaged in specialized visual subtasks (discerning color, depth, movement, and form).

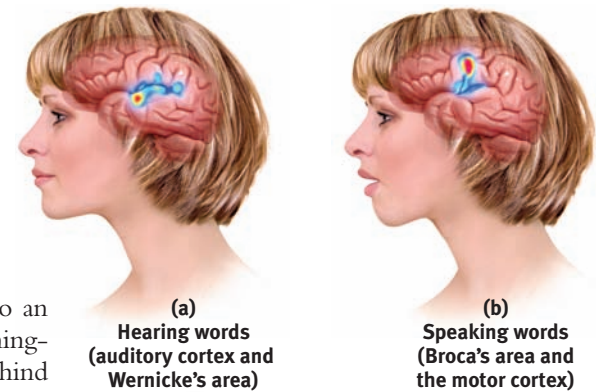


FIGURE 9.9

Brain activity when hearing and speaking words

"It is the way systems interact and have a dynamic interdependence that is—unless one has lost all sense of wonder—quite awe-inspiring."

Simon Conway Morris,
"The Boyle Lecture," 2005

RETRIEVE IT

- _____ is the part of the brain that, if damaged, might impair your ability to *speak* words. If you damage _____, you might impair your ability to understand language.

ANSWERS: Broca's area; Wernicke's area

Do Other Species Have Language?



9-10: Do other animals share our capacity for language?

Humans have long and proudly proclaimed that language sets us above all other animals. "When we study human language," asserted Chomsky (1972), "we are approaching what some might call the 'human essence,' the qualities of mind that are, so far as we know, unique [to humans]."

If in our use of language we humans are, as the psalmist long ago rhapsodized, "little lower than God," where, then, do other animals fit in the scheme of things? Are they "little lower than humans"?

Animals display impressive comprehension and communication. Vervet monkeys sound different alarm cries for different predators: a barking call for a leopard, a cough for an eagle, and a chattering for a snake. Hearing the leopard alarm, other vervets climb the nearest tree. Hearing the eagle alarm, they rush into the bushes. Hearing the snake chutter, they stand up and scan the ground (Byrne, 1991). To indicate such things as

a type of threat—an eagle, leopard, falling tree, or neighboring group—monkeys will combine 6 different calls into a 25-call sequence (Balter, 2010). But is this language? This question has launched many studies with chimpanzees.

In the late 1960s, psychologists Allen Gardner and Beatrix Gardner (1969) aroused enormous scientific and public interest when they built on chimpanzees' natural tendencies for gestured communication and taught sign language to a chimpanzee named Washoe (c. 1965–2007). After four years, Washoe could use 132 signs; by her life's end, she was using 245 signs (Metzler et al., 2010; Sanz et al., 1998).

During the 1970s, as more and more reports came in, it seemed apes might indeed be “little lower than human” (FIGURE 9.10). One *New York Times* reporter, having learned sign language from his deaf parents, visited Washoe and exclaimed, “Suddenly I realized I was conversing with a member of another species in my native tongue.” Some chimpanzees strung signs together to form sentences. Washoe, for example, signed “You me go out, please.” Some word combinations seemed very creative—saying *water bird* for “swan” or *apple-which-is-orange* for “orange” (Patterson, 1978; Rumbaugh, 1977).

By the late 1970s, some psychologists were growing skeptical. Were the chimps language champs or were the researchers chumps? Consider, said the skeptics:

- Ape vocabularies and sentences are simple, rather like those of a 2-year-old child. And unlike speaking or signing children, who easily soak up dozens of new words a week (and 60,000 by adulthood), apes gain their limited vocabularies only with great difficulty (Wynne, 2004, 2008). Saying that apes can learn language because they can sign words is like saying humans can fly because they can jump.
- Chimpanzees can make signs or push buttons in sequence to get a reward. But pigeons, too, can peck a sequence of keys to get grain (Straub et al., 1979). The apes' signing might be nothing more than aping their trainers' signs and learning that certain arm movements produce rewards (Terrace, 1979).
- Studies of perceptual set (Chapter 6) show that when information is unclear, we tend to see what we want or expect to see. Interpreting chimpanzee signs as language may be little more than the trainers' wishful thinking (Terrace, 1979). When Washoe signed *water bird*, she may have been separately naming *water* and *bird*.
- “Give orange me give eat orange me eat orange . . .” is a far cry from the exquisite syntax of a 3-year-old (Anderson, 2004; Pinker, 1995). To the child, “You tickle” and “Tickle you” communicate different ideas. A chimpanzee, lacking human syntax, might use the same sequence of signs for both phrases.

Controversy can stimulate progress, and in this case, it triggered more evidence of chimpanzees' abilities to think and communicate. One surprising finding was that Washoe trained her adopted son Loulis to use the signs she had learned. After her second infant died, Washoe became withdrawn when told, “Baby dead, baby gone, baby finished.” Two weeks later, researcher caretaker Roger Fouts (1992, 1997) signed

FIGURE 9.10

Talking hands Chimpanzees' use of sign language builds upon their natural gestured words (such as a hand extended for “I want some”). Among wild chimpanzees, researchers have identified 66 distinct gestures (Hobaiter & Byrne, 2011). Human language appears to have evolved from such gestured communications (Corballis, 2002, 2003; Pollick & de Waal, 2007). Even today, gestures are naturally associated with spontaneous speech, especially speech that has spatial content. Both gesture and speech communicate, and when they convey the same rather than different information (as they do in baseball's sign language), we humans understand faster and more accurately (Hostetter, 2011; Kelly et al., 2010). Outfielder William Hoy, the first deaf player to join the major leagues (1892), invented hand signals for “Strike!” “Safe!” (shown here) and “Yerr Out!” (Pollard, 1992). Referees in all sports now use invented signs, and fans are fluent in sports sign language.



better news: “I have baby for you.” Washoe reacted with instant excitement. Hair on end, she swaggered and panted while signing over and again, “Baby, my baby.” It took several hours for the foster mom and infant to warm to each other, but then Washoe broke the ice by signing, “Come baby” and cuddling Loulis. In the months that followed, Loulis, without human assistance, picked up 68 signs, simply by observing Washoe and three other language-trained chimps signing together.

Even more stunning was a report that Kanzi, a bonobo with a reported 384-word vocabulary, could understand syntax in spoken English (Savage-Rumbaugh et al., 1993, 2009). Kanzi has responded appropriately when asked, “Can you show me the light?” and “Can you bring me the [flash]light?” and “Can you turn the light on?” Given stuffed animals and asked—for the first time—to “make the dog bite the snake,” he put the snake to the dog’s mouth.

So, how should we interpret these studies? Are humans the only language-using species? If by *language* we mean verbal or signed expression of complex grammar, most psychologists would now agree that humans alone possess language. If we mean, more simply, an ability to communicate through a meaningful sequence of symbols, then apes are indeed capable of language.

One thing is certain: Studies of animal language and thinking have moved psychologists toward a greater appreciation of other species, not only for the traits we share with them but also for their own remarkable abilities. In the past, many psychologists doubted that other species could plan, form concepts, count, use tools, show compassion, or use language (Thorpe, 1974). Today, thanks to animal researchers, we know better. It’s true that humans alone are capable of complex sentences. Moreover, 2½-year-old children display some cognitive abilities, such as following an actor’s gaze to a target, that are unmatched even by chimpanzees (Herrmann et al., 2010). Nevertheless, other species do exhibit insight, show family loyalty, communicate with one another, care for one another, and transmit cultural patterns across generations. Working out what this means for the moral rights of other animals is an unfinished task.

Returning to our debate about how deserving we humans are of our name *Homo sapiens*, let’s pause to issue an interim report card. On decision making and risk assessment, our error-prone species might rate a C+. On problem solving, where humans are inventive yet vulnerable to foibles such as fixation, we would probably receive a better mark, perhaps a B. On cognitive efficiency and creativity, our fallible but quick heuristics and divergent thinking earn us an A. And when it comes to learning and using language, the awestruck experts would surely award the human species an A+.



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Comprehending canine Border collie Rico has a 200 human-word vocabulary. If asked to retrieve a toy with a name he has never heard, Rico will pick out a new toy from a group of familiar items (Kaminski et al., 2004). Hearing that name for the second time four weeks later, Rico more often than not retrieves the same toy. Another border collie, Chaser, has set an animal record by learning 1022 object names (Pilley & Reid, 2011). Like a 3-year-old child, she can also categorize them by function and shape. She can “fetch a ball” or “fetch a doll.”



Paul Fusco/Magnum Photos

But is this language?

Chimpanzees’ ability to express themselves in American Sign Language (ASL) raises questions about the very nature of language. Here, the trainer is asking, “What is this?” The sign in response is “Baby.” Does the response constitute language?

RETRIEVE IT

- If your dog barks at a stranger at the front door, does this qualify as language? What if the dog yips in a telltale way to let you know she needs to go out?

ANSWER: These are definitely communications. But if language consists of words and the grammatical rules we use to combine them to communicate meaning, few scientists would label a dog’s barking and yipping as language.

linguistic determinism Whorf's hypothesis that language determines the way we think.

Thinking and Language



9-11: What is the relationship between thinking and language, and what is the value of thinking in images?

Thinking and language intricately intertwine. Asking which comes first is one of psychology's chicken-and-egg questions. Do our ideas come first and we wait for words to name them? Or are our thoughts conceived in words and therefore unthinkable without them?

Language Influences Thinking

Linguist Benjamin Lee Whorf (1956) contended that language *determines* the way we think: "Language itself shapes a [person's] basic ideas." The Hopi, who have no past tense for their verbs, could not readily *think* about the past, said Whorf.

Whorf's **linguistic determinism** hypothesis is too extreme. We all think about things for which we have no words. (Can you think of a shade of blue you cannot name?) And we routinely have *unsymbolized* (wordless, imageless) thoughts, as when someone, while watching two men carry a load of bricks, wondered whether the men would drop them (Heavey & Hurlburt, 2008; Hurlburt & Akhter, 2008).

Nevertheless, to many who speak two dissimilar languages, such as English and Japanese, it seems obvious that a person may think differently in different languages (Brown, 1986). Unlike English, which has a rich vocabulary for self-focused emotions such as anger, Japanese has more words for interpersonal emotions such as sympathy (Markus & Kitayama, 1991). Many bilingual individuals report that they have different senses of self, depending on which language they are using (Matsumoto, 1994). In one series of studies with bilingual Israeli Arabs (who speak both Arabic and Hebrew), participants thought differently about their social world, with differing automatic associations with Arabs and Jews, depending on which language the testing session used (Danziger & Ward, 2010).

Bilingual individuals have even revealed different personality profiles when taking the same test in their two languages, as happened when China-born, bilingual University of Waterloo students were asked to describe themselves in English or Chinese (Dinges & Hull, 1992; Ross et al., 2002). The students' English-language self-descriptions fit typical Canadian profiles: They expressed mostly positive self-statements and moods. Responding in Chinese, the same students gave typically Chinese self-descriptions: They reported more agreement with Chinese values and roughly equal positive and negative self-statements and moods. Similar personality changes have been shown when bicultural, bilingual Americans and Mexicans shifted between the cultural frames associated with English and Spanish (Ramírez-Esparza et al., 2006). "Learn a new language and get a new soul," says a Czech proverb.

Our words may not *determine* what we think, but they do *influence* our thinking (Boroditsky, 2011). We use our language in forming categories. In Brazil, the isolated Piraha people have words for the numbers 1 and 2, but numbers above that are simply "many." Thus, if shown 7 nuts in a row, they find it very difficult to lay out the same number from their own pile (Gordon, 2004).

Words also influence our thinking about colors. Whether we live in New Mexico, New South Wales, or New Guinea, we *see* colors much the same, but we use our native language to *classify* and *remember* colors (Davidoff, 2004; Roberson et al., 2004, 2005). Imagine participating in a study in which you view three colors. Two are what Americans call "yellow" and one is "blue." If you speak the language of Papua New Guinea's Berinmo tribe, who have words for two different shades of yellow, you would more speedily perceive and better recall the variations between the two yellows. But if your language is Russian, which

Culture and color In Papua New Guinea, Berinmo children have words for different shades of "yellow," which might enable them to spot and recall yellow variations more quickly. Here and everywhere, "the languages we speak profoundly shape the way we think, the way we see the world, the way we live our lives," notes psychologist Lera Boroditsky (2009).



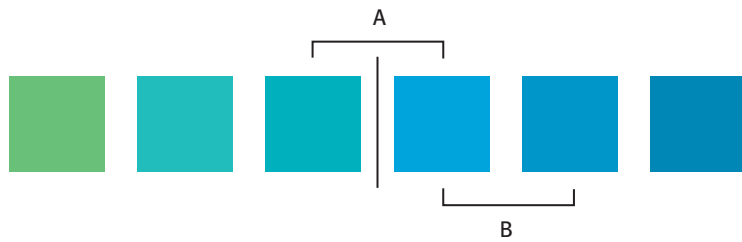


FIGURE 9.11

Language and perception When people view blocks of equally different colors, they perceive those with different names as more different. Thus the “green” and “blue” in contrast A may appear to differ more than the two similarly different “blues” in contrast B (Özgen, 2004).

has distinct names for various shades of blue, such as *goluboy* and *sinly*, you might later recall the yellows as more similar and remember the blue better. Words matter.

Perceived differences grow when we assign different names to colors. On the color spectrum, blue blends into green—until we draw a dividing line between the portions we call “blue” and “green.” Although equally different on the color spectrum, two different items that share the same color name (as the two “blues” do in **FIGURE 9.11**, contrast B) are harder to distinguish than two items with different names (“blue” and “green,” as in Figure 9.11, contrast A) (Özgen, 2004).

Given words’ subtle influence on thinking, we do well to choose our words carefully. Does it make any difference whether I write, “A child learns language as *he* interacts with *his* caregivers” or “Children learn language as *they* interact with *their* caregivers”? Many studies have found that it does. When hearing the generic *he* (as in “the artist and his work”) people are more likely to picture a male (Henley, 1989; Ng, 1990). If *he* and *his* were truly gender free, we shouldn’t skip a beat when hearing that “man, like other mammals, nurses his young.”

To expand language is to expand the ability to think. Young children’s thinking develops hand in hand with their language (Gopnik & Meltzoff, 1986). Indeed, it is very difficult to think about or conceptualize certain abstract ideas (*commitment*, *freedom*, or *rhyming*) without language! And what is true for preschoolers is true for everyone: *It pays to increase your word power*. That’s why most textbooks, including this one, introduce new words—to teach new ideas and new ways of thinking.

Increased word power helps explain what McGill University researcher Wallace Lambert (1992; Lambert et al., 1993) calls the *bilingual advantage*. Although their vocabulary in each language is somewhat smaller than that of people speaking a single language, bilingual people are skilled at inhibiting one language while using the other. And thanks to their well-practiced “executive control” over language, they also are better at inhibiting their attention to irrelevant information (Bialystock & Craik, 2010).

Lambert helped devise a Canadian program that immerses English-speaking children in French. (The number of enrolled non-Quebec children rose from 65,000 in 1981 to 300,000 in 2007 [Statistics Canada, 2010].) For most of their first three years in school, the English-speaking children are taught entirely in French, and thereafter they gradually shift to classes mostly in English. Not surprisingly, the children attain a natural French fluency unrivaled by other methods of language teaching. Moreover, compared with similarly capable children in control groups, they do so without detriment to their English fluency, and with increased aptitude scores, creativity, and appreciation for French-Canadian culture (Genesee & Gándara, 1999; Lazaruk, 2007).

Whether we are in the linguistic minority or majority, language links us to one another. Language also connects us to the past and the future. “To destroy a people, destroy their language,” observed poet Joy Harjo.

Perceived distances between cities also grow when two cities are in different rather than in the same countries or states (Burris & Branscombe, 2005; Mishra & Mishra, 2010).

“All words are pegs to hang ideas on.”

Henry Ward Beecher, Proverbs from Plymouth Pulpit, 1887

RETRIEVE IT

- Benjamin Lee Whorf’s controversial hypothesis, called _____, suggested that we cannot think about things unless we have words for those concepts or ideas.

ANSWER: linguistic determinism

“When we see a person walking down the street talking to himself, we generally assume that he is mentally ill. But we all talk to ourselves continuously—we just have the good sense of keeping our mouths shut. . . . It’s as though we are having a conversation with an imaginary friend possessed of infinite patience. Who are we talking to?”

Sam Harris, “We Are Lost in Thought,” 2011

Thinking in Images

When you are alone, do you talk to yourself? Is “thinking” simply conversing with yourself? Words do convey ideas. But sometimes ideas precede words. To turn on the cold water in your bathroom, in which direction do you turn the handle? To answer, you probably thought not in words but with *implicit* (nondeclarative, procedural) memory—a mental picture of how you do it (see Chapter 8).

Indeed, we often think in images. Artists think in images. So do composers, poets, mathematicians, athletes, and scientists. Albert Einstein reported that he achieved some of his greatest insights through visual images and later put them into words. Pianist Liu Chi Kung showed the value of thinking in images. One year after placing second in the 1958 Tchaikovsky piano competition, Liu was imprisoned during China’s cultural revolution. Soon after his release, after seven years without touching a piano, he was back on tour, the critics judging his musicianship better than ever. How did he continue to develop without practice? “I did practice,” said Liu, “every day. I rehearsed every piece I had ever played, note by note, in my mind” (Garfield, 1986).

For someone who has learned a skill, such as ballet dancing, even *watching* the activity will activate the brain’s internal simulation of it, reported one British research team after taking fMRIs as people watched videos (Calvo-Merino et al., 2004). So, too, will *imagining* a physical experience, which activates some of the same neural networks that are active during the actual experience (Grèzes & Decety, 2001). Small wonder, then, that mental practice has become a standard part of training for Olympic athletes (Suinn, 1997).

One experiment on mental practice and basketball foul shooting tracked the University of Tennessee women’s team over 35 games (Savoy & Beitel, 1996). During that time, the team’s free-throw shooting increased from approximately 52 percent in games following standard physical practice to some 65 percent after mental practice. Players had repeatedly imagined making foul shots under various conditions, including being “trash-talked” by their opposition. In a dramatic conclusion, Tennessee won the national championship game in overtime, thanks in part to their foul shooting.

Mental rehearsal can also help you achieve an academic goal, as researchers demonstrated with two groups of introductory psychology students facing a midterm exam one week later (Taylor et al., 1998). (Scores of other students, not engaging in any mental simulation, formed a control group.) The first group spent five minutes each day visualizing themselves scanning the posted grade list, seeing their A, beaming with joy, and feeling proud. This *outcome simulation* had little effect, adding only 2 points to their exam-score average. Another group spent five minutes each day visualizing themselves effectively studying—reading the chapters, going over notes, eliminating distractions, declining an offer to go out. This *process simulation* paid off: This second group began studying sooner, spent more time at it, and beat the others’ average by 8 points.

The point to remember: It’s better to spend your fantasy time planning *how* to get somewhere than to dwell on the imagined destination.

What, then, should we say about the relationship between thinking and language? As we have seen, language influences our thinking. But if thinking did not also affect language, there would never be any new words. And new words and new combinations of old words express new ideas. The basketball term *slam dunk* was coined after the act itself had become fairly common. So, let us say that *thinking affects our language, which then affects our thought* (FIGURE 9.12).

Psychological research on thinking and language suggests that the human mind is simultaneously capable of striking intellectual failures and of striking intellectual power. Misjudgments are common and can have disastrous consequences. So we do well to appreciate our capacity for error. Yet our efficient heuristics often serve us well. Moreover, our ingenuity at problem solving and our extraordinary power of language mark humankind as almost “infinite in faculties.”



Blend Images/Jupiterimages

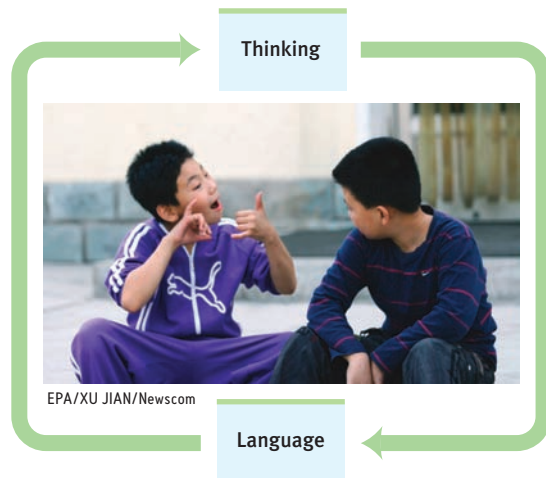


FIGURE 9.12
The interplay of thought and language The traffic runs both ways between thinking and language. Thinking affects our language, which affects our thought.

intelligence mental quality consisting of the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

RETRIEVE IT

- What is “mental practice,” and how can it help you to prepare for an upcoming event?

ANSWER: Mental practice uses visual imagery to mentally rehearse future behaviors, activating some of the same brain areas used during the actual behaviors. Visualizing the details of the process is more effective than visualizing only your end goal.

Intelligence

So far, we have considered how humans as a species think and communicate. But we humans also differ from one another in these abilities. School boards, courts, and scientists debate the use and fairness of tests that assess people’s mental abilities and assign them a score. In psychology, no controversy has been more heated than the question of whether there exists in each person a general intellectual capacity that can be measured and quantified as a number.

In this section, we consider some findings from a century of research, as psychologists have searched for answers to these questions and more:

- What is intelligence? Is it one general ability or many different abilities?
- How can we best assess intelligence?
- How do heredity and experience together weave the fabric of intelligence?

What Is Intelligence?



9-12: How do psychologists define *intelligence*, and what are the arguments for *g*?

In many research studies, *intelligence* has been defined as whatever intelligence tests measure, which has tended to be school smarts. Intelligence is not a quality like height or weight, which has the same meaning in all generations, all around the globe. *Intelligence* is a concept, a term people apply to the qualities that enable success in their own time and in their own culture (Sternberg & Kaufman, 1998). In the Amazon rain forest, intelligence may be understanding the medicinal qualities of local plants. In a North American high school, it may be mastering difficult concepts in tough courses. In both locations, **intelligence** is the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

You probably know some people with talents in science, others who excel at the humanities, and still others gifted in athletics, art, music, or dance. You may also know a

Hands-on healing The socially constructed concept of intelligence varies from culture to culture. This folk healer in Peru displays his intelligence in his knowledge about his medicinal plants and understanding of the needs of the people he is helping.



“*g* is one of the most reliable and valid measures in the behavioral domain . . . and it predicts important social outcomes such as educational and occupational levels far better than any other trait.”

Behavior geneticist Robert Plomin (1999)



© Ocean/Corbis

talented artist who is stumped by the simplest math problem, or a brilliant math student with little aptitude for literary discussion. Are all these people intelligent? Could you rate their intelligence on a single scale? Or would you need several different scales? Simply put, is intelligence a single overall ability or several specific abilities?

Spearman’s General Intelligence Factor

Charles Spearman (1863–1945) believed we have one **general intelligence** (often shortened to *g*) that is at the heart of all of our intelligent behavior, from navigating the sea to excelling in school. He granted that people often have special, outstanding abilities. But he noted that those who score high in one area, such as verbal intelligence, typically score higher than average in other areas, such as spatial or reasoning ability. Spearman’s belief stemmed in part from his work with *factor analysis*, a statistical procedure that identifies clusters of related items.

In this view, mental abilities are much like physical abilities: The ability to run fast is distinct from the eye–hand coordination required to throw a ball on target. Yet there remains some tendency for good things to come packaged together—for running speed and throwing accuracy to correlate. In both athleticism and intelligence, several distinct abilities tend to cluster together and to correlate enough to define a general underlying factor.

Theories of Multiple Intelligences



9-13: How do Gardner’s and Sternberg’s theories of multiple intelligences differ?

Other psychologists, particularly since the mid-1980s, have sought to extend the definition of *intelligence* beyond the idea of academic smarts.

Gardner’s Eight Intelligences Howard Gardner (1983, 2006) views intelligence as multiple abilities that come in different packages. He asks us to consider studies of people with brain damage, who may lose one ability while others remain intact. Or consider people with **savant syndrome**. Despite their island of brilliance, these people often score low on intelligence tests and may have limited or no language ability (Treffert & Wallace, 2002). Some can render incredible works of art or musical performance. Others can compute numbers as quickly and accurately as an electronic calculator, or identify almost instantly the day of the week that matches any given date in history (Miller, 1999).

Islands of genius: Savant syndrome

Matt Savage, a 19-year-old, award-winning jazz musician, has released nine albums and is studying at Berklee College of Music. His success has been hard-won given his early childhood diagnosis of autism, which came with struggles to communicate and an initial inability to tolerate sounds of any kind.



Joanne Raher/The Boston Globe via Getty Images

Four in five people with savant syndrome are males. Many also have *autism*, a developmental disorder (see Chapter 4). The late memory whiz Kim Peek (who did not have autism) was the inspiration for the movie *Rain Man*. In 8 to 10 seconds, he could read and remember a page. During his lifetime, he memorized 9000 books, including Shakespeare’s plays and the Bible, by heart. He learned maps from the front of phone books and could provide MapQuest-like travel directions within any major U.S. city. Yet he could not button his clothes, and he had little capacity for abstract concepts. Asked by his father at a restaurant to “lower your voice,” he slid lower in his chair to lower his voice box. Asked for Lincoln’s Gettysburg Address, he responded, “227 North West Front Street. But he only stayed there one night—he gave the speech the next day” (Treffert & Christensen, 2005).

Gardner has identified a total of eight *relatively independent intelligences*, including the verbal and mathematical aptitudes assessed by standard tests (FIGURE 9.13). Thus, the computer programmer, the poet, the street-smart adolescent who becomes a crafty executive, and the basketball team’s play-making point guard exhibit different kinds of intelligence (Gardner, 1998). To Gardner, a numerical score representing general intelligence is like the overall rating of a city—which tells you something but doesn’t give much specific information about its schools, streets, or nightlife.

Sternberg’s Three Intelligences Robert Sternberg (1985, 1999, 2003) agrees with Gardner that there is more to success than traditional intelligence and that we have multiple intelligences. But his *triarchic theory* proposes three, not eight, intelligences:

- **Analytical intelligence** (school smarts; traditional academic problem solving)
- **Creative intelligence** (the ability to react adaptively to new situations and generate novel ideas)

general intelligence (g) a general intelligence factor that, according to Spearman and others, underlies specific mental abilities and is therefore measured by every task on an intelligence test.

savant syndrome a condition in which a person otherwise limited in mental ability has an exceptional specific skill, such as in computation or drawing.

“You have to be careful, if you’re good at something, to make sure you don’t think you’re good at other things that you aren’t necessarily so good at. . . . Because I’ve been very successful at [software development] people come in and expect that I have wisdom about topics that I don’t.”

Bill Gates (1998)

FIGURE 9.13 Gardner’s eight intelligences



Street smarts This child selling candy on the streets of Manaus, Brazil, is developing practical intelligence at a very young age.



David R. Frazier/Photolibrary, Inc./Alamy

- **Practical intelligence** (street smarts; skill at handling everyday tasks, which may be ill defined, with multiple solutions)

Sternberg (2006, 2007, 2010) and a team of collaborators have developed new measures of creativity (such as thinking up a caption for an untitled cartoon) and practical thinking (such as figuring out how to move a large bed up a winding staircase). Initial results indicate that these more comprehensive assessments improve prediction of American students' first-year college grades, and they do so with reduced ethnic-group differences.

Gardner and Sternberg differ in some areas, but they agree on two important points: Multiple abilities can contribute to life success, and differing varieties of giftedness add spice to life and challenges for education. Under their influence, many teachers have been trained to appreciate such variety and to apply multiple intelligence theories in their classrooms.

Criticisms of Multiple Intelligence Theories Wouldn't it be wonderful if the world were so just that a weakness in one area would be compensated by genius in some other area? Alas, say critics, the world is not just (Ferguson, 2009; Scarr, 1989).

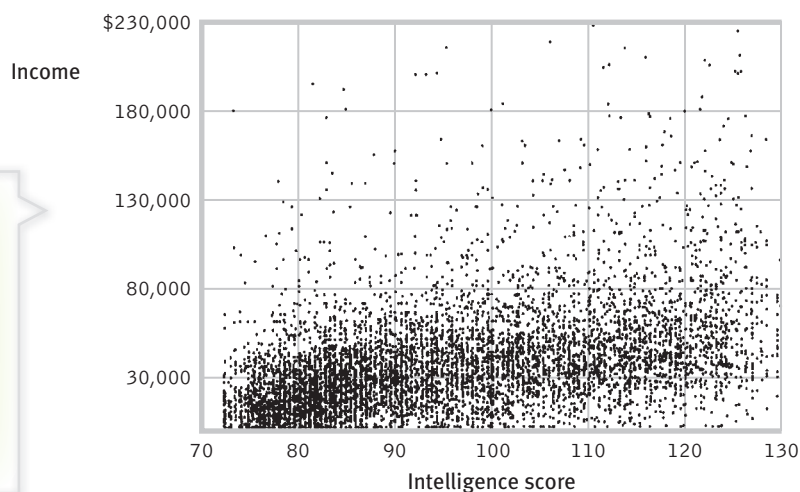
Recent research, using factor analysis, has confirmed that there *is* a general intelligence factor (Johnson et al., 2008): *g* matters. It predicts performance on various complex tasks and in various jobs (Gottfredson, 2002a,b, 2003a,b). In one study, youths' intelligence test scores correlated with their later income (**FIGURE 9.14**). Much as jumping ability is not a predictor of jumping performance when the bar is set a foot off the ground—but becomes a predictor when the bar is set higher—so extremely high cognitive ability scores predict exceptional attainments, such as doctoral degrees and publications (Kuncel & Hezlett, 2010).

Even so, “success” is not a one-ingredient recipe. High intelligence may help you get into a profession (via the schools and training programs that take you there), but it won't make you successful once there. The recipe for success combines talent with *grit*: Those who become highly successful tend also to be conscientious, well connected, and doggedly energetic. Researchers report a *10-year rule*: A common ingredient of expert performance in chess, dancing, sports, computer programming, music, and medicine is “about 10 years of intense, daily practice” (Ericsson, 2002, 2007; Simon & Chase, 1973). (For more on how self-disciplined grit feeds achievement, see Appendix B.)

Bees, birds, chimpanzees, and other species also require time and experience to acquire peak expertise in skills such as foraging (Helton, 2008). As with humans, performance tends to peak near midlife.

FIGURE 9.14

Smart and rich? Jay Zagorsky (2007) tracked 7403 participants in the U.S. National Longitudinal Survey of Youth across 25 years. As shown in this graph, their intelligence scores showed a small but significant correlation (.30) with their later income. Each dot indicates a given youth's intelligence score and later adult income.



RETRIEVE IT

- How does the existence of savant syndrome support Gardner's theory of multiple intelligences?

ANSWER: People with savant syndrome have limited mental ability overall but possess one or more exceptional skills. According to Howard Gardner, this suggests that our abilities come in separate packages rather than being fully expressed by one general intelligence that encompasses all our talents.

Emotional Intelligence



9-14: What are the four components of emotional intelligence?

Is being in tune with yourself and others also a sign of intelligence, distinct from academic intelligence? Some researchers say *Yes*. They define *social intelligence* as the know-how involved in social situations and managing yourself successfully (Cantor & Kihlstrom, 1987). People with high social intelligence can read social situations the way a skilled football player reads the defense or a seafarer reads the weather. The concept was first proposed in 1920 by psychologist Edward Thorndike, who noted, “The best mechanic in a factory may fail as a foreman for lack of social intelligence” (Goleman, 2006, p. 83).

One line of research has explored a specific aspect of social intelligence called **emotional intelligence**, consisting of four abilities (Mayer et al., 2002, 2008):

- *Perceiving* emotions (recognizing them in faces, music, and stories)
- *Understanding* emotions (predicting them and how they may change and blend)
- *Managing* emotions (knowing how to express them in varied situations)
- *Using* emotions to enable adaptive or creative thinking

Emotionally intelligent people are both socially aware and self-aware. Those who score high on managing emotions enjoy higher-quality interactions with friends (Lopes et al., 2004). They avoid being hijacked by overwhelming depression, anxiety, or anger. They can read others' emotional cues and know what to say to soothe a grieving friend, encourage a workmate, and manage a conflict.

These emotional intelligence high scorers also perform modestly better on the job (Joseph & Newman, 2010; Van Rooy & Viswesvaran, 2004; Zeidner et al., 2008). On and off the job, they can delay gratification in pursuit of long-range rewards, rather than being overtaken by immediate impulses. Simply said, they are emotionally smart. Thus, they often succeed in career, marriage, and parenting situations where academically smarter (but emotionally less intelligent) people fail (Cherniss, 2001a,b; Ciarrochi et al., 2006).

Some scholars, however, are concerned that emotional intelligence stretches the concept of intelligence too far (Visser et al., 2006). Howard Gardner (1999) includes interpersonal and intrapersonal intelligences as two of his eight forms of multiple intelligences. But let us also, he acknowledges, respect emotional sensitivity, creativity, and motivation as important but different. Stretch *intelligence* to include everything we prize and the word will lose its meaning.

For a summary of Spearman's, Gardner's, and Sternberg's theories, see **TABLE 9.2** on the next page.

Assessing Intelligence

An **intelligence test** assesses people's mental abilities and compares them with others, using numerical scores. How do we design such tests, and what makes them credible? Consider why psychologists created tests of mental abilities and how they have used them.



“You're wise, but you lack tree smarts.”

© The New Yorker Collection, 1988. Reilly from cartoonbank.com. All Rights Reserved.

“I worry about [intelligence] definitions that collapse assessments of our cognitive powers with statements about the kind of human beings we favor.”

Howard Gardner, “Rethinking the Concept of Intelligence,” 2000

emotional intelligence the ability to perceive, understand, manage, and use emotions.

intelligence test a method for assessing an individual's mental aptitudes and comparing them with those of others, using numerical scores.

Table 9.2
Comparing Theories of Intelligence

Theory	Summary	Strengths	Other Considerations
<i>Spearman's general intelligence (g)</i>	A basic intelligence predicts our abilities in varied academic areas.	Different abilities, such as verbal and spatial, do have some tendency to correlate.	Human abilities are too diverse to be encapsulated by a single general intelligence factor.
<i>Gardner's multiple intelligences</i>	Our abilities are best classified into eight independent intelligences, which include a broad range of skills beyond traditional school smarts.	Intelligence is more than just verbal and mathematical skills. Other abilities are equally important to our human adaptability.	Should all of our abilities be considered <i>intelligences</i> ? Shouldn't some be called less vital <i>talents</i> ?
<i>Sternberg's triarchic theory</i>	Our intelligence is best classified into three areas that predict real-world success: analytical, creative, and practical.	These three domains can be reliably measured.	<ol style="list-style-type: none"> 1. These three domains may be less independent than Sternberg thought and may actually share an underlying <i>g</i> factor. 2. Additional testing is needed to determine whether these domains can reliably predict success.



Alfred Binet “Some recent philosophers have given their moral approval to the deplorable verdict that an individual’s intelligence is a fixed quantity, one which cannot be augmented. We must protest and act against this brutal pessimism” (Binet, 1909, p. 141).

National Library of Medicine

“The IQ test was invented to predict academic performance, nothing else. If we wanted something that would predict life success, we’d have to invent another test completely.”

Social psychologist Robert Zajonc (1984b)

What Do Intelligence Tests Test?



9-15: When and why were intelligence tests created, and how do today’s tests differ from early intelligence tests?

Barely a century ago, psychologists began designing tests to assess people’s abilities. Some measured **aptitude** (ability to learn). Others assessed **achievement** (what people have already learned).

Alfred Binet: Predicting School Achievement Modern intelligence testing traces its birth to early twentieth-century France, where a new law required all children to attend school. French officials knew that some children, including many newcomers to Paris, would need special classes. But how could the schools make fair judgments about children’s learning potential? Teachers might assess children who had little prior education as slow learners. Or they might sort children into classes on the basis of their social backgrounds. To minimize such bias, France’s minister of public education in 1904 gave Alfred Binet (1857–1911) and others, including Théodore Simon, the task of studying this problem.

Binet and Simon began by assuming that all children follow the same course of intellectual development but that some develop more rapidly. A “dull” child should therefore score much like a typical younger child, and a “bright” child like a typical older child. Binet and Simon now had a clear goal: They would measure each child’s **mental age**, the level of performance typically associated with a certain chronological age. The average 8-year-old, for example, has a mental age of 8. An 8-year-old with a below-average mental age (perhaps performing at the level of a typical 6-year-old) would struggle with schoolwork considered normal for 8-year-olds.

Binet and Simon tested a variety of reasoning and problem-solving questions on Binet’s two daughters, and then on “bright” and “backward” Parisian schoolchildren. The items they developed eventually predicted how well French children would handle their schoolwork. Binet hoped his test would be used to improve children’s education, but he also feared it would be used to label children and limit their opportunities (Gould, 1981).

RETRIEVE IT

- What did Binet hope to achieve by establishing a child’s *mental age*?

ANSWER: Binet hoped that the child’s *mental age* (the age that typically corresponds to the child’s level of performance) would help identify appropriate school placements with children of similar abilities.

Lewis Terman: The Innate IQ Soon after Binet's death in 1911, others adapted his tests for wider use. One of them was a Stanford University professor, Lewis Terman (1877–1956). Terman found that the Paris-developed questions and age norms worked poorly with California schoolchildren. He adapted some items, added others, and established new standards for various ages. He also extended the upper end of the test's range from teenagers to “superior adults” and gave his revision the name it retains today—the **Stanford-Binet**.

German psychologist William Stern's contribution to intelligence testing was the famous **intelligence quotient**, or **IQ**. The IQ was simply a person's mental age divided by *chronological age* (age in years) and multiplied by 100 to get rid of the decimal point.

Thus, an average child, whose mental age (8) and chronological age (8) are the same has an IQ of 100. But an 8-year-old who answers questions at the level of a typical 10-year-old has an IQ of 125:

$$\text{IQ} = \frac{\text{mental age of 10}}{\text{chronological age of 8}} \times 100 = 125$$

The original IQ formula worked fairly well for children but not for adults. (Should a 40-year-old who does as well on the test as an average 20-year-old be assigned an IQ of only 50?) Most current intelligence tests, including the Stanford-Binet, no longer compute an IQ (though the term *IQ* still lingers in everyday vocabulary as shorthand for “intelligence test score”). Instead, they represent the test-taker's performance *relative to the average performance of others the same age*. This average performance is arbitrarily assigned a score of 100, and about two-thirds of all test-takers fall between 85 and 115.

RETRIEVE IT

- An employer with a pool of applicants for a single available position is interested in testing each applicant's potential as a part of her selection process. She should use an _____ (achievement/aptitude) test. That same employer wishing to test the effectiveness of a new, on-the-job training program would be wise to use an _____ (achievement/aptitude) test.

ANSWERS: aptitude; achievement

- What is the IQ of a 4-year-old with a mental age of 5?

ANSWER: 125 (5 ÷ 4 × 100 = 125)

David Wechsler: Separate Scores for Separate Skills Psychologist David Wechsler created what is now the most widely used intelligence test, the **Wechsler Adult Intelligence Scale (WAIS)**. There is a version for school-age children (the *Wechsler Intelligence Scale for Children [WISC]*), and another for preschool children. The WAIS (2008) edition consists of 15 subtests, broken into verbal and performance areas, including these:

- Similarities**—Considering the commonality of two objects or concepts, such as “In what way are wool and cotton alike?”
- Vocabulary**—Naming pictured objects, or defining words (“What is a guitar?”)
- Block design**—Visual abstract processing, such as “Using the four blocks, make one just like this.”
- Letter-number sequencing**—On hearing a series of numbers and letters, repeat the numbers in ascending order, and then the letters in alphabetical order: “R-2-C-1-M-3.”



The WAIS yields both an overall intelligence score and separate scores for verbal comprehension, perceptual organization, working memory, and processing speed. Striking differences among these scores can provide clues to cognitive strengths or weaknesses.

aptitude test a test designed to predict a person's future performance; *aptitude* is the capacity to learn.

achievement test a test designed to assess what a person has learned.

mental age a measure of intelligence test performance devised by Binet; the chronological age that most typically corresponds to a given level of performance. Thus, a child who does as well as an average 8-year-old is said to have a mental age of 8.

Stanford-Binet the widely used American revision (by Terman at Stanford University) of Binet's original intelligence test.

intelligence quotient (IQ) defined originally as the ratio of mental age (*ma*) to chronological age (*ca*) multiplied by 100 (thus, $\text{IQ} = \text{ma}/\text{ca} \times 100$). On contemporary intelligence tests, the average performance for a given age is assigned a score of 100.

Wechsler Adult Intelligence Scale (WAIS) the WAIS is the most widely used intelligence test; contains verbal and performance (nonverbal) subtests.

Matching patterns Block design puzzles test visual abstract processing ability. Wechsler's individually administered intelligence test comes in forms suited for adults and children.



standardization defining uniform testing procedures and meaningful scores by comparison with the performance of a pretested group.

normal curve the bell-shaped curve that describes the distribution of many physical and psychological attributes. Most scores fall near the average, and fewer and fewer scores lie near the extremes.

reliability the extent to which a test yields consistent results, as assessed by the consistency of scores on two halves of the test, or on retesting.

For example, a low verbal comprehension score combined with high scores on other subtests could indicate a reading or language disability. Other comparisons can help a therapist establish a rehabilitation plan for a stroke patient. In such ways, tests help realize Binet’s aim: to identify opportunities for improvement and strengths that teachers and others can build upon.

Three Tests of a “Good” Test



9-16: What is a normal curve, and what does it mean to say that a test has been standardized and is reliable and valid?

To be widely accepted, a psychological test must be *standardized*, *reliable*, and *valid*. The Stanford-Binet and Wechsler tests meet these requirements.

Was the Test Standardized? The number of questions you answer correctly on an intelligence test would tell you almost nothing. To know how well you performed, you would need some basis for comparison. That’s why test-makers give new tests to a representative sample of people. The scores from this pretested group become the basis for future comparisons. If you later take the test following the same procedures, your score will be meaningful when compared with others. This process is called **standardization**.

If we construct a graph of test-takers’ scores, they typically form a bell-shaped pattern called the **normal curve**. No matter what attributes we measure—height, weight, or mental aptitude—people’s scores tend to form a “bell curve.” The highest point is the midpoint, or the average score. On an intelligence test, we give this average score a value of 100 (**FIGURE 9.15**). Moving out from the average, toward either extreme, we find fewer and fewer people. For the Stanford-Binet and Wechsler tests, a person’s score indicates whether that person’s performance fell above or below the average. A performance higher than all but 2 percent of all scores earns an intelligence score of 130. A performance lower than 98 percent of all scores earns an intelligence score of 70.

Is the Test Reliable? Knowing your score in comparison to the standardization group scores still won’t tell you much unless the test has **reliability**. A reliable test gives consistent scores, no matter who takes the test or when they take it. To check a test’s reliability, researchers test people many times. They may retest people using the same test, or they may split the test in half and see whether odd-question scores and even-question scores agree. If the two sets of scores generally agree, or *correlate*, the test is reliable. The higher the correlation, the higher the test’s reliability. The tests we have considered so far—the Stanford-Binet, the WAIS, and the WISC—are very reliable: about +.9. When retested, people’s scores generally match their first score closely.

Recall from Chapter 1 that the lowest correlation, -1.0 , represents perfect disagreement between two sets of scores—as one score goes up, the other score goes down. A correlation of 0.0 represents no association. The highest correlation, $+1.0$, represents perfect agreement—as the first score goes up, the other score goes up.

Number of scores

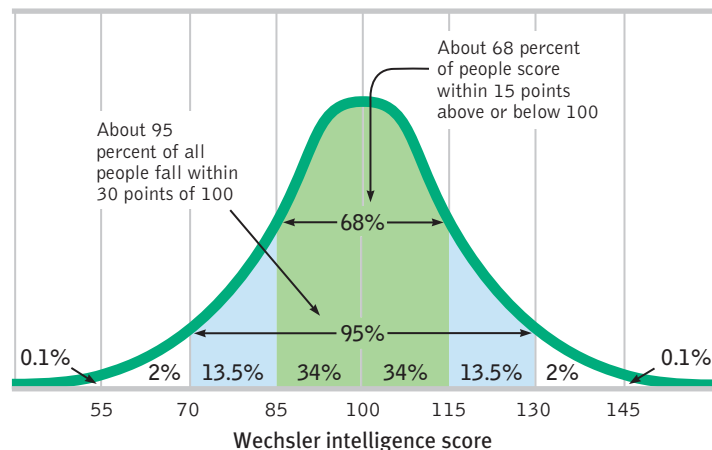


FIGURE 9.15

The normal curve Scores on aptitude tests tend to form a normal, or bell-shaped, curve around an average score. For the Wechsler scale, for example, the average score is 100.

Is The Test Valid? High reliability does not ensure a test's **validity**—the extent to which the test actually measures or predicts what it promises. Imagine using a miscalibrated tape measure to measure people's heights. Your results would be very reliable. No matter how many times you measured, people's heights would be the same. But your results would not be valid—you would not be giving the information you promised—real height.

Tests that tap the pertinent behavior, or *criterion*, have **content validity**. The road test for a driver's license has content validity because it samples the tasks a driver routinely faces. Course exams have content validity if they assess your mastery of relevant course material. But we expect intelligence tests to have **predictive validity**: They should predict future performance, and to some extent they do. (See Close-Up: Extremes of Intelligence on the next page.)

The predictive power of aptitude tests is fairly strong in the early school years, but later it weakens. Past grades, which reflect both aptitude and motivation, are better predictors of future achievements.

RETRIEVE IT

- What three criteria must a psychological test meet in order to be widely accepted? Explain.

ANSWER: A psychological test must be *standardized* (pretested on a similar group of people), *reliable* (yielding consistent results), and *valid* (measuring what it is supposed to measure).

Aging and Intelligence

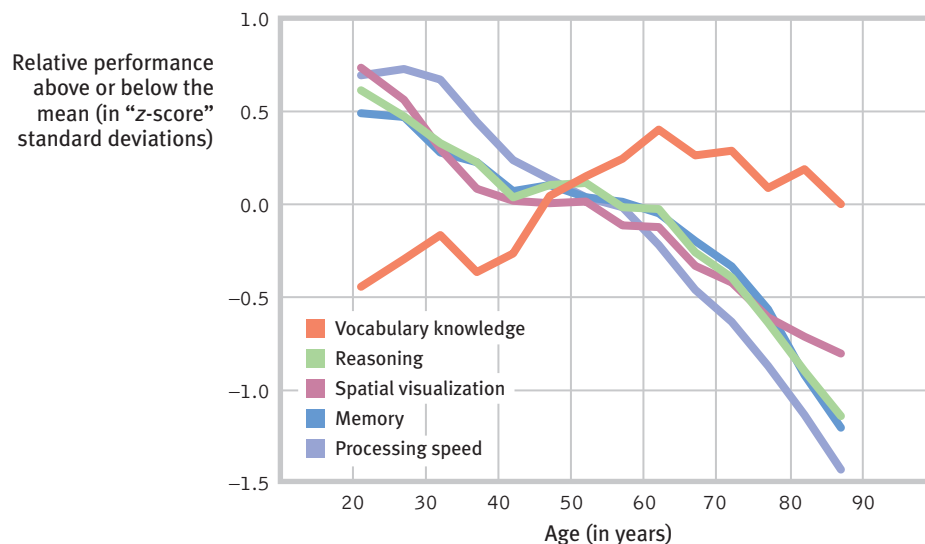


9-18: How does aging affect crystallized and fluid intelligence?

Does intelligence increase, decrease, or remain constant as we age? The answer depends on the type of intellectual performance we measure:

- **Crystallized intelligence**—our accumulated knowledge as reflected in vocabulary and analogies tests—*increases* up to old age.
- **Fluid intelligence**—our ability to reason speedily and abstractly, as when solving novel logic problems—*decreases* beginning in the twenties and thirties, slowly up to age 75 or so, then more rapidly, especially after age 85 (Cattell, 1963; Horn, 1982; Salthouse, 2009).

How do we know? Developmental psychologists use longitudinal studies (restudying the same group at different times across their life span) and cross-sectional studies (comparing members of different age groups at the same time) to study the way intelligence and other traits change with age. (See Appendix A for more information.) With age we lose and we win. We lose recall memory and processing speed, but we gain vocabulary and knowledge (**FIGURE 9.16**). Fluid intelligence may decline, but



Ann Baldwin/Shutterstock

"Knowledge is knowing a tomato is a fruit; wisdom is not putting it in a fruit salad."

Anonymous

FIGURE 9.16

With age, we lose and we win. Data from studies by Timothy Salthouse (2010b) reveal that word power grows with age, while fluid intelligence dimensions decline.

CLOSE UP:

Extremes of Intelligence



9-17: What are the traits of those at the low and high intelligence extremes?

One way to glimpse the validity and significance of any test is to compare people who score at the two extremes of the normal curve. The two groups should differ noticeably, and they do.

The Low Extreme

At one extreme of the intelligence test normal curve are those with unusually low scores. The American Association on Intellectual and Developmental Disabilities guidelines list two criteria for a diagnosis of **intellectual disability** (formerly referred to as *mental retardation*):

1. A test score indicating performance below 98 percent of test-takers (Schalock et al., 2010). For an intelligence test with a midpoint of 100, that is a score of approximately 70 or below.
2. Difficulty adapting to the normal demands of independent living, as expressed in three areas:
 - *conceptual skills* (such as language, literacy, and concepts of money, time, and number).
 - *social skills* (such as interpersonal skills, social responsibility, and the ability to follow basic rules and laws and avoid being victimized).

- *practical skills* (such as daily personal care, occupational skill, and travel and health care).

Intellectual disability is a developmental condition that is apparent before age 18, sometimes with a known physical cause. **Down syndrome**, for example, is a disorder of varying intellectual and physical severity caused by an extra copy of chromosome 21.

Consider one reason why people diagnosed with a mild intellectual disability—those just below the 70 score—might be better able to live independently today than many decades ago, when they were institutionalized. The tests have been periodically restandardized. As that happened, individuals who scored near 70 on earlier tests have suddenly lost about 6 test-score points. Two people with the same ability level could thus be classified differently, depending on when they were tested (Kanaya et al., 2003; Reynolds et al., 2010). As the intellectual-disability boundary has shifted, more people have become eligible for special education and for Social Security payments. And in the United States (one of only a few industrialized countries with the death penalty), fewer people are now eligible for execution: The U.S. Supreme Court ruled in 2002 that the execution of people with an intellectual disability is “cruel and unusual



Reuters/Claudia Daut

Mainstreaming in Chile Most Chilean children with Down syndrome attend separate schools for children with special needs. However, this boy is a student at the Altamira School, where children with differing abilities share the classroom.

punishment.” For people near that score of 70, intelligence testing can be a high-stakes competition. And so it was for Teresa Lewis, a “dependant personality” with limited intellect, who was executed by the state of Virginia in 2010. Lewis, whose reported test score was 72, reportedly agreed to a plot in which two men killed her husband and stepson in exchange for a split of a life insurance payout (Eckholm, 2010). If only she had scored 69.

older adults’ social reasoning skills increase, as shown by an ability to take multiple perspectives, to appreciate knowledge limits, and to offer helpful wisdom in times of social conflict (Grossman et al., 2010). Decisions also become less distorted by negative emotions such as anxiety, depression, and anger (Blanchard-Fields, 2007; Carstensen & Mikels, 2005).

Age-related cognitive differences help explain why older adults are less likely to embrace new technologies (Charness & Boot, 2009). In 2010, only 31 percent of Americans ages 65 and older had broadband Internet at home, compared with 80 percent of adults under 30 (Pew, 2010). These cognitive differences also help explain why mathematicians and scientists produce much of their most creative work during their late twenties or early thirties, when fluid intelligence is at its peak. In contrast, people working in literature, history, and philosophy tend to produce their best work in their forties, fifties, and beyond—after accumulating more knowledge (Simonton, 1988, 1990). Poets, for example, who depend on fluid intelligence, reach their peak output earlier than prose authors, who need the deeper knowledge reservoir that accumulates with age. This finding holds in every major literary tradition, for both living and dead languages.

“In youth we learn, in age we understand.”

Marie Von Ebner-Eschenbach,
Aphorisms, 1883



AP Photo/Damian Dovarganes

The extremes of intelligence Ten-year-old Moshe Kai Cavallin, who hopes to become an astrophysicist, was carrying an A+ average as a sophomore at East Los Angeles College when shown in this statistics class.

The High Extreme

In one famous project begun in 1921, Lewis Terman studied more than 1500 California schoolchildren with IQ scores over 135. Terman’s high-scoring children (the “Termites”) were healthy, well-adjusted, and unusually successful academically (Koenen et al.,

2009; Lubinski, 2009a; Stanley, 1997). When restudied over the next seven decades, most had attained high levels of education (Austin et al., 2002; Holahan & Sears, 1995). Many were doctors, lawyers, professors, scientists, and writers, but no Nobel Prize winners. (The two future physics Nobel laureates Terman tested failed to score above his gifted-sample cutoff [Hulbert, 2005].)

A more recent study of precocious youths who aced the math SAT at age 13—by scoring in the top quarter of 1 percent of their age group—were at age 33 twice as likely to have patents as were those in the bottom quarter of the top 1 percent (Wai et al., 2005). Compared with the math aces, 13-year-olds scoring high on verbal aptitude were more likely to have become humanities professors or written a novel (Park et al., 2007). About 1 percent of Americans earn doctorates. But among those scoring in the top 1 in 10,000 on the SAT at age 12 or 13, more than half have done so (Lubinski, 2009b).

These whiz kids remind me of Jean Piaget, who by age 15 was publishing scientific articles

intellectual disability a condition of limited mental ability, indicated by an intelligence test score of 70 or below and difficulty in adapting to the demands of life. (Formerly referred to as *mental retardation*.)

Down syndrome a condition of mild to severe intellectual disability and associated physical disorders caused by an extra copy of chromosome 21.

on mollusks and who went on to become the twentieth century’s most famous developmental psychologist (Hunt, 1993). Children with extraordinary academic gifts are sometimes more isolated, introverted, and in their own worlds (Winner, 2000). But most thrive.

“Joining Mensa means that you are a genius. . . . I worried about the arbitrary 132 cutoff point, until I met someone with an IQ of 131 and, honestly, he was a bit slow on the uptake.”

Comedian Steve Martin, 1997

RETRIEVE IT

- Why do psychologists NOT diagnose an intellectual disability based solely on the person’s intelligence test score?

ANSWER: An intelligence test score is only one measure of a person’s ability to function. Other important factors to consider in an overall assessment include conceptual skills, social skills, and practical skills.

Genetic and Environmental Influences on Intelligence



9-19: What evidence points to a genetic influence on intelligence, and what is heritability?

Intelligence runs in families. But why? Are our intellectual abilities mostly inherited? Or are they molded by our environment? Few issues in psychology arouse so much passion. Let’s examine some of the evidence.

Twin and Adoption Studies

Does sharing the same genes also mean sharing the same mental abilities? As you can see from **FIGURE 9.17** on the next page, which summarizes many studies, the answer is clearly *Yes*.

Identical twins who grow up together have intelligence test scores nearly as similar as those of the same person taking the same test twice (Haworth et al., 2009; Lykken, 1999). (Fraternal twins, who typically share only half their genes, differ more.) Even when



“I told my parents that if grades were so important they should have paid for a smarter egg donor.”

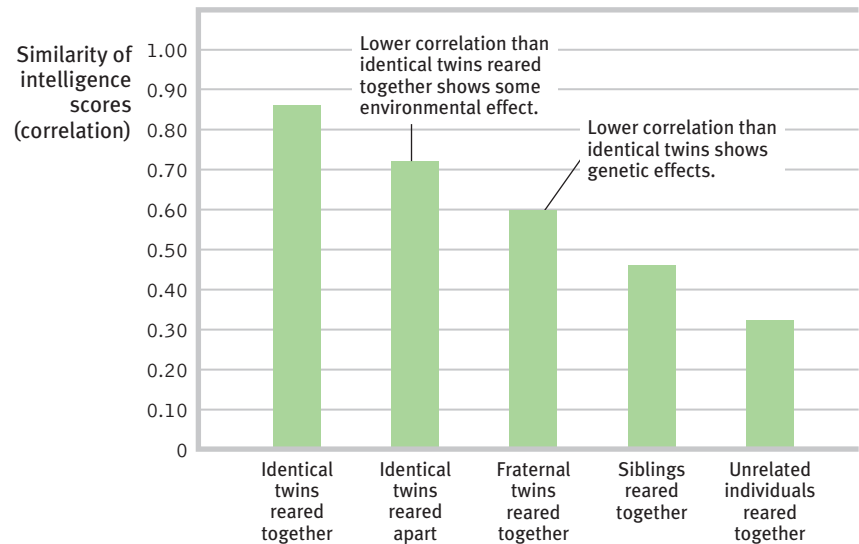
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FIGURE 9.17

Intelligence: Nature and nurture The most genetically similar people have the most similar intelligence scores. Remember: 1.0 indicates a perfect correlation; zero indicates no correlation at all. (Data from McGue et al., 1993.)



identical twins are adopted by two different families, their scores are very similar. Estimates of the **heritability** of intelligence—the extent to which intelligence test score variation can be attributed to genetic variation—range from 50 to 80 percent (Johnson et al., 2009; Neisser et al., 1996; Plomin, 2003). Identical twins also exhibit substantial similarity (and heritability) in specific talents, such as music, math, and sports (Vinkhuyzen et al., 2009).

Scans of identical twins' brains reveal that gray- and white-matter volume is similar, and areas associated with verbal and spatial intelligence are virtually the same (Deary et al., 2009; Thompson et al., 2001). Their brains also show similar activity while doing mental tasks (Koten et al., 2009).

Although genes matter, there is no known “genius” gene. Intelligence appears to be *polygenic*, involving many genes, each accounting for much less than 1 percent of our differences (Butcher et al., 2008). Intelligence is thus like height, suggests Wendy Johnson (2010): Research shows that 54 specific gene variations together account for 5 percent of our individual differences in height, leaving the rest yet to be explained.

Other evidence points to an additional effect of environment. Where environments vary widely, as they do among children of less-educated parents, environmental differences are more predictive of intelligence scores (Rowe et al., 1999; Tucker-Drob et al., 2011; Turkheimer et al., 2003). And fraternal twins, who are genetically no more alike than any other siblings—but who are treated more alike because they are the same age—tend to score more alike than other siblings. Other studies also show that adoption of mistreated or neglected children enhances their intelligence scores (van IJzendoorn & Juffer, 2005, 2006).

So should we expect biologically unrelated children adopted into the same family to share similar aptitudes? Seeking to untangle genes and environment, researchers have compared the intelligence test scores of adopted children with those of their family members. These include their *biological parents* (the providers of their genes), their *adoptive parents* (the providers of their home environment), and their *adoptive siblings* (who share that home environment). During childhood, adoptive siblings' test scores correlate modestly. What do you think happens as the years go by and adopted children settle in with their adoptive families? Would you expect the family-environment effect to grow stronger and the genetic-legacy effect to shrink?

If you said *Yes*, behavior geneticists have a stunning surprise for you. Mental similarities between adopted children and their adoptive families *lessen* with age, dropping to roughly zero by adulthood (McGue et al., 1993). Genetic influences—not environmental ones—become more apparent as we accumulate life experience. Identical twins' similarities, for example, continue or increase into their eighties (Deary et al., 2009). In one massive study of 11,000 twin pairs in four countries, the heritability of *g* increased from 41 percent in middle childhood, to 55 percent in adolescence, to 66 percent in young adulthood (Haworth et al., 2010). Similarly, adopted children's verbal ability scores over time become more like those of their biological parents (**FIGURE 9.18**). Who would have guessed?

heritability the proportion of variation among individuals that we can attribute to genes. The heritability of a trait may vary, depending on the range of populations and environments studied.

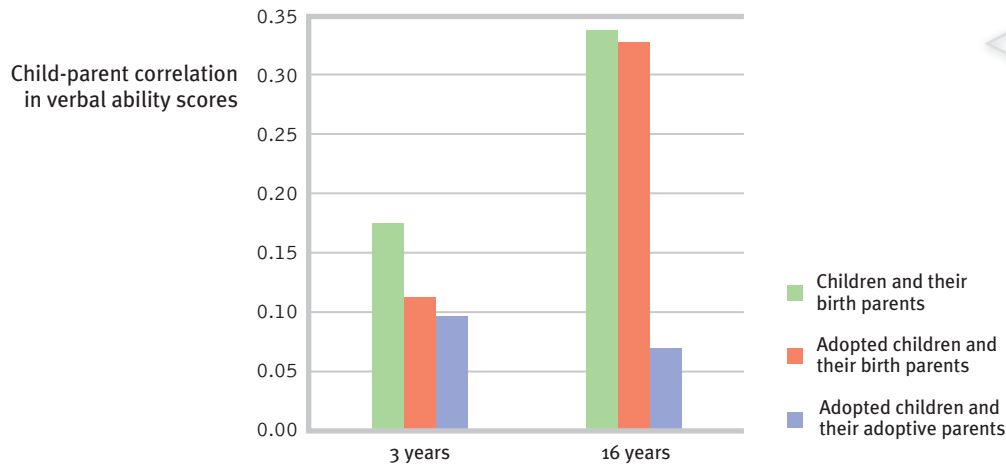


FIGURE 9.18

In verbal ability, adopted children resemble their birth parents. As the years went by in their adoptive families, children's verbal ability scores became modestly more like their *biological* parents' scores. (Adapted from Plomin & DeFries, 1998.)

RETRIEVE IT

- A check on your understanding of heritability: If environments become more equal, the heritability of intelligence would

a. increase. b. decrease. c. be unchanged.

ANSWER: a. (Heritability—variation explained by genetic influences—will increase as environmental variation decreases.)

Environmental Influences



9-20: What does evidence reveal about environmental influences on intelligence?

We have seen that biology and experience intertwine. Nowhere is this more apparent than in the most hopeless human environments. Severe deprivation leaves footprints on the brain, as J. McVicker Hunt (1982) observed in a destitute Iranian orphanage. The typical child Hunt observed there could not sit up unassisted at age 2 or walk at age 4. The little care the infants received was not in response to their crying, cooing, or other behaviors, so the children developed little sense of personal control over their environment. They were instead becoming passive “glum lumps.” Extreme deprivation was crushing native intelligence—a finding confirmed by other studies of orphanage-reared children in Romania and elsewhere (Nelson et al., 2009; van IJzendoorn et al., 2008).

Mindful of the effect of early experiences and early intervention, Hunt began a training program for caregivers, teaching them to play language-fostering games with 11 infants. They learned to imitate the babies' babbling. They engaged them in vocal follow-the-leader. And, finally, they taught the infants sounds from the Persian language. The results were dramatic. By 22 months of age, the infants could name more than 50 objects and body parts. They so charmed visitors that most were adopted—an unprecedented success for the orphanage.

So, extreme conditions—malnutrition, sensory deprivation, and social isolation—can retard normal brain development. Is the reverse also true? Will an “enriched” environment give normal children a superior intellect? Most experts are doubtful (Bruer, 1999), but some parents disagree. After exposing their 12- to 18-month-olds to educational DVDs such as from the *Baby Einstein* series, they believe they have observed their baby's vocabulary growing. To see whether such cognitive growth is a result of the DVD exposure, or simply of infants' natural language explosion, two research teams assigned babies to DVD exposure or a control group (DeLoache et al., 2010; Reichert et al., 2010). Their common finding: The two groups' word learning did not differ.



“Selective breeding has given me an aptitude for the law, but I still love fetching a dead duck out of freezing water.”

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Josef Polleros/The Image Works

Devastating neglect Some Romanian orphans, such as this child in the Lagunul Pentro Copii orphanage in 1990, had minimal interaction with caregivers, and suffered delayed development.

"A high IQ and a subway token will only get you into town."

Psychologist Richard Nisbett (quoted by Michael Balter), 2011

"It is our choices . . . that show what we truly are, far more than our abilities."

Professor Dumbledore to Harry Potter in J. K. Rowling's Harry Potter and the Chamber of Secrets, 1999

All babies should have normal exposure to sights, sounds, and speech. Beyond that, Sandra Scarr's (1984) verdict still is widely shared: "Parents who are very concerned about providing special educational lessons for their babies are wasting their time." There is no environmental recipe for fast-forwarding a normal infant into a genius.

Later in life, however, schooling does pay intelligence score dividends. Schooling and intelligence interact, and both enhance later income (Ceci & Williams, 1997, 2009). But what we accomplish with our genes and experiences depends also on our own beliefs and motivation. One analysis of 72,431 collegians found that study motivation and study skills rivaled aptitude and previous grades as predictors of academic achievement (Credé & Kuncel, 2008). Motivation can even affect intelligence test performance. Four dozen studies show that, when promised money for doing well, adolescents score higher on such tests (Duckworth et al., 2011).

Group Differences in Intelligence Test Scores

If there were no group differences in aptitude scores, psychologists could politely debate hereditary and environmental influences in their ivory towers. But there are group differences. What are they? And what shall we make of them?

Gender Similarities and Differences



9-21: How and why do the genders differ in mental ability scores?

In science, as in everyday life, differences, not similarities, excite interest. Compared with the anatomical and physiological similarities between men and women, our differences are minor. In one 1932 study that tested Scottish 11-year-olds, for example, the girls' average intelligence score was 100.6 and the boys' was 100.5 (Deary et al., 2003). So far as *g* is concerned, boys and girls, men and women, are the same species.

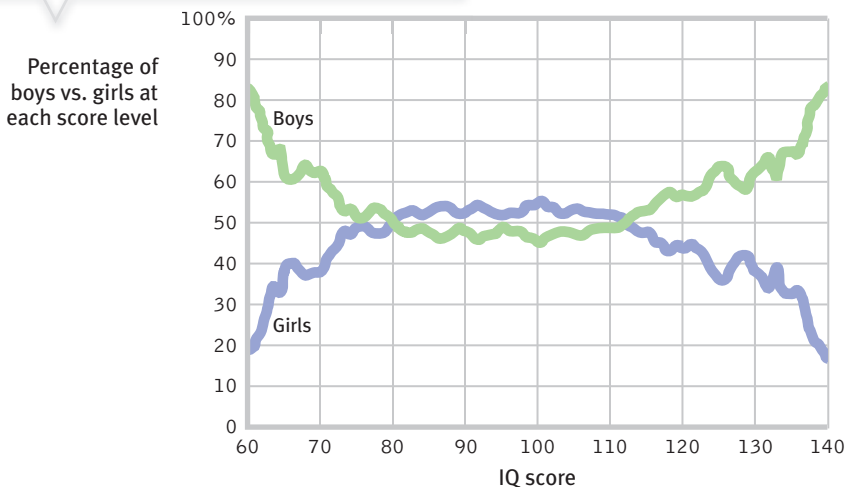
Yet, most people find differences more newsworthy. Girls outpace boys in spelling, verbal fluency, locating objects, detecting emotions, and sensitivity to touch, taste, and color (Halpern et al., 2007). Boys outperform girls in tests of spatial ability and complex math problems, though in math computation and overall math performance, boys and girls hardly differ (Else-Quest et al., 2010; Hyde & Mertz, 2009; Lindberg et al., 2010). Males' mental ability scores also vary more than females'. Thus, boys worldwide outnumber girls at both the low extreme and the high extreme (Machin & Pekkarinen, 2008; Strand et al., 2006; also see **FIGURE 9.19**). Boys, for example, are more often found in special education classes. And among 12- to 14-year-olds scoring extremely high (700 or higher) on SAT math, boys outnumber girls 4 to 1 (Wai et al., 2010).

The most reliable male edge appears in spatial ability tests like the one shown in **FIGURE 9.20**. The solution requires speedily rotating three-dimensional objects in one's mind (Collins & Kimura, 1997; Halpern, 2000). Today, such skills help when fitting suitcases into a car trunk, playing chess, or doing certain types of geometry problems. From an evolutionary perspective, those same skills would have helped our ancestral fathers track prey and make their way home (Geary, 1995, 1996; Halpern et al., 2007). The survival of our ancestral mothers may have benefited more from a keen memory for the location of edible plants—a legacy that lives today in women's superior memory for objects and their location.

But experience matters. One experiment found that playing action video games boosts spatial abilities (Feng et al., 2007). And you probably won't be surprised to know that among entering American

FIGURE 9.19

Gender and variability In a 1932 intelligence testing of nearly 90,000 Scottish 11-year-olds, the average IQ score for girls and boys was essentially identical. But as other studies have found, boys were overrepresented at the low and high extremes. (Adapted from Johnson et al., 2008.)



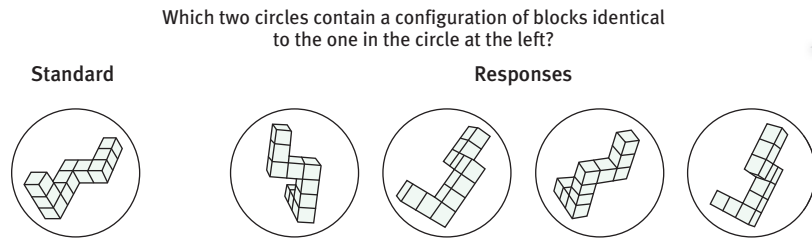


FIGURE 9.20
The mental rotation test This is a test of spatial abilities. (From Vandenberg & Kuse, 1978.) See inverted answer below.
ANSWER: The first and fourth alternatives.

collegians, six times as many men (23 percent) as women (4 percent) report playing video or computer games six or more hours a week (Pryor et al., 2010).

Social expectations and opportunities also matter. Gender-equal cultures, such as Sweden and Iceland, exhibit little of the gender math gap found in gender-unequal cultures, such as Turkey and Korea (Guiso et al., 2008).

Racial and Ethnic Similarities and Differences



9-22: How and why do racial and ethnic groups differ in mental ability scores?

Fueling the group-differences debate are two other disturbing but agreed-upon facts:

- Racial and ethnic groups differ in their average intelligence test scores.
- High-scoring people (and groups) are more likely to attain high levels of education and income.

There are many group differences in average intelligence test scores. New Zealanders of European descent outscore native Maori New Zealanders. Israeli Jews outscore Israeli Arabs. Most Japanese outscore most Burakumin, a stigmatized Japanese minority. Those who can hear outscore those born deaf (Braden, 1994; Steele, 1990; Zeidner, 1990). And White Americans have outscored Black Americans. This Black-White difference has diminished somewhat in recent years, especially among children (Dickens & Flynn, 2006; Nisbett, 2009). Such *group* differences provide little basis for judging individuals. Worldwide, women outlive men by four years, but knowing only that you are male or female won't tell us much about how long you will live.

We have seen that heredity contributes to *individual* differences in intelligence. But group differences in a heritable trait may be entirely environmental. Consider one of nature's experiments: Allow some children to grow up hearing their culture's dominant language, while others, born deaf, do not. Then give both groups an intelligence test rooted in the dominant language, and (no surprise) those with expertise in that language will score highest. Although individual performance differences may be substantially genetic, the group difference is not (FIGURE 9.21).

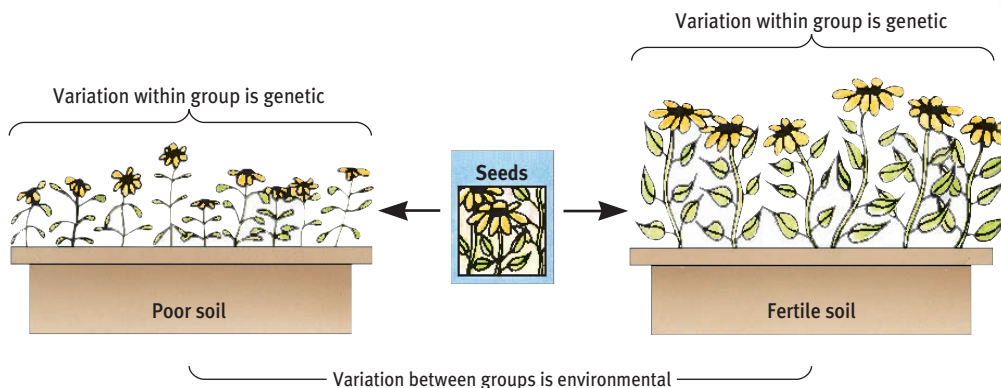


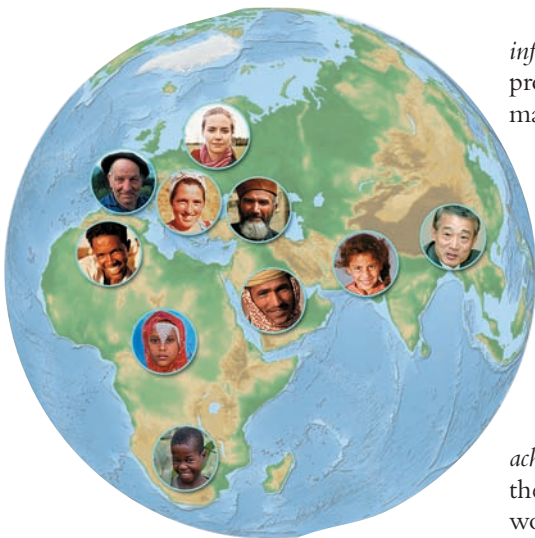
FIGURE 9.21
Group differences and environmental impact Even if the variation between members within a group reflects genetic differences, the average difference between groups may be wholly due to the environment. Imagine that seeds from the same mixture are sown in different soils. Although height differences *within* each window box will be genetic, the height difference *between* the two groups will be environmental. (From Lewontin, 1976.)



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Nature's own morphing Nature draws no sharp boundaries between races, which blend gradually one into the next around the Earth. Thanks to the human urge to classify, however, people socially define themselves in racial categories, which become catchall labels for physical features, social identity, and nationality.

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“Do not obtain your slaves from Britain, because they are so stupid and so utterly incapable of being taught.”

Cicero, 106–43 B.C.E.

Might the racial gap be similarly environmental? Consider:

Genetics research reveals that under the skin, the races are remarkably alike. The average genetic difference between two Icelandic villagers or between two Kenyans greatly exceeds the group difference between Icelanders and Kenyans (Cavalli-Sforza et al., 1994; Rosenberg et al., 2002). Moreover, looks can deceive. Light-skinned Europeans and dark-skinned Africans are genetically closer than are dark-skinned Africans and dark-skinned Aboriginal Australians.

Race is not a neatly defined biological category. Many social scientists see race primarily as a social construction without well-defined physical boundaries, as each race blends seamlessly into the race of its geographical neighbors (Helms et al., 2005; Smedley & Smedley, 2005). People with varying ancestry may categorize themselves in the same race. Moreover, with increasingly mixed ancestries, more and more people defy neat racial categorization and self-identify as multiracial (Pauker et al., 2009).

The intelligence test performance of today's better-fed, better-educated, and more test-prepared population exceeds that of the 1930s population—by a greater margin than the intelligence test score of the average White today exceeds that of the average Black. One research review noted that the average intelligence test performance of today's sub-Saharan Africans is the same as British adults in 1948, with the possibility of similar gains to come, given improved nutrition, economic development, and education (Wicherts et al., 2010). No one attributes generational group differences to genetics.

When Blacks and Whites have or receive the same pertinent knowledge, they exhibit similar information-processing skill. “The data support the view that cultural differences in the provision of information may account for racial differences in [intelligence test performance],” reported researchers Joseph Fagan and Cynthia Holland (2007).

Schools and culture matter. Countries whose economies create a large wealth gap between rich and poor tend also to have a large rich-versus-poor intelligence test score gap (Nisbett, 2009). Moreover, educational policies such as kindergarten attendance, school discipline, and instructional time per year predict national differences in intelligence and knowledge tests (Rindermann & Ceci, 2009). Math achievement and aptitude test differences may reflect conscientiousness more than competence. Asian students, who have outperformed North American students on such tests, have also spent 30 percent more time in school and much more time in and out of school studying math (Geary et al., 1996; Larson & Verma, 1999; Stevenson, 1992).

In different eras, different ethnic groups have experienced golden ages—periods of remarkable achievement. Twenty-five-hundred years ago, it was the Greeks and the Egyptians, then the Romans. In the eighth and ninth centuries, genius seemed to reside in the Arab world. Five hundred years ago, the Aztec Indians and the peoples of Northern Europe were the superachievers. Today, people marvel at Asians' technological genius and Jews' cultural success. Cultures rise and fall over centuries; genes do not. That fact makes it difficult to attribute a natural superiority to any race.

RETRIEVE IT

- The heritability of intelligence scores will be greater in a society marked by equal opportunity than in a society of peasants and aristocrats. Why?

ANSWER: Perfect environmental equality would create 100 percent heritability, because genes alone would account for any remaining human differences.

The Question of Bias



9-23: Are intelligence tests inappropriately biased?

If one assumes that *race* is a meaningful concept, the debate over race differences in intelligence divides into three camps (Hunt & Carlson, 2007):

- There are genetically disposed racial differences in intelligence.
- There are socially influenced racial differences in intelligence.
- There are racial differences in test scores, but the tests are inappropriate or biased.

We have considered group differences from the first and second perspectives. Let's turn now to the third: Are intelligence tests biased? The answer depends on the definition of *bias* we use, and on our understanding of stereotypes.

Two Meanings of Bias The *scientific* meaning of *bias* hinges on a test's validity—on whether it predicts future behavior only for some groups of test-takers. For example, if the SAT accurately predicted the college achievement of women but not that of men, then the test would be biased. In this statistical meaning of the term, the near-consensus among psychologists (as summarized by the U.S. National Research Council's Committee on Ability Testing and the American Psychological Association's Task Force on Intelligence) has been that the major U.S. aptitude tests are *not* biased (Hunt & Carlson, 2007; Neisser et al., 1996; Wigdor & Garner, 1982). The tests' predictive validity is roughly the same for women and men, for various races, and for rich and poor. If an intelligence test score of 95 predicts slightly below-average grades, that rough prediction usually applies equally to all.

But we can also consider a test biased if it makes predictions based not only on innate differences in intelligence but also on past cultural experiences. This in fact happened to Eastern European immigrants in the early 1900s. Lacking the experience to answer questions about their new culture, many were classified as feeble-minded. In this popular sense, intelligence tests are biased. They measure your developed abilities, which reflect, in part, your education and experiences.

You may have read examples of intelligence test items that make middle-class assumptions (for example, that a cup goes with a saucer). Such items can bias the test against those who do not use saucers. Could such questions explain cultural differences in test performance? In such cases, tests can be a vehicle for discrimination, consigning potentially capable children (some of whom may have a different native language) to dead-end classes and jobs. For such reasons, some intelligence researchers recommend creating culture-neutral questions—such as assessing people's ability to learn novel words, sayings, and analogies—to enable culture-fair aptitude tests (Fagan & Holland, 2007, 2009).

So, test-makers' expectations can introduce bias in an intelligence test. This is consistent with an observation you have seen throughout this text: Our expectations and attitudes can influence our perceptions and behaviors. This is also true for the person taking the test.

What time is it now? When I asked you (in the section on overconfidence) to estimate how quickly you would finish this chapter, did you underestimate or overestimate?



Jason Goltz

The culture of scholarship The children of Indochinese refugee families have excelled in school (Caplan et al., 1992). On weekday nights after dinner, the family clears the table and begins homework. Family cooperation is valued, and older siblings help younger ones.

RETRIEVE IT

- What is the difference between a test that is biased culturally and a test that is biased in terms of its validity?

ANSWER: A test may be *culturally* biased if higher scores are achieved by those with certain cultural experiences. That same test may not be biased in terms of *validity* if it predicts what it is supposed to predict. For example, the SAT may be culturally biased in favor of those with experience in the U.S. school system, but it does still accurately predict U.S. college success.

Stereotype Threat If, when taking an intelligence test or an exam, you are worried that your group or “type” often doesn't do well, your self-doubts and self-monitoring may hijack your working memory and impair your performance (Schmader, 2010). This self-confirming concern that you will be evaluated based on a negative viewpoint

stereotype threat a self-confirming concern that one will be evaluated based on a negative stereotype.

“Math class is tough!”

*“Teen talk” talking Barbie doll
(introduced February 1992, recalled
October 1992)*

is called **stereotype threat**, and it may impair your attention and learning (Inzlicht & Kang, 2010; Rydell, 2010).

When Steven Spencer and his colleagues (1997) gave a difficult math test to equally capable men and women, women did not do as well—except when they had been led to expect that women usually do as well as men on the test. Otherwise, the women apparently felt apprehensive, which affected their performance. And with Claude Steele and Joshua Aronson, Spencer (2002) again observed stereotype threat when Black students were reminded of their race just before taking verbal aptitude tests and performed worse. Follow-up experiments have confirmed that negatively stereotyped minorities and women may have unrealized academic potential (Nguyen & Ryan, 2008; Walton & Spencer, 2009).

Critics note that stereotype threat does not fully account for Black-White aptitude score differences (Sackett et al., 2004, 2008). But it does help explain why Blacks have scored higher when tested by Blacks than when tested by Whites (Danso & Esses, 2001; Inzlicht & Ben-Zeev, 2000). It gives us insight into why women have scored higher on math tests with no male test-takers present, and why women’s chess play drops sharply when they *think* they are playing a male opponent (Maass et al., 2008). It also explains “the Obama effect”—the finding that African-American adults performed better if they took a verbal aptitude test immediately after watching then-candidate Barack Obama’s stereotype-defying nomination-acceptance speech, or just after his 2008 presidential victory (Marx et al., 2009).

Steele (1995, 2010) concludes that telling students they probably won’t succeed (as is sometimes implied by remedial “minority support” programs) functions as a stereotype that can erode performance. Minority students in university programs that have challenged them to believe in their potential, or to focus on the idea that intelligence is malleable and not fixed, have produced markedly higher grades and had lower dropout rates (Wilson, 2006).

These observations lend support to other research by psychologist Carol Dweck (2006, 2007, 2008). She reports that the belief that intelligence is changeable can foster a *growth mind-set*, which focuses on learning and growing. Collegians with a growth mind-set tend to flourish happily (Howell, 2009). To foster this mind-set, Dweck has developed interventions to teach early teens that the brain is like a muscle that grows stronger with use as neuron connections grow. Indeed, as noted earlier, superior achievements in fields from sports to science to music arise from disciplined effort and sustained practice (Ericsson et al., 2007). Believing in our ability to learn, and applying ourselves with sustained effort, we are likely to fulfill our potential.

Perhaps, then, our goals for tests of mental abilities should be threefold.

- We should realize the benefits Alfred Binet foresaw—to enable schools to recognize who might profit most from early intervention.
- We must remain alert to Binet’s fear that intelligence test scores may be misinterpreted as literal measures of a person’s worth and potential.
- We must remember that the competence that general intelligence tests sample is important; without such tests, those who decide on jobs and admissions would rely more on other considerations, such as personal opinion. But these tests reflect only one aspect of personal competence. Our practical intelligence and emotional intelligence matter, too, as do other forms of creativity, talent, and character.

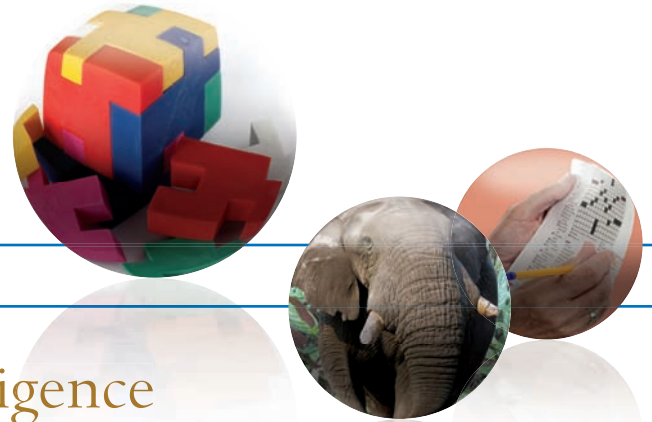
The point to remember: There are many ways of being successful: Our differences are variations of human adaptability. Life’s great achievements result not only from “can do” abilities but also from “will do” motivation. Competence + Diligence → Accomplishment.

“Almost all the joyful things of life are outside the measure of IQ tests.”

*Madeleine L’Engle,
A Circle of Quiet, 1972*

“[Einstein] showed that genius equals brains plus tenacity squared.”

*Walter Isaacson,
“Einstein’s Final Quest,” 2009*



CHAPTER REVIEW

Thinking, Language, and Intelligence

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Thinking

- 9-1:** What is cognition, and what are the functions of concepts?
- 9-2:** What cognitive strategies assist our problem solving, and what obstacles hinder it?
- 9-3:** What is intuition, and how can the availability heuristic, overconfidence, belief perseverance, and framing influence our decisions and judgments?
- 9-4:** How do smart thinkers use intuition?
- 9-5:** What is creativity, and what fosters it?
- 9-6:** What do we know about animal thinking?

Language

- 9-7:** What are the structural components of a language?
- 9-8:** What are the milestones in language development, and how do we acquire language?
- 9-9:** What brain areas are involved in language processing and speech?
- 9-10:** Do other animals share our capacity for language?

Thinking and Language

- 9-11:** What is the relationship between thinking and language, and what is the value of thinking in images?

Intelligence

- 9-12:** How do psychologists define *intelligence*, and what are the arguments for *g*?
- 9-13:** How do Gardner's and Sternberg's theories of multiple intelligences differ?
- 9-14:** What are the four components of emotional intelligence?
- 9-15:** When and why were intelligence tests created, and how do today's tests differ from early intelligence tests?
- 9-16:** What is a normal curve, and what does it mean to say that a test has been standardized and is reliable and valid?
- 9-17:** What are the traits of those at the low and high intelligence extremes?
- 9-18:** How does aging affect crystallized and fluid intelligence?
- 9-19:** What evidence points to a genetic influence on intelligence, and what is heritability?
- 9-20:** What does evidence reveal about environmental influences on intelligence?
- 9-21:** How and why do the genders differ in mental ability scores?
- 9-22:** How and why do racial and ethnic groups differ in mental ability scores?
- 9-23:** Are intelligence tests inappropriately biased?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

cognition, p. 306

concept, p. 306

prototype, p. 306

algorithm, p. 307

heuristic, p. 307

insight, p. 307

confirmation bias, p. 307

mental set, p. 308

intuition, p. 308

availability heuristic, p. 309

overconfidence, p. 311

belief perseverance, p. 312

framing, p. 312

creativity, p. 314

convergent thinking, p. 314

divergent thinking, p. 314

language, p. 318

phoneme, p. 319

morpheme, p. 319

grammar, p. 319

babbling stage, p. 320

one-word stage, p. 320

two-word stage, p. 320

telegraphic speech, p. 320

aphasia, p. 322

Broca's area, p. 323

Wernicke's area, p. 323

linguistic determinism, p. 326

intelligence, p. 329

general intelligence (*g*), p. 330

savant syndrome, p. 330

emotional intelligence, p. 333

intelligence test, p. 333

aptitude test, p. 334

achievement test, p. 334

mental age, p. 334

Stanford-Binet, p. 334

intelligence quotient (IQ), p. 334

Wechsler Adult Intelligence Scale (WAIS), p. 334

standardization, p. 336

normal curve, p. 336

reliability, p. 336

validity, p. 337

content validity, p. 337

predictive validity, p. 337

crystallized intelligence, p. 337

fluid intelligence, p. 337

intellectual disability, p. 338

Down syndrome, p. 338

heritability, p. 340

stereotype threat, p. 346

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- A mental grouping of similar things is called a _____.
- The most systematic procedure for solving a problem is a(n) _____.
- Oscar describes his political beliefs as "strongly liberal," but he has decided to explore opposing viewpoints. How might he be affected by *confirmation bias* and *belief perseverance* in this effort?
- A major obstacle to problem solving is fixation, which is a(n)
 - tendency to base our judgments on vivid memories.
 - tendency to wait for insight to occur.
 - inability to view a problem from a new perspective.
 - rule of thumb for judging the likelihood of an event in terms of our mental image of it.
- After the 9/11 attacks by foreign-born terrorists, some observers initially assumed that the 2003 U. S. East Coast blackout was probably also the work of foreign-born terrorists. This assumption illustrates the _____ heuristic.
- When consumers respond more positively to ground beef described as "75 percent lean" than to the same product labeled "25 percent fat," they have been influenced by _____.
- Which of the following is NOT a characteristic of a creative person?
 - Expertise
 - Extrinsic motivation
 - A venturesome personality
 - Imaginative thinking skills
- Children reach the one-word stage of speech development at about
 - 4 months.
 - 6 months.
 - 1 year.
 - 2 years.
- The three basic building blocks of language are _____, _____, and _____.
- When young children speak in short phrases using mostly verbs and nouns, this is referred to as _____.

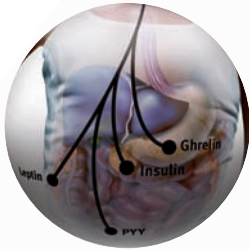
11. According to Chomsky, all languages share a(n) _____.
12. Most researchers agree that apes can
 a. communicate through symbols.
 b. reproduce most human speech sounds.
 c. master language in adulthood.
 d. surpass a human 3-year-old in language skills.
13. Charles Spearman suggested we have one _____ underlying success across a variety of intellectual abilities.
14. The existence of savant syndrome seems to support
 a. Sternberg's distinction among three types of intelligence.
 b. criticism of multiple intelligence theories.
 c. Gardner's theory of multiple intelligences.
 d. Thorndike's view of social intelligence.
15. Sternberg's three types of intelligence are _____, _____, and _____.
16. Emotionally intelligent people tend to
 a. seek immediate gratification.
 b. understand their own emotions but not those of others.
 c. understand others' emotions but not their own.
 d. succeed in their careers.
17. The IQ of a 6-year-old with a measured mental age of 9 would be
 a. 67.
 b. 133.
 c. 86.
 d. 150.
18. The Wechsler Adult Intelligence Scale (WAIS) is best able to tell us
 a. what part of an individual's intelligence is determined by genetic inheritance.
 b. whether the test-taker will succeed in a job.
 c. how the test-taker compares with other adults in vocabulary and arithmetic reasoning.
 d. whether the test-taker has specific skills for music and the performing arts.
19. The Stanford-Binet, the Wechsler Adult Intelligence Scale, and the Wechsler Intelligence Scale for Children yield consistent results, for example on retesting. In other words, these tests have high _____.
20. The strongest support for heredity's influence on intelligence is the finding that
 a. identical twins, but not other siblings, have nearly identical intelligence test scores.
 b. the correlation between intelligence test scores of fraternal twins is higher than that for other siblings.
 c. mental similarities between adopted siblings increase with age.
 d. children in impoverished families have similar intelligence scores.
21. To say that the heritability of intelligence is about 50 percent means that 50 percent of
 a. an individual's intelligence is due to genetic factors.
 b. the similarities between two groups of people are attributable to genes.
 c. the variation in intelligence within a group of people is attributable to genetic factors.
 d. intelligence is due to the mother's genes and the rest is due to the father's genes.
22. The environmental influence that has the clearest, most profound effect on intellectual development is
 a. exposing normal infants to educational DVDs before age 1.
 b. growing up in an economically disadvantaged home or neighborhood.
 c. being raised in conditions of extreme deprivation.
 d. being an identical twin.
23. In prosperous country X everyone eats all they want. In country Y the rich are well fed, but the semistarved poor are often thin. In which country will the heritability of body weight be greater?
24. _____ can lead to poor performance on tests by undermining test-takers' belief that they can do well on the test.

Find answers to these questions in Appendix E, in the back of the book.



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MOTIVATIONAL CONCEPTS

Instincts and Evolutionary Psychology
Drives and Incentives
Optimum Arousal
A Hierarchy of Motives

HUNGER

The Physiology of Hunger
The Psychology of Hunger
Obesity and Weight Control

CLOSE-UP: Waist Management

THE NEED TO BELONG

The Benefits of Belonging
The Pain of Being Shut Out
Connecting and Social Networking

CLOSE-UP: Managing Your Social
Networking

ACHIEVEMENT MOTIVATION

EMOTION: AROUSAL, BEHAVIOR, AND COGNITION

Historical Emotion Theories
Schachter-Singer Two-Factor Theory: Arousal
+ Label = Emotion
Zajonc, LeDoux, and Lazarus: Does Cognition
Always Precede Emotion?

EMBODIED EMOTION

The Basic Emotions
Emotions and the Autonomic Nervous System
The Physiology of Emotions

THINKING CRITICALLY ABOUT: Lie
Detection

EXPRESSED AND EXPERIENCED EMOTION

Detecting Emotion in Others
Gender and Emotion
Culture and Emotion
The Effects of Facial Expressions



Motivation and Emotion



After an ill-fated spring Saturday in 2003, experienced mountaineer Aron Ralston understood how motivation can energize and direct behavior. Having bagged nearly all of Colorado's tallest peaks, Ralston ventured some solo canyon hiking that seemed so risk free he didn't bother to tell anyone where he was going. In Utah's narrow Bluejohn Canyon, just 150 yards above his final rappel, he was climbing over an 800-pound rock when disaster struck: The rock shifted and pinned his right wrist and arm. He was, as the title of his book says, caught *Between a Rock and a Hard Place*.

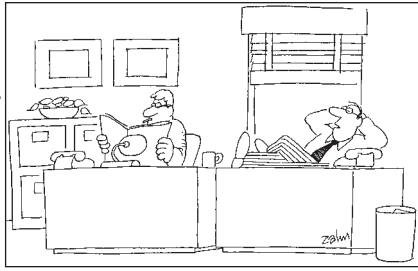
Realizing no one would be rescuing him, Ralston tried with all his might to dislodge the rock. Then, with a dull pocketknife, he tried chipping away at it. When that, too, failed, he rigged up ropes to lift the rock. Alas, nothing worked. Hour after hour, then cold night after cold night, he was stuck.

By Tuesday, he had run out of food and water. On Wednesday, as thirst and hunger gnawed, he began saving and sipping his own urine. Using his video recorder, he said good-bye to family and friends, for whom he now felt intense love: "So again love to everyone. Bring love and peace and happiness and beautiful lives into the world in my honor. Thank you. Love you."

On Thursday, surprised to find himself still alive, Ralston had a seemingly divine insight into his reproductive future, a vision of a preschool boy being scooped up by a one-armed man. With this inspiration, he summoned his remaining strength and his enormous will to live and, over the next hour, willfully broke his arm bones and then proceeded to use that dull knife to cut off his arm. He put on a tourniquet, chopped through the last piece of skin, and, after 127 hours, broke free. He then rappelled with his bleeding half-arm down a 65-foot cliff and hiked 5 miles before finding someone. He was, in his own words, "just reeling with this euphoria . . . having been dead and standing in my grave, leaving my last will and testament, etching 'Rest in peace' on the wall, all of that, gone and then replaced with having my life again. It was undoubtedly the sweetest moment that I will ever experience" (Ralston, 2004). Aron Ralston's thirst and hunger, his sense of belonging to others, and his brute will to live highlight the force of *motivation*: a need or desire that energizes behavior and directs it toward a goal. His intense emotional experiences of love and joy demonstrate the close ties between our feelings, or *emotions*, and our motivated behaviors. In this chapter, we explore both of these human forces.



© The New Yorker Collection, 2000, Bob Zohn from cartoonbank.com. All Rights Reserved.



“What do you think . . . should we get started on that motivation research or not?”

Motivational Concepts



10-1: How do psychologists define *motivation*? From what perspectives do they view motivated behavior?

Psychologists today define **motivation** as a need or desire that energizes and directs behavior. Our motivations arise from the interplay between nature (the bodily “push”) and nurture (the “pulls” from our thought processes and culture).

In their attempts to understand motivated behavior, psychologists have viewed it from four perspectives:

- *Instinct theory* (now replaced by the *evolutionary perspective*) focuses on genetically predisposed behaviors.
- *Drive-reduction theory* focuses on how we respond to our inner pushes.
- *Arousal theory* focuses on finding the right level of stimulation.
- Abraham Maslow’s *hierarchy of needs* focuses on the priority of some needs over others.

Instincts and Evolutionary Psychology

Early in the twentieth century, as the influence of Charles Darwin’s evolutionary theory grew, it became fashionable to classify all sorts of behaviors as instincts. If people criticized themselves, it was because of their “self-abasement instinct.” If they boasted, it reflected their “self-assertion instinct.” After scanning 500 books, one sociologist compiled a list of 5759 supposed human instincts! Before long, this instinct-naming fad collapsed under its own weight. Rather than *explaining* human behaviors, the early instinct theorists were simply *naming* them. It was like “explaining” a bright child’s low grades by labeling the child an “underachiever.” To name a behavior is *not* to explain it.

To qualify as an **instinct**, a complex behavior must have a fixed pattern throughout a species and be unlearned (Tinbergen, 1951). Such behaviors are common in other species (recall imprinting in birds in Chapter 4 and the return of salmon to their birthplace in Chapter 7). Some human behaviors, such as infants’ innate reflexes for rooting

Same motive, different wiring The more complex the nervous system, the more adaptable the organism. Both humans and weaverbirds satisfy their need for shelter in ways that reflect their inherited capacities. Human behavior is flexible; we can learn whatever skills we need to build a house. The bird’s behavior pattern is fixed; it can build only this kind of nest.



Annika Erickson/Getty Images



Tony Brandenburg/Bruce Coleman, Inc.

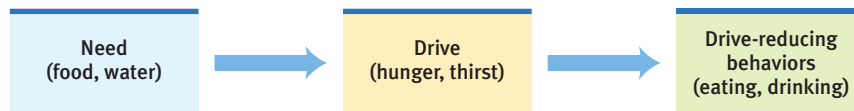
and sucking, also exhibit unlearned fixed patterns, but many more are directed by both physiological needs and psychological wants.

Instinct theory failed to explain most human motives, but its underlying assumption continues in evolutionary psychology: Genes do predispose some species-typical behavior. We saw this in Chapter 7's discussion of the limits that biological predispositions place on conditioning, and in Chapter 9's discussion of human language. Later in this chapter, we'll see how our taste preferences aid our survival. And we will see this in discussions of how evolution might influence our helping behaviors and our romantic attractions (Chapter 13), and our phobias (Chapter 14).

Drives and Incentives

When the original instinct theory of motivation collapsed, it was replaced by **drive-reduction theory**—the idea that a physiological need (food, water) creates an aroused, motivated state (a *drive*, such as hunger or thirst) that pushes the organism to reduce the need by, say, eating or drinking (**FIGURE 10.1**). With few exceptions, when a physiological need increases, so does a psychological drive.

The physiological aim of drive reduction is **homeostasis**—the maintenance of a steady internal state. An example of homeostasis (literally “staying the same”) is the body's temperature-regulation system, which works like a room's thermostat. Both systems operate through feedback loops: Sensors feed room temperature to a control device. If the room's temperature cools, the control device switches on the furnace. Likewise, if our body's temperature cools, our blood vessels constrict (to conserve warmth) and we feel driven to put on more clothes or seek a warmer environment.



Not only are we *pushed* by our need to reduce drives, we also are *pulled* by **incentives**—positive or negative environmental stimuli that lure or repel us. This is one way our individual learning histories influence our motives. Depending on our learning, the aroma of good food, whether fresh roasted peanuts or toasted ants, can motivate our behavior. So can the sight of those we find attractive or threatening.

When there is both a need and an incentive, we feel strongly driven. The food-deprived person who smells baking bread feels a strong hunger drive. In the presence of that drive, the baking bread becomes a compelling incentive. For each motive, we can therefore ask, “How is it pushed by our inborn physiological needs and pulled by incentives in the environment?”

Optimum Arousal

We are much more than homeostatic systems, however. Some motivated behaviors actually *increase* arousal. Well-fed animals will leave their shelter to explore and gain information, seemingly in the absence of any need-based drive. Curiosity drives monkeys to monkey around trying to figure out how to unlock a latch that opens nothing or how to open a window that allows them to see outside their room (Butler, 1954). It drives the 9-month-old infant to investigate every accessible corner of the house. It drives the scientists whose work this text discusses. And it drives explorers and adventurers such as Aron Ralston and George Mallory. Asked why he wanted to climb Mount Everest, Mallory answered, “Because it is there.” Those who, like Mallory and Ralston, enjoy high arousal are most likely to seek out intense music, novel foods, and risky behaviors (Zuckerman, 1979, 2009). They are “sensation-seekers.”

motivation a need or desire that energizes and directs behavior.

instinct a complex behavior that is rigidly patterned throughout a species and is unlearned.

drive-reduction theory the idea that a physiological need creates an aroused tension state (a *drive*) that motivates an organism to satisfy the need.

homeostasis a tendency to maintain a balanced or constant internal state; the regulation of any aspect of body chemistry, such as blood glucose, around a particular level.

incentive a positive or negative environmental stimulus that motivates behavior.

FIGURE 10.1

Drive-reduction theory Drive-reduction motivation arises from *homeostasis*—an organism's natural tendency to maintain a steady internal state. Thus, if we are water deprived, our thirst drives us to drink and to restore the body's normal state.

Driven by curiosity Baby monkeys and young children are fascinated by things they've never experienced before. Their drive to explore the relatively unfamiliar is one of several motives that do not fill any immediate physiological need.



Hartlow Primate Laboratory, University of Wisconsin

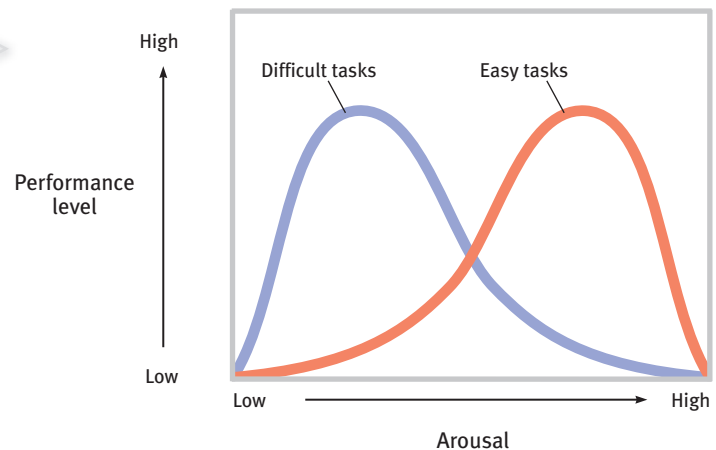


©Robert Brenner/PhotoEdit

So, human motivation aims not to eliminate arousal but to seek optimum levels of arousal. Having all our biological needs satisfied, we feel driven to experience stimulation and we hunger for information. We are “infovores,” said neuroscientists Irving Biederman and Edward Vessel (2006), after identifying brain mechanisms that reward us for acquiring information. Lacking stimulation, we feel bored and look for a way to increase arousal to some optimum level. However, with too much stimulation comes stress, and we then look for a way to decrease arousal.

Two early-twentieth-century psychologists studied the relationship of arousal to performance and identified what we now call the **Yerkes-Dodson law**, suggesting that moderate arousal would lead to optimal performance (Yerkes & Dodson, 1908). When taking an exam, for example, it pays to be moderately aroused—alert but not trembling with nervousness. We have since learned that optimal arousal levels depend upon the task as well, with more difficult tasks requiring lower arousal for best performance (Hembree, 1988) (**FIGURE 10.2**).

FIGURE 10.2
Arousal and performance



RETRIEVE IT

- Performance peaks at lower levels of arousal for difficult tasks, and at higher levels for easy or well-learned tasks. (1) How might this phenomenon affect runners? (2) How might this phenomenon affect anxious test-takers facing a difficult exam? (3) How might the performance of anxious students be affected by relaxation training?

ANSWERS: (1) Runners tend to excel when aroused by competition. (2) High anxiety in test-takers may disrupt their performance. (3) Teaching anxious students how to relax before an exam can enable them to perform better (Hembree, 1988).

Yerkes-Dodson law the principle that performance increases with arousal only up to a point, beyond which performance decreases.

A Hierarchy of Motives

Some needs take priority over others. At this moment, with your needs for air and water hopefully satisfied, other motives—such as your desire to achieve—are energizing and directing your behavior. Let your need for water go unsatisfied and your thirst will preoccupy you. Just ask Aron Ralston. Deprived of air, your thirst would disappear.

Abraham Maslow (1970) described these priorities as a **hierarchy of needs** (FIGURE 10.3). At the base of this pyramid are our physiological needs, such as those for food and water. Only if these needs are met are we prompted to meet our need for safety, and then to satisfy the uniquely human needs to give and receive love and to enjoy self-esteem. Beyond this, said Maslow (1971), lies the need for *self-actualization*, to realize one's full potential. (More on self-esteem and self-actualization in Chapter 12.)

Near the end of his life, Maslow proposed that some of us also reach a level of self-transcendence. At the self-actualization level, we seek to realize our *own* potential. At the *self-transcendence* level, we strive for meaning, purpose, and communion that are transpersonal, beyond the self (Koltko-Rivera, 2006).

Maslow's hierarchy is somewhat arbitrary: The order of such needs is not universally fixed. People have starved themselves to make a political statement. Culture also matters: Self-esteem matters most in individualist nations, whose citizens tend to focus more on personal achievements than on family and community identity (Oishi et al., 1999). And, while agreeing with Maslow's basic levels of need, today's evolutionary psychologists note that gaining and retaining mates and parenting offspring are also universal human motives (Kenrick et al., 2010).

Nevertheless, the simple idea that some motives are more compelling than others provides a framework for thinking about motivation. Worldwide life-satisfaction surveys support this basic idea (Oishi et al., 1999; Tay & Diener, 2011). In poorer nations that lack easy access to money and the food and shelter it buys, financial satisfaction more strongly predicts feelings of well-being. In wealthy nations, where most are able to meet basic needs, home-life satisfaction is a better predictor.

Let's take a closer look now at three specific motives, beginning at the basic level with *hunger* and working up to higher-level needs: the *need to belong* and the *need to achieve*. As you read about these motives, watch for ways that incentives (the psychological “pull”) interact with physiological needs (the biological “push”).

hierarchy of needs Maslow's pyramid of human needs, beginning at the base with physiological needs that must first be satisfied before higher-level safety needs and then psychological needs become active.

“Hunger is the most urgent form of poverty.”

Alliance to End Hunger, 2002

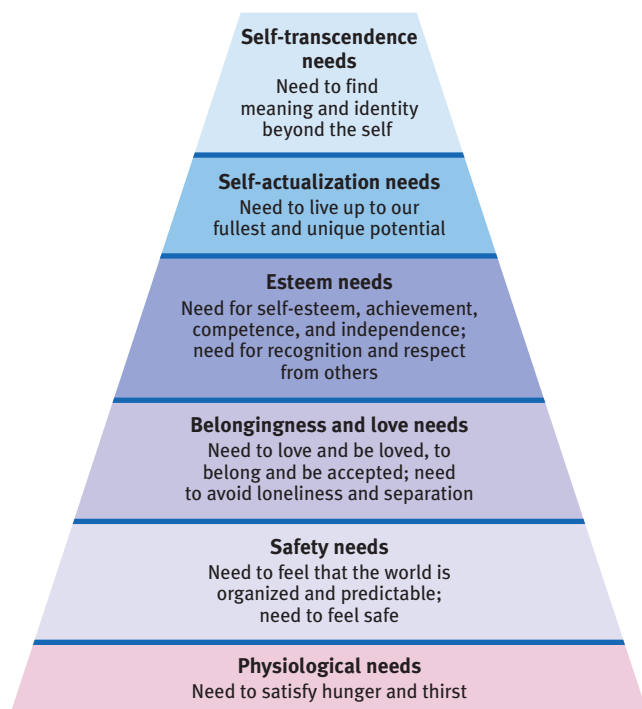


FIGURE 10.3

Maslow's hierarchy of needs Once our lower-level needs are met, we are prompted to satisfy our higher-level needs. (From Maslow, 1970.) For survivors of the disastrous tornadoes that swept across the Midwest and Southeastern United States in 2011, satisfying very basic needs for water, food, and safety became top priority. Higher-level needs on Maslow's hierarchy, such as respect, self-actualization, and meaning, become far less important during such times.



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RETRIEVE IT

- How do instinct theory, drive-reduction theory, and arousal theory contribute to our understanding of motivated behavior?

ANSWER: Instincts and evolutionary psychology help explain the genetic basis for our unlearned, species-typical behaviors. From drive-reduction theory we know that our physiological needs (such as hunger) create an aroused state that drives us to reduce the need (for example by eating). Arousal theory suggests we need to maintain an optimal level of arousal, which helps explain our motivation toward behaviors that meet no physiological need.

- After hours of driving alone in an unfamiliar city, you finally see a diner. Although it looks deserted and a little creepy, you stop because you are *really* hungry. How would Maslow's hierarchy of needs explain your behavior?

ANSWER: According to Maslow, our drives to meet the physiological needs of hunger and thirst take priority over safety needs, prompting us to take risks at times in order to eat.

Hunger

The power of physiological needs was vividly demonstrated when Ancel Keys (the creator of Army K rations) and his research team (1950) conducted a now-classic study of semistarvation. They first fed 36 male volunteers (all wartime conscientious objectors) just enough to maintain their initial weight. Then, for six months, they cut this food level in half. The effects soon became visible. Without thinking about it, the men began conserving energy. They appeared sluggish and dull. After dropping rapidly, their body weights stabilized at about 25 percent below their starting point.

As Maslow might have guessed, the men became food obsessed. They talked food. They daydreamed food. They collected recipes, read cookbooks, and feasted their eyes on delectable forbidden food. Preoccupied with their unmet basic need, they lost interest in sex and social activities. As one man reported, “If we see a show, the most interesting part of it is contained in scenes where people are eating. I couldn’t laugh at the funniest picture in the world, and love scenes are completely dull.”

The semistarved men’s preoccupations illustrate how activated motives can hijack our consciousness. As journalist Dorothy Dix (1861–1951) observed, “Nobody wants to kiss when they are hungry.” When we’re hungry, thirsty, fatigued, or sexually aroused, little else seems to matter. When we’re not, food, water, sleep, or sex just doesn’t seem like that big a thing in life, now or ever.

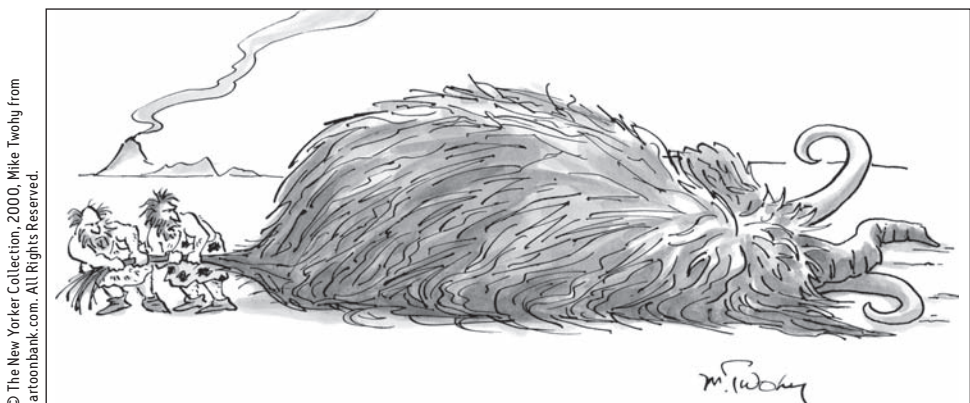
In studies, people in a motivational “hot” state (from fatigue, hunger, or sexual arousal) have easily recalled such feelings in their own past and have perceived them as driving forces in others’ behavior (Nordgren et al., 2006, 2007). (You may recall from Chapter 8 a parallel effect of our current good or bad mood on our memories.) Grocery shop with an empty stomach and you are more likely to see those jelly-filled doughnuts as just what you’ve always loved and will be wanting tomorrow. *Motives matter mightily.*

“Nature often equips life’s essentials—sex, eating, nursing—with built-in gratification.”

Frans de Waal, “Morals Without God?” 2010

“The full person does not understand the needs of the hungry.”

Irish proverb



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“Never hunt when you’re hungry.”

The Physiology of Hunger



10-2: What physiological factors produce hunger?

Deprived of a normal food supply, Keys' semistarved volunteers were clearly hungry. But what precisely triggers hunger? Are the pangs of an empty stomach the source of hunger? So it seemed to A. L. Washburn. Working with Walter Cannon (Cannon & Washburn, 1912), Washburn agreed to swallow a balloon attached to a recording device (**FIGURE 10.4**). When inflated to fill his stomach, the balloon transmitted his stomach contractions. Washburn supplied information about his *feelings* of hunger by pressing a key each time he felt a hunger pang. The discovery: Washburn was indeed having stomach contractions whenever he felt hungry.

Can hunger exist without stomach pangs? To answer that question, researchers removed some rats' stomachs and created a direct path to their small intestines (Tsang, 1938). Did the rats continue to eat? Indeed they did. Some hunger persists similarly in humans whose stomachs have been removed as a treatment for ulcers or cancer. So the pangs of an empty stomach are not the *only* source of hunger. What else might trigger hunger?

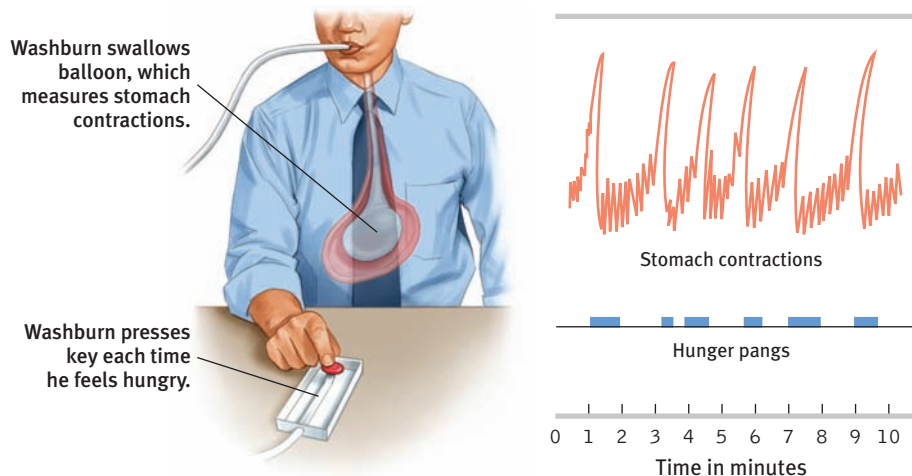


FIGURE 10.4
Monitoring stomach contractions Using this procedure, Washburn showed that stomach contractions (transmitted by the stomach balloon) accompany feelings of hunger (indicated by a key press). (From Cannon, 1929.)

Body Chemistry and the Brain

Somehow, somewhere, your body is keeping tabs on the energy it takes in and the energy it uses. If this weren't true, you would be unable to maintain a stable body weight. A major resource of energy in your body is the blood sugar **glucose**. If your blood glucose level drops, you won't consciously feel this change, but your stomach, intestines, and liver will signal your brain to motivate eating. Your brain, which is automatically monitoring your blood chemistry and your body's internal state, will then trigger hunger.

How does the brain integrate these messages and sound the alarm? The work is done by several neural areas, some housed deep in the brain within the hypothalamus (**FIGURE 10.5**). This neural traffic intersection includes areas that influence eating. For example, one neural arc (called the *arcuate nucleus*) has a center that secretes appetite-stimulating hormones, and another center that secretes appetite-suppressing hormones. Explorations of this neural area and others reveal that when an appetite-enhancing center is stimulated electrically, well-fed animals begin to eat. If the area is destroyed, even starving animals have no interest in food. The opposite occurs when an appetite-suppressing area is stimulated: Animals will stop eating. Destroy this area and animals become extremely fat (Duggan & Booth, 1986; Hoebel & Teitelbaum, 1966) (**FIGURE 10.6** on the next page).

FIGURE 10.5
The hypothalamus As we saw in Chapter 2, the hypothalamus (colored red) performs various body maintenance functions, including control of hunger.

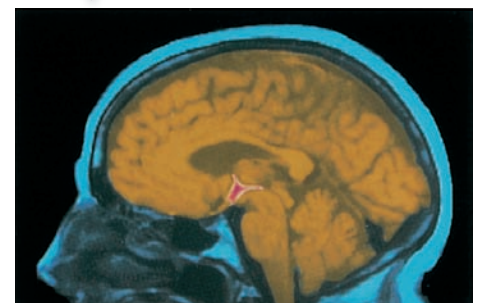


FIGURE 10.6

Evidence for the brain's control of eating Destroying an appetite-suppressing area of the hypothalamus caused this rat's weight to triple.



Richard Howard

Over the next 40 years you will eat about 20 tons of food. If, during those years, you increase your daily intake by just .01 ounce more than required for your energy needs, you will gain an estimated 24 pounds (Martin et al., 1991).

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"Never get a tattoo when you're drunk and hungry."

FIGURE 10.7

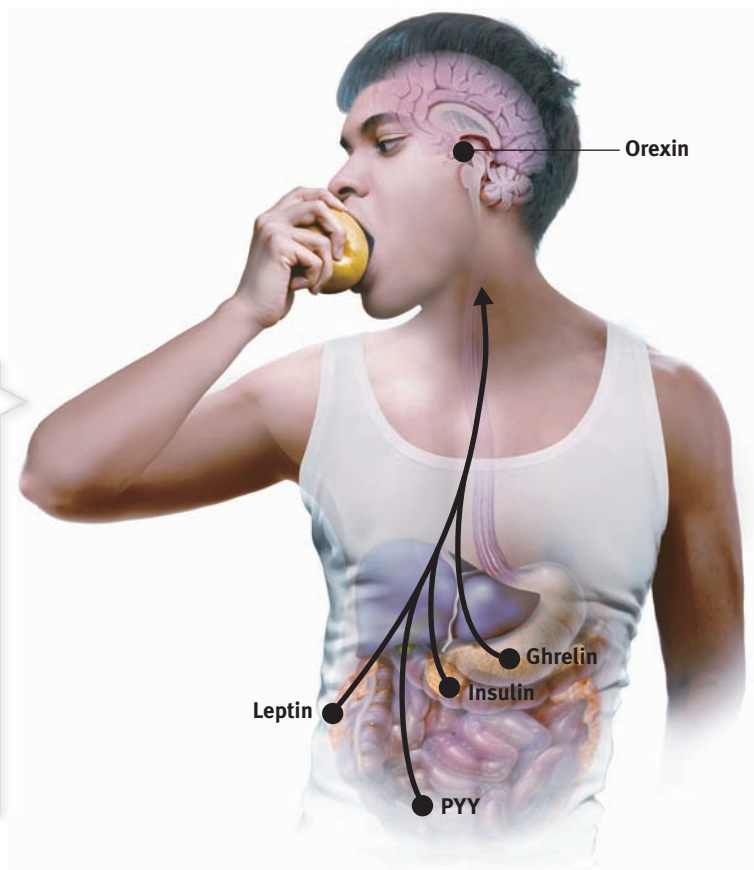
The appetite hormones

- **Insulin:** Hormone secreted by pancreas; controls blood glucose.
- **Ghrelin:** Hormone secreted by empty stomach; sends "I'm hungry" signals to the brain.
- **Leptin:** Protein hormone secreted by fat cells; when abundant, causes brain to increase metabolism and decrease hunger.
- **Orexin:** Hunger-triggering hormone secreted by hypothalamus.
- **PYY:** Digestive tract hormone; sends "I'm not hungry" signals to the brain.

Blood vessels supply the hypothalamus, enabling it to respond to our current blood chemistry as well as to incoming neural information about the body's state. One of its tasks is monitoring levels of appetite hormones, such as *ghrelin*, a hunger-arousing hormone secreted by an empty stomach. During bypass surgery for severe obesity, surgeons seal off part of the stomach. The remaining stomach then produces much less ghrelin, and the person's appetite lessens (Lemonick, 2002). Other appetite hormones include *insulin*, *leptin*, *orexin*, and *PYY*; **FIGURE 10.7** describes how they influence your feelings of hunger.

The interaction of appetite hormones and brain activity suggests that the body has some sort of "weight thermostat." When semistarved rats fall below their normal weight, this system signals the body to restore the lost weight. The rats' hunger increases and their energy output decreases. If body weight rises—as happens when rats are force fed—hunger decreases and energy expenditure increases. In this way, rats (and humans) tend to hover around a stable weight, or **set point**, influenced in part by heredity (Keesey & Corbett, 1983).

We humans (and other species, too) vary in our **basal metabolic rate**, a measure of how much energy we use to maintain basic body functions when our body is at rest. But we share a common response to decreased food intake: Our basal metabolic rate drops, as it did for participants in Keys' experiment. After 24 weeks of semistarvation, they stabilized at three-quarters of their normal weight, although they were taking in only *half* their previous calories. How did their bodies achieve this dieter's nightmare? They reduced their energy expenditure, partly by being less active, but partly by dropping their basal metabolic rate by 29 percent.



Some researchers have suggested that the idea of a biologically *fixed* set point is too rigid to explain some things. One thing it doesn't address is that slow, sustained changes in body weight can alter a person's set point (Assanand et al., 1998). Another is that when we have unlimited access to a wide variety of tasty foods, we tend to overeat and gain weight (Raynor & Epstein, 2001). And set points don't explain why psychological factors influence hunger. For all these reasons, some prefer the looser term *settling point* to indicate the level at which a person's weight settles in response to caloric intake and energy use. As we will see next, these factors are influenced by environment as well as biology.

RETRIEVE IT

- Hunger occurs in response to _____ (low/high) blood glucose and _____ (low/high) levels of ghrelin.

ANSWERS: low; high

The Psychology of Hunger



10-3: What cultural and situational factors influence hunger?

We have seen that our eagerness to eat is pushed by our body chemistry and brain activity. Yet there is more to hunger than meets the stomach. This was strikingly apparent when trickster researchers tested two patients who had no memory for events occurring more than a minute ago (Rozin et al., 1998). If offered a second lunch 20 minutes after eating a normal lunch, both patients readily consumed it . . . and usually a third meal offered 20 minutes after they finished the second. This suggests that one part of our decision to eat is our memory of the time of our last meal. As time passes, we think about eating again, and those thoughts trigger feelings of hunger.

Taste Preferences: Biology and Culture

Body chemistry and environmental factors together influence not only the when of hunger, but also the what—our taste preferences. When feeling tense or depressed, do you crave starchy, carbohydrate-laden foods? Carbohydrates such as pasta, chips, and sweets help boost levels of the neurotransmitter serotonin, which has calming effects. When stressed, even rats find it extra rewarding to scarf Oreos (Artiga et al., 2007; Boggiano et al., 2005).

Our preferences for sweet and salty tastes are genetic and universal, but conditioning can intensify or alter those preferences. People given highly salted foods may develop a liking for excess salt (Beauchamp, 1987). People sickened by a food may develop an aversion to it. (The frequency of children's illnesses provides many chances for them to learn to avoid certain foods.)

Our culture teaches us that some foods are acceptable but others are not. Bedouins enjoy eating the eye of a camel, which most North Americans would find repulsive. North Americans and Europeans also shun horse, dog, and rat meat, all of which are prized elsewhere.

But there is biological wisdom to many of our taste preferences. Environments can influence the human genetics that affect diet and taste. In places where agriculture has produced milk, for example, survival patterns have favored people with lactose tolerance (Arjamaa & Vuorisalo, 2010). And in hot climates (where foods spoil more quickly) recipes often include spices that inhibit the growth of bacteria (**FIGURE 10.8** on the next page). India averages nearly 10 spices per meat recipe; Finland, 2 spices. Pregnancy's food dislikes—and the nausea associated with them—peak about the tenth week, when the developing embryo is most vulnerable to toxins.

set point the point at which your “weight thermostat” is supposedly set. When your body falls below this weight, increased hunger and a lowered metabolic rate may combine to restore the lost weight.

basal metabolic rate the body's resting rate of energy expenditure.

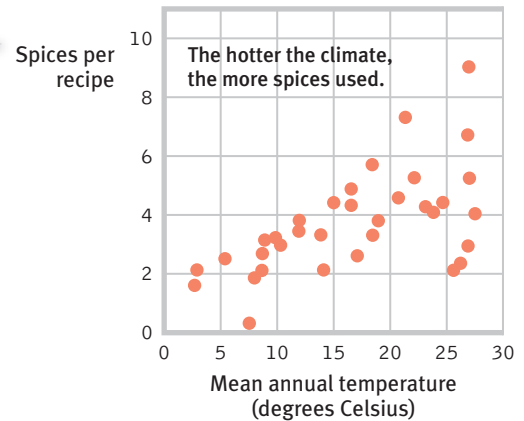
An acquired taste People everywhere learn to enjoy the fatty, bitter, or spicy foods common in their culture. For Yupik Alaska Natives (left), but not for most other North Americans, *akutaq* (sometimes called “Eskimo ice cream”), traditionally made with reindeer fat, seal oil, and wild berries, is a tasty treat. For Peruvians, roasted guinea pig (right) is similarly delicious.



AP Photo/Al Grillo

Jeffrey Jackson/Alamy

FIGURE 10.8
Hot cultures like hot spices



Rats tend to avoid unfamiliar foods (Sclafani, 1995). So do we, especially those that are animal based. This *neophobia* (dislike of things unfamiliar) surely was adaptive for our ancestors by protecting them from potentially toxic substances. In time, though, most people who repeatedly sample an initially novel fruit drink or ethnic food come to appreciate the new taste (Pliner, 1982, Pliner et al., 1993).

Situational Influences on Eating

To a surprising extent, situations also control our eating—a phenomenon psychologists have called the *ecology of eating*. Here are three situations you may have noticed but underestimated:

- Do you eat more when eating with others? Most of us do (Herman et al., 2003; Hetherington et al., 2006). After a party, you may realize you've overeaten. This happens because the presence of others tends to amplify our natural behavior tendencies. (You'll hear more about *social facilitation* in Chapter 13.)
- *Unit bias* occurs with similar mindlessness. Working with researchers at France's National Center for Scientific Research, Andrew Geier and his colleagues (2006) explored a possible explanation of why French waistlines are smaller than American waistlines. From soda drinks to yogurt sizes, the French offer foods in smaller portion sizes. Does it matter? (One could as well order two small sandwiches as one large one.) To find out, the investigators offered people varieties of free snacks. For example, in the lobby of an apartment house, they laid out either full or half pretzels, big or little Tootsie Rolls, or a big bowl of M&M's with either a small or large serving scoop. Their consistent result: Offered a supersized standard portion, people put away more calories. In other studies (Wansink, 2006, 2007), even nutrition experts helped themselves to 31 percent more ice cream when given a big bowl rather than a small one, and 15 percent more when scooping with a big rather than a small scoop. Portion size matters.
- *Food variety* also stimulates eating. Offered a dessert buffet, we eat more than we do when asked to choose a portion from one favorite dessert. For our early ancestors, these behaviors were adaptive. When foods were abundant and varied, eating more provided a wide range of vitamins and minerals and produced fat that protected them during winter cold or famine. When a bounty of varied foods was unavailable, eating less extended the food supply until winter or famine ended (Polivy et al., 2008; Remick et al., 2009).

RETRIEVE IT

- After an eight-hour hike without food, your long-awaited favorite dish is placed in front of you, and your mouth waters in anticipation. Why?

ANSWER: You have learned to respond to the sight and aroma that signal the food about to enter your mouth. Both physiological cues (low blood sugar) and psychological cues (anticipation of the tasty meal) heighten your experienced hunger.

Obesity and Weight Control



10-4: What factors predispose some people to become and remain obese?

Obesity can be socially toxic, by affecting both how you are treated and how you feel about yourself. Obesity has been associated with lower psychological well-being, especially among women, and increased risk of depression (de Wit et al., 2010; Luppino et al., 2010; Mendes, 2010). Obese 6- to 9-year-olds are 60 percent more likely to suffer bullying (Lumeng et al., 2010). And, as we will see, obesity has physical health risks as well. Yet few overweight people win the battle of the bulge. Why? And why do some people gain weight while others eat the same amount and seldom add a pound?

The Physiology of Obesity

Our bodies store fat for good reasons. Fat is an ideal form of stored energy—a high-calorie fuel reserve to carry the body through periods when food is scarce—a common occurrence in our prehistoric ancestors' world. No wonder that in many developing societies today (as in Europe in earlier centuries) people find heavier bodies attractive: Obesity signals affluence and social status (Furnham & Baguma, 1994; Swami et al., 2011).

In parts of the world where food and sweets are now abundantly available, the rule that once served our hungry distant ancestors—*When you find energy-rich fat or sugar, eat it!*—has become dysfunctional. Pretty much everywhere this book is being read, people have a growing problem. The World Health Organization (WHO) (2007) has estimated that more than 1 billion people worldwide are overweight, and 300 million of them are clinically *obese*, defined by the WHO as a *body mass index* (BMI) of 30 or more. (See cdc.gov/healthyweight/assessing/bmi to calculate your BMI.) In the United States, the adult obesity rate has more than doubled in the last 40 years, reaching 34 percent, and child-teen obesity has quadrupled (Flegal et al., 2010).

Significant obesity increases the risk of diabetes, high blood pressure, heart disease, gallstones, arthritis, and certain types of cancer, thus increasing health care costs and shortening life expectancy (de Gonzales et al., 2010; Jarrett et al., 2010; Sun, 2009). Recent research also has linked women's obesity to their risk of late-life cognitive decline, including Alzheimer's disease and brain tissue loss (Bruce-Keller et al., 2009; Whitmer et al., 2008). One experiment found improved memory performance 12 weeks after severely obese people had weight-loss surgery and lost significant weight. Those not having the surgery showed some further cognitive decline (Gunstad et al., 2011).

Research on the physiology of obesity challenges the stereotype of severely overweight people being weak-willed gluttons.

Set Point and Metabolism Once we become fat, we require less food to maintain our weight than we did to attain it. Fat has a lower metabolic rate than does muscle—it takes less food energy to maintain. When an overweight person's body drops below its previous set (or settling) point, the person's hunger increases and metabolism decreases. Thus, the body adapts to starvation by burning off fewer calories.

Lean people also seem naturally disposed to move about. They burn more calories than do energy-conserving overweight people who tend to sit still longer (Levine et al., 2005). These individual differences in resting metabolism help explain why two people of the same height, age, and activity level can maintain the same weight, even if one of them eats much less than the other does.

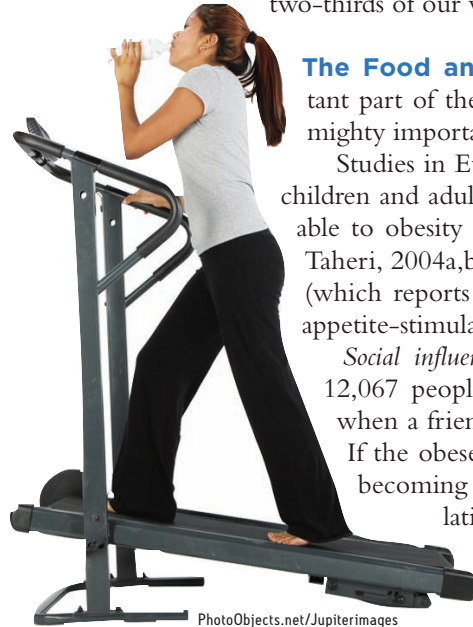
The Genetic Factor Do our genes predispose us to fidget or sit still? Studies do reveal a genetic influence on body weight. Consider two examples:

- Despite shared family meals, adoptive siblings' body weights are uncorrelated with one another or with those of their adoptive parents. Rather, people's weights resemble those of their biological parents (Grilo & Pogue-Geile, 1991).

"Americans, on average, report that they weigh 177 pounds, but would like to weigh 161."

Elizabeth Mendes, www.gallup.com, 2010

- Identical twins have closely similar weights, even when reared apart (Hjelmberg et al., 2008; Plomin et al., 1997). Across studies, their weight correlates $+ .74$. The much lower $+ .32$ correlation among fraternal twins suggests that genes explain two-thirds of our varying body mass (Maes et al., 1997).



PhotoObjects.net/Jupiterimages

The Food and Activity Factors Genes tell an important part of the obesity story. But environmental factors are mighty important, too.

Studies in Europe, Japan, and the United States show that children and adults who suffer from *sleep loss* are more vulnerable to obesity (Keith et al., 2006; Nedeltcheva et al., 2010; Taheri, 2004a,b). With sleep deprivation, the levels of leptin (which reports body fat to the brain) fall, and ghrelin (the appetite-stimulating stomach hormone) rise.

Social influence is another factor. One 32-year study of 12,067 people found them most likely to become obese when a friend became obese (Christakis & Fowler, 2007).

If the obese friend was a close one, the odds of likewise becoming obese almost tripled. Moreover, the correlation among friends' weights was not simply a matter of seeking out similar people as friends. Friends matter.

The strongest evidence that environment influences weight comes from *our fattening world* (FIGURE 10.9). What explains this growing problem? Changing *food consumption* and *activity levels* are at work. We are eating more and moving less, with lifestyles approaching those of animal feedlots (where farmers fatten inactive animals). In the United States, jobs requiring moderate physical activity declined from about 50 percent in 1960 to 20 percent in 2011 (Church et al., 2011).

The “bottom” line: New stadiums, theaters, and subway cars—but not airlines—are widening seats to accommodate the girth growth (Hampson, 2000; Kim & Tong, 2010). Washington State Ferries abandoned a 50-year-old standard: “Eighteen-inch butts are a thing of the past” (Shepherd, 1999). New York City, facing a large problem with Big Apple bottoms, has mostly replaced 17.5-inch bucket-style subway seats with bucketless seats (Hampson, 2000). In the end, today's people need more room.

Note how these findings reinforce a familiar lesson from Chapter 9's study of intelligence: There can be high levels of heritability (genetic influence on individual differences) without heredity explaining group differences. Genes mostly determine why one person today is heavier than another. Environment mostly determines why people today

“We put fast food on every corner, we put junk food in our schools, we got rid of [physical education classes], we put candy and soda at the checkout stand of every retail outlet you can think of. The results are in. It worked.”

Harold Goldstein, Executive Director of the California Center for Public Health Advocacy, 2009, when imagining a vast U.S. national experiment to encourage weight gain

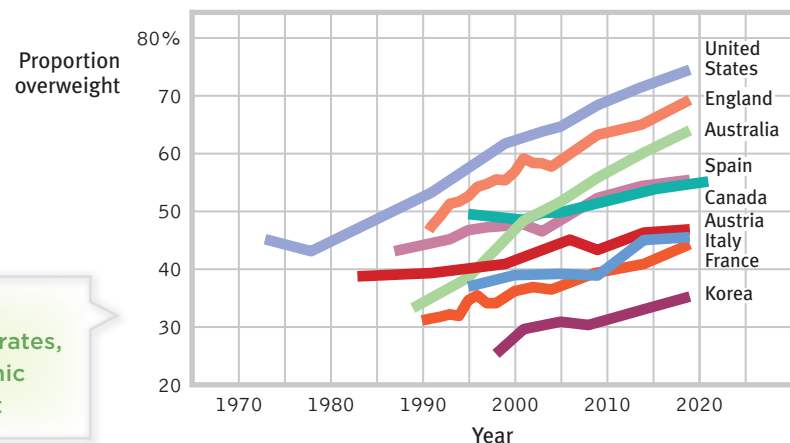


FIGURE 10.9
Past and projected overweight rates, by the Organisation for Economic Co-operation and Development

CLOSE UP:

Waist Management

Perhaps you are shaking your head: “Slim chance I have of becoming and staying thin.” People struggling with obesity are well advised to seek medical evaluation and guidance. For others who wish to take off a few pounds, researchers have offered these tips.

Begin only if you feel motivated and self-disciplined. For most people, permanent weight loss requires making a career of staying thin—a lifelong change in eating habits combined with increased exercise.

Exercise and get enough sleep. Inactive people are often overweight (FIGURE 10.10). Especially when supported by 7 to 8 hours of sleep a night, exercise empties fat cells, builds muscle, speeds up metabolism, and helps lower your settling point (Bennett, 1995; Kolata, 1987; Thompson et al., 1982).

Minimize exposure to tempting food cues. Food shop only on a full stomach. Keep tempting foods out of the house, and store other appealing foods out of sight.

Limit variety and eat healthy foods. Given more variety, people consume more; eat simple meals with whole grains, fruits, and vegetables. Healthy fats, such as those found in olive oil and fish, help regulate appetite and artery-clogging cholesterol (Taubes, 2001, 2002). Better crispy greens than Krispy Kremes.

Reduce portion sizes. Serve food with smaller bowls, plates, and utensils.

Don't starve all day and eat one big meal at night. This eating pattern, common among overweight people, slows metabolism. Moreover, those who eat a balanced breakfast are,

by late morning, more alert and less fatigued (Spring et al., 1992).

Beware of the binge. Especially for men, eating slowly can lead to eating less (Martin et al., 2007). Among people who do consciously restrain their eating, drinking alcohol or feeling anxious or depressed can unleash the urge to eat (Herman & Polivy, 1980).

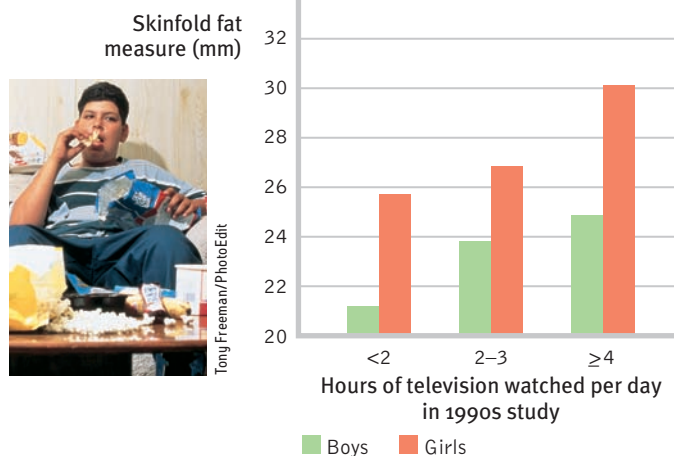
Before eating with others, decide how much you want to eat. Eating with friends can distract us from monitoring our own eating (Ward & Mann, 2000).

Remember, most people occasionally lapse. A lapse need not become a full collapse.

Connect to a support group. Join with others, either face-to-face or online, with whom you can share your goals and progress (Freedman, 2011).

FIGURE 10.10

American idle: Couch potatoes beware—TV watching correlates with obesity As lifestyles have become more sedentary and TV watching has increased, so has the percentage of overweight people in Britain, Canada, and the United States (Pagani et al., 2010). When California children were placed in a TV-reduction educational program, they watched less—and lost weight (Robinson, 1999). Don't watch TV? Then watch out for other screen time that keeps your motor idling.



are heavier than their counterparts 50 years ago. Our eating behavior also demonstrates the now-familiar interaction among biological, psychological, and social-cultural factors. For tips on shedding unwanted pounds, see Close-Up: Waist Management.

RETRIEVE IT

- Which THREE of the following five strategies help prevent unwanted weight gain?
 - a. Proper sleep
 - b. Regular exercise
 - c. Eating the heaviest meal in the evening
 - d. Eating with friends
 - e. Joining a support group

ANSWERS: a., b., e.

The Need to Belong



10-5: What evidence points to our human need to belong?

The social stigma attached to obesity may bother an overweight person as much as, or more than, the health concerns. Why? We are what Greek philosopher Aristotle called *the social animal*. Cut off from friends or family—alone in prison or at a new school or in a foreign land—most people feel keenly their lost connections with important others. This deep *need to belong* seems to be a basic human motivation (Baumeister & Leary, 1995). We have a need to affiliate with others, even to become strongly attached to certain others in enduring, close relationships. Human beings, contended personality theorist Alfred Adler, have an “urge to community” (Ferguson, 1989, 2001, 2010). Our psychological needs drive our adaptive behaviors and, when satisfied, enhance our psychological well-being (Sheldon, 2011).

The Benefits of Belonging

Social bonds boosted our early ancestors’ chances of survival. Adults who formed attachments were more likely to reproduce and to co-nurture their offspring to maturity. Attachment bonds helped keep those children close to their caregivers, protecting them from many threats. Indeed, to be “wretched” literally means, in its Middle English origin (*wreche*), to be without kin nearby.

Cooperation also enhanced survival. In solo combat, our ancestors were not the toughest predators. But as hunters, they learned that six hands were better than two. As food gatherers, they gained protection from two-footed and four-footed enemies by traveling in groups. Those who felt a need to belong survived and reproduced most successfully, and their genes now predominate. We are innately social creatures. People in every society on Earth belong to groups and (as Chapter 13 explains) prefer and favor “us” over “them.”

Do you have close friends—people with whom you freely disclose your ups and downs? Having someone who rejoices with us over good news helps us feel even better about the good news, as well as about the friendship (Reis et al., 2010). The need to belong runs deeper, it seems, than any need to be rich. One study found that *very* happy university students were distinguished not by their money but by their “rich and satisfying close relationships” (Diener & Seligman, 2002).

The need to belong colors our thoughts and emotions. We spend a great deal of time thinking about actual and hoped-for relationships. When relationships form, we often feel joy. Falling in mutual love, people have been known to feel their cheeks ache from their irrepressible grins. Asked, “What is necessary for your happiness?” or “What is it that makes your life meaningful?” most people have mentioned—before anything else—close, satisfying relationships with family, friends, or romantic partners (Berscheid, 1985). Happiness hits close to home.

Consider: What was your most satisfying moment in the past week? Researchers asked that question of American and South Korean collegians, then asked them to rate how much that moment had satisfied various needs (Sheldon et al., 2001). In both countries, the peak moment had contributed most to satisfaction of self-esteem and relatedness-belonging needs. When our need for relatedness is satisfied in balance with two other basic psychological needs—*autonomy* (a sense of personal control) and *competence*—we experience a deep sense of well-being, and our self-esteem rides high (Deci & Ryan, 2002, 2009; Milyavskaya et al., 2009; Sheldon & Niemiec, 2006). Indeed, *self-esteem* is a gauge of how valued and accepted we feel (Leary et al., 1998).

Is it surprising, then, that so much of our social behavior aims to increase our feelings of belonging? To gain acceptance, we generally conform to group standards. We monitor our behavior, hoping to make a good impression. We spend billions on clothes, cosmetics, and diet and fitness aids—all motivated by our search for love and acceptance.

“We must love one another or die.”

W. H. Auden “September 1, 1939”



Photodisc

By drawing a sharp circle around “us,” the need to belong feeds both deep attachments and menacing threats. Out of our need to define a “we” come loving families, faithful friendships, and team spirit, but also teen gangs, ethnic rivalries, and fanatic nationalism.

For good or for bad, we work hard to build and maintain our relationships. Familiarity breeds liking, not contempt. Thrown together in groups at school, at work, in a tornado shelter, we behave like magnets, moving closer, forming bonds. Parting, we feel distress. We promise to call, to write, to come back for reunions.

This happens in part because feelings of love activate brain reward and safety systems. In one experiment involving exposure to heat, deeply-in-love university students felt markedly less pain when looking at their beloved’s picture (rather than viewing someone else’s photo or being distracted by a word task) (Younger et al., 2010). Pictures of our loved ones also activate a brain region associated with safety—the prefrontal cortex—that dampens feelings of physical pain (Eisenberger et al., 2011). Love is a natural painkiller.

Even when bad relationships break, people suffer. In one 16-nation survey, and in repeated U.S. surveys, separated and divorced people have been half as likely as married people to say they were “very happy” (Inglehart, 1990; NORC, 2010). After such separations, loneliness and anger—and sometimes even a strange desire to be near the former partner—linger. For those in abusive relationships, the fear of being alone sometimes seems worse than the certainty of emotional or physical pain.

Children who move through a series of foster homes or through repeated family relocations know the fear of being alone. After repeated disruption of budding attachments, they may have difficulty forming deep attachments (Oishi & Schimmack, 2011). The evidence is clearest at the extremes—the children who grow up in institutions without a sense of belonging to anyone, or who are locked away at home and severely neglected. Too many become withdrawn, frightened, speechless. Feeling insecurely attached to others during childhood can persist into adulthood, in two main forms (Fraley et al., 2011). Some display *insecure anxious attachment*, constantly craving acceptance but remaining vigilant to signs of possible rejection. Others are trapped in *insecure avoidant attachment*, feeling such discomfort over getting close to others that they employ avoidant strategies to maintain their distance.

No matter how secure our early years were, we all experience anxiety, loneliness, jealousy, or guilt when something threatens or dissolves our social ties. Much as life’s best moments occur when close relationships begin—making a new friend, falling in love, having a baby—life’s worst moments happen when close relationships end (Jaremka et al., 2011). Bereaved, we may feel life is empty, pointless. Even the first weeks living on a college campus away from home can be distressing.

For immigrants and refugees moving alone to new places, the stress and loneliness can be depressing. After years of placing individual families in isolated communities, U.S. immigration policies began to encourage *chain migration* (Pipher, 2002). The second refugee Sudanese family settling in a town generally has an easier adjustment than the first.

Social isolation can put us at risk for mental decline and ill health (Cacioppo & Hawkley, 2009). But if feelings of acceptance and connection increase, so will self-esteem, positive feelings, and the desire to help rather than hurt others (Blackhart et al., 2009; Buckley & Leary, 2001).

The Pain of Being Shut Out

Can you recall feeling excluded or ignored or shunned? Perhaps you received the silent treatment. Perhaps people avoided you or averted their eyes in your presence or even mocked you behind your back. If you are like others, even being in a group speaking a different language may have left you feeling excluded, a linguistic outsider (Dotan-Eliaz,



AP/Wide World Photos

The need to connect Six days a week, women from the Philippines work as “domestic helpers” in 154,000 Hong Kong households. On Sundays, they throng to the central business district to picnic, dance, sing, talk, and laugh. “Humanity could stage no greater display of happiness,” reported one observer (*Economist*, 2001).



The Granger Collection, New York

Enduring the pain of ostracism

Caucasian cadets at the United States Military Academy at West Point ostracized Henry Flipper for years, hoping he would drop out. He somehow resisted their cruelty and in 1877 became the first African-American West Point graduate.

Note: The researchers later *debriefed* and reassured the participants.

2009). In one mock-interview study, women felt more excluded if interviewers used gender-exclusive language (*he, his, him*) rather than inclusive (*his or her*) or neutral (*their*) language (Stout & Dasgupta, 2011).

All these experiences are instances of *ostracism*—of social exclusion (Williams et al., 2007, 2009). Worldwide, humans use many forms of ostracism—exile, imprisonment, solitary confinement—to punish, and therefore control, social behavior. For children, even a brief time-out in isolation can be punishing. Asked to describe personal episodes that made them feel especially *bad* about themselves, people will—about four times in five—describe a relationship difficulty (Pillemer et al., 2007). Feelings of loneliness can also spread from person to person like a disease, through one’s social network (Cacioppo et al., 2009).

Being shunned—given the cold shoulder or the silent treatment, with others’ eyes avoiding yours—threatens one’s need to belong (Williams & Zadro, 2001). “It’s the meanest thing you can do to someone, especially if you know they can’t fight back. I never should have been born,” said Lea, a lifelong victim of the silent treatment by her mother and grandmother. Like Lea, people often respond to ostracism with depressed moods, initial efforts to restore their acceptance, and then withdrawal. After two years of silent treatment by his employer, Richard reported, “I came home every night and cried. I lost 25 pounds, had no self-esteem and felt that I wasn’t worthy.”

To experience ostracism is to experience real pain, as social psychologists Kipling Williams and his colleagues were surprised to discover in their studies of *cyber-ostracism* (Gonsalkorale & Williams, 2006). (Perhaps you can recall the feeling of being unfriended or having few followers on a social networking site, being ignored in a chat room, or having a text message or e-mail go unanswered.) Such ostracism, they discovered, takes a toll: It elicits increased activity in brain areas, such as the *anterior cingulate cortex*, that also activate in response to physical pain (Kross et al., 2011; Lieberman & Eisenberger, 2009). That helps explain another surprising finding: The pain-reliever acetaminophen (as in Tylenol and Anacin) lessens *social* as well as physical pain (DeWall et al., 2010). Across cultures, people use the same words (for example, *hurt, crushed*) for social pain and physical pain (MacDonald & Leary, 2005). Psychologically, we seem to experience social pain with the same emotional unpleasantness that marks physical pain.

Pain, whatever its source, focuses our attention and motivates corrective action. Rejected and unable to remedy the situation, people may seek new friends or relieve stress in a strengthened religious faith (Aydin et al., 2010). Or they may turn nasty. In a series of experiments, researchers (Baumeister et al., 2002; Twenge et al., 2001, 2002, 2007) told some students (who had taken a personality test) that they were “the type likely to end up alone later in life,” or that people they had met didn’t want them in a group that was forming. They told other students that they would have “rewarding relationships throughout life,” or that “everyone chose you as someone they’d like to work with.” Those excluded became much more likely to engage in self-defeating behaviors and to underperform on aptitude tests. The rejection also interfered with their empathy

Social acceptance and rejection Successful participants on the reality TV show *Survivor* form alliances and gain acceptance among their peers. The rest receive the ultimate social punishment as they are “voted off the island.”



CBS/Getty Images

for others and made them more likely to act in disparaging or aggressive ways against those who had excluded them (blasting them with noise, for example). “If intelligent, well-adjusted, successful . . . students can turn aggressive in response to a small laboratory experience of social exclusion,” noted the research team, “it is disturbing to imagine the aggressive tendencies that might arise from . . . chronic exclusion from desired groups in actual social life.” Indeed, as Williams (2007) has observed, ostracism “weaves through case after case of school violence.”

RETRIEVE IT

- How have students reacted in studies where they were made to feel rejected and unwanted? What helps explain these results?

ANSWER: These students' basic need to belong seems to have been disrupted. They engaged in more self-defeating behaviors, underperformed on aptitude tests, and displayed less empathy and more aggression.

Connecting and Social Networking



10-6: How does social networking influence us?

As social creatures, we live for connection. Asked what he had learned from studying 238 Harvard University men from the 1930s to the end of their lives, researcher George Vaillant (2009) replied, “The only thing that really matters in life are your relationships to other people.” A South African Zulu saying captures the idea: *Umuntu ngumuntu ngabantu*—“a person is a person through other persons.”

Mobile Networks and Social Media

Look around and see humans connecting: talking, texting, posting, chatting, social gaming, e-mailing. The changes in how we connect have been fast and vast:

- Cell phones have been history's most rapidly adopted technology. At the end of 2010, the world had 6.9 billion people and 5.3 billion mobile cell-phone subscriptions (ITU, 2010). Asia and Europe lead the way. In India, 618 million people have mobile phone access—reportedly almost double the 366 million with access to a toilet (*Harper's*, 2010). But American youth are keeping up with the world: 85 percent of 15- to 18-year-olds are cell-phone users (Kaiser, 2010).
- Texting and e-mailing have been displacing phone talking, which now accounts for less than half of U.S. mobile network traffic (Wortham, 2010). Now, in Canada and elsewhere, e-mailing is itself declining, displaced by texting, Facebook, and other messaging technology (IPSOS, 2010a). Speedy texting is not really writing, observes John McWhorter (2012), but rather a new form of conversation—“fingered speech.”
- Ninety percent of U.S. teens text, up from 50 percent in 2006. Half (mostly females) send 50 or more texts daily; one-third send 200 (Lenhart, 2010). For many, it's as though friends, for better or worse, are always present.
- How many of us are using social networking sites, such as Facebook? Among 2010's entering American collegians, 94 percent were (Pryor et al., 2011). With a “critical mass” of your friends on a social network, its lure becomes hard to resist. Such is our need to belong. Check in or miss out.

“There's no question in my mind about what stands at the heart of the communication revolution—the human desire to connect.”

Skype President Josh Silverman, 2009



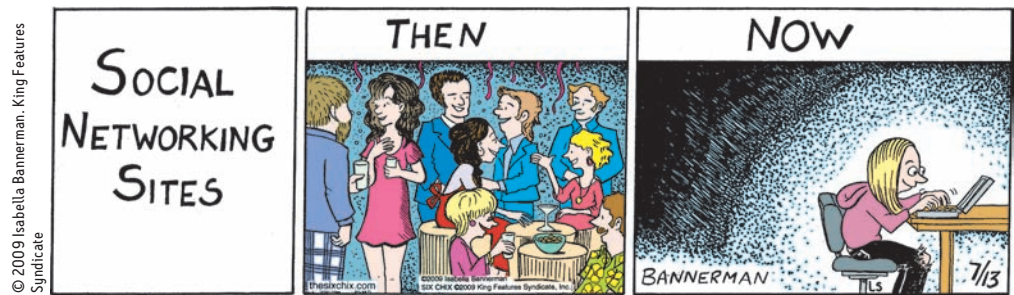
Thomas Northcut/Jupiterimages

The Social Effects of Social Networking

By connecting like-minded people, the Internet serves as a social amplifier. It also functions as an online dating matchmaker (more on those topics in Chapter 13). As electronic communication becomes part of the “new normal,” researchers are exploring how these changes affect our relationships.

Are Social Networking Sites Making Us More, or Less, Socially Isolated? In the Internet's early years, when online communication in chat rooms and during social games was mostly between strangers, the adolescents and adults who spent more time online spent less time with friends (Kraut et al., 1998; Mesch, 2001; Nie, 2001). As a result, their offline relationships suffered. Even today, lonely people tend to spend greater-than-average time online (Bonetti et al., 2010; Stepanikova et al., 2010). Social networkers are less likely to know their real-world neighbors and are “64 percent less likely than non-Internet users to rely on neighbors for help in caring for themselves or a family member” (Pew, 2009).

Despite the decrease in neighborliness, the Internet is diversifying our social networks. (I am now connected to other hearing-technology advocates across the world.) Social networking is also mostly strengthening our connections with people we already know (DiSalvo, 2010; Valkenburg & Peter, 2010). If your Facebook page helps you connect with friends, stay in touch with extended family, or find support in facing challenges, then you are not alone (Rainie et al., 2011). For many, though, being alone is not the problem. If you are like other students, two days of Facebook deprivation would be followed by a glut of Facebook use, much as you would eat voraciously after a two-day food fast (Sheldon et al., 2011). Social networks connect us, but they can also become a gigantic time- and attention-sucking diversion. For some research-based strategies, see *Close-Up: Managing Your Social Networking*.



Does Electronic Communication Stimulate Healthy Self-Disclosure? As we will see in Chapter 11, confiding in others can be a healthy way of coping with day-to-day challenges. When communicating electronically rather than face to face, we often are less focused on others' reactions, less self-conscious, and thus less inhibited. We become more willing to share joys, worries, and vulnerabilities. Sometimes this is taken to an extreme, as when “sexting” teens send nude photos of themselves, or “cyber-bullies” hound a victim, or hate groups post messages promoting bigotry or crimes. More often, however, the increased self-disclosure serves to deepen friendships (Valkenburg & Peter, 2010).

Although electronic networking pays dividends, nature has designed us for face-to-face communication, which appears to be the better predictor of life satisfaction (Killingsworth & Gilbert, 2010; Lee et al., 2011). Texting and e-mailing are rewarding, but eye-to-eye conversation with family and friends is even more so.

Do Social Networking Profiles and Posts Reflect People's Actual Personalities? We've all heard stories of Internet predators hiding behind false personalities, values, and motives. Generally, however, social networks reveal people's real personalities. In one study, participants completed a personality test twice. In one test, they described their “actual personality”; in the other, they described their “ideal self.” Volunteers then used the participants' Facebook profiles to create an independent set of personality ratings. The ratings based on Facebook profiles were much closer to the participants' actual personalities than to their ideal personalities (Back et al., 2010). In another study, people who seemed most likable on their Facebook page also seemed most likable in face-to-face meetings (Weisbuch et al., 2009). Your Facebook profile may indeed reflect the real you!



CLOSE UP:

Managing Your Social Networking

In today's world, each of us is challenged to find a healthy balance between our real-world time with people and our online sharing. In both Taiwan and the United States, excessive online socializing and gaming have been associated with lower grades (Chen & Fu, 2008; Kaiser Foundation, 2010). In one U.S. survey, 47 percent of the heaviest users of the Internet and other media were receiving mostly C grades or lower, as were 23 percent of the lightest users (Kaiser Foundation, 2010). Except when sleeping, the heaviest users may be almost constantly connected.

If you're trying to maintain a healthy balance between online connecting and real-world responsibilities, experts offer these practical suggestions:

- **Monitor your time.** Keep a log of how you use your time. Then ask yourself, "Does my time use reflect my priorities? Am I spending more time online than I intended? Is my time online interfering with school or work performance? Have family or friends commented on this?"
- **Monitor your feelings.** Again, ask yourself, "Am I emotionally distracted by online pre-occupations? When I disconnect and move on to another activity, how do I feel?"
- **"Hide" your more distracting online friends.** And in your own postings, practice the golden rule. Before you post, ask yourself, "Is this something I'd care about reading if someone else posted it?"
- **Try turning off your handheld devices or leaving them elsewhere.** Selective attention—the flashlight of your mind—can be in only one place at a time. "One of the most stubborn, persistent phenomena of the mind," notes cognitive psychologist Daniel Willingham (2010), "is that when you do two things at once, you don't do either one as well as when you do them one at a time." When you want to study or work productively, squelch the temptation to check for messages, posts, or e-mails. And disable sound alerts and pop-ups.

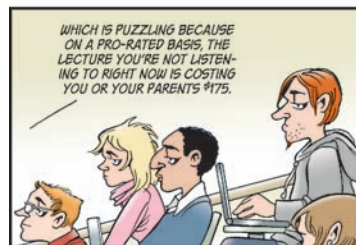
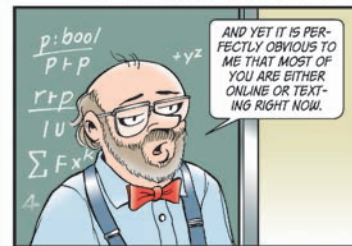
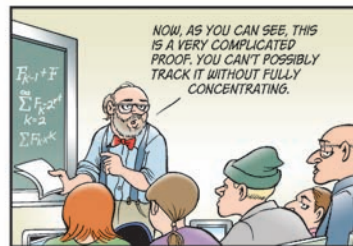
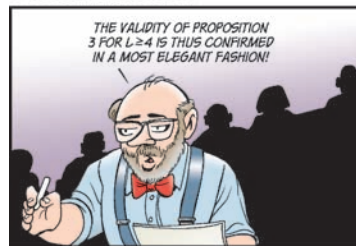
These distractions can interrupt your work and hijack your attention just when you've managed to get focused.

- **Try a Facebook fast (give it up for an hour, a day, or a week) or a time-controlled social media diet (check in only after homework is done, or only during a lunch break).** Take notes on what you're losing and gaining on your new "diet."
- **Replenish your focus with a nature walk.** University of Michigan researchers have reported that a walk in the woods, unlike walking on a busy street, replenishes people's capacity for focused attention (Berman et al., 2008). People learn better after a peaceful walk that restores their fatigued attention.

"The solution is not to bemoan technology but to develop strategies of self-control, as we do with every other temptation in life."

Psychologist Steven Pinker, "Mind Over Mass Media," 2010

DOONESBURY



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Does Social Networking Promote Narcissism? *Narcissism* is self-esteem gone awry. Narcissistic people are self-important, self-focused, and self-promoting. Some personality tests assess narcissism with items such as "I like to be the center of attention." Given our constant social comparison—our measuring ourselves against others—many Facebook users can't resist comparing numbers of friends. (The average is about 125—near the 150 people with whom evolutionary psychologist Robin Dunbar [1992, 2010] estimates we can have meaningful, supportive relationships [also a typical size of tribal villages].)



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Calum's road: What grit can accomplish

Having spent his life on the Scottish island of Raasay, farming a small patch of land, tending its lighthouse, and fishing, Malcolm (“Calum”) MacLeod (1911–1988) felt anguished. His local government repeatedly refused to build a road that would enable vehicles to reach his north end of the island. With the once-flourishing population there having dwindled to two—MacLeod and his wife—he responded with heroic determination. One spring morning in 1964, MacLeod, then in his fifties, gathered an ax, a chopper, a shovel, and a wheelbarrow. By hand, he began to transform the existing footpath into a 1.75-mile road (Miers, 2009).

“With a road,” a former neighbor explained, “he hoped new generations of people would return to the north end of Raasay,” restoring its culture (Hutchinson, 2006). Day after day he worked through rough hillsides, along hazardous cliff faces, and over peat bogs. Finally, 10 years later, he completed his supreme achievement. The road, which the government has since surfaced, remains a visible example of what vision plus determined grit can accomplish. It bids us each to ponder: What “roads”—what achievements—might we, with sustained effort, build in the years before us?

“Genius is 1% inspiration and 99% perspiration.”

Thomas Edison, 1847–1931

Those who score high on narcissism are especially active on social networking sites. They collect more superficial “friends.” They offer more staged, glamorous photos. And, not surprisingly, they *seem* more narcissistic to strangers viewing their pages (Buffardi & Campbell, 2008).

For narcissists, social networking sites are more than a gathering place; they are a feeding trough. In one study, college students were randomly assigned either to edit and explain their MySpace page for 15 minutes, or to use that time to study and explain a Google Maps routing (Freeman & Twenge, 2010). After completing their tasks, all were tested. Who then scored higher on a narcissism measure? Those who had spent the time focused on themselves.

RETRIEVE IT

- Social networking tends to _____ (strengthen/weaken) your relationships with people you already know, _____ (increase/decrease) your self-disclosure, and _____ (reveal/hide) your true personality.

ANSWERS: strengthen; increase; reveal

Achievement Motivation



10-7: What is achievement motivation?

The biological perspective on motivation—the idea that physiological needs drive us to satisfy those needs—provides only a partial explanation of what energizes and directs our behavior. Hunger and the need to belong have social as well as biological components. Moreover, there are motives that seem to have little obvious survival value. Billionaires may be motivated to make ever more money, movie stars to become ever more famous, politicians to achieve ever more power, daredevils to seek ever greater thrills. Such motives seem not to diminish when they are fed. The more we achieve, the more we may need to achieve.

Think of someone you know who strives to succeed by excelling at any task where evaluation is possible. Now think of someone who is less driven. Psychologist Henry Murray (1938) defined the first person's **achievement motivation** as a desire for significant accomplishment, for mastering skills or ideas, for control, and for rapidly attaining a high standard.

As you might expect from their persistence and eagerness for realistic challenges, people with high achievement motivation do achieve more. One study followed the lives of 1528 California children whose intelligence test scores were in the top 1 percent. Forty years later, when researchers compared those who were most and least successful professionally, they found a motivational difference. Those most successful were more ambitious, energetic, and persistent. As children, they had more active hobbies. As adults, they participated in more groups and favored being sports participants to being spectators (Goleman, 1980). Gifted children are able learners. Accomplished adults are tenacious doers. Most of us are energetic doers when starting and finishing a project. It's easiest—have you noticed?—to “get stuck in the middle,” which is when high achievers keep going (Bonezzi et al., 2011).

In other studies of both secondary school and university students, self-discipline has been a better predictor of school performance, attendance, and graduation honors than intelligence scores have been. When combined with a positive enthusiasm, sustained, gritty effort predicts success for teachers, too—with their students making good academic progress (Duckworth et al., 2009). “Discipline outdoes talent,” concluded researchers Angela Duckworth and Martin Seligman (2005, 2006).

Discipline also refines talent. By their early twenties, top violinists have accumulated some 10,000 lifetime practice hours—double the practice time of other violin students

aiming to be teachers (Ericsson 2001, 2006, 2007). From his studies, Herbert Simon (1998), a psychologist who won a Nobel Prize in Economics, formed what Chapter 9 called the *10-year rule*: World-class experts in a field typically have invested “at least 10 years of hard work—say, 40 hours a week for 50 weeks a year.” A study of outstanding scholars, athletes, and artists found that all were highly motivated and self-disciplined, willing to dedicate hours every day to the pursuit of their goals (Bloom, 1985). These superstar achievers were distinguished not so much by their extraordinary natural talent as by their extraordinary daily discipline.

What distinguishes extremely successful individuals from their equally talented peers, note Duckworth and Seligman, is *grit*—passionate dedication to an ambitious, long-term goal. Although intelligence is distributed like a bell curve, achievements are not. That tells us that achievement involves much more than raw ability. That is why organizational psychologists seek ways to engage and motivate ordinary people doing ordinary jobs (see Appendix B: Psychology at Work). And that is why training students in “hardiness”—resilience under stress—leads to better grades (Maddi et al., 2009).

achievement motivation a desire for significant accomplishment, for mastery of skills or ideas, for control, and for rapidly attaining a high standard.

Emotion: Arousal, Behavior, and Cognition



10-8: How do arousal, cognition, and expressive behavior interact in emotion?

Motivated behavior is often connected to powerful emotions. My own need to belong was unforgettably challenged one day. I went to a huge store to drop off film and brought along Peter, my toddler first-born child. As I set Peter down on his feet and prepared to complete the paperwork, a passerby warned, “You’d better be careful or you’ll lose that boy!” Not more than a few breaths later, after dropping the film in the slot, I turned and found no Peter beside me.

With mild anxiety, I peered around one end of the counter. No Peter in sight. With slightly more anxiety, I peered around the other end. No Peter there, either. Now, with my heart accelerating, I circled the neighboring counters. Still no Peter anywhere. As anxiety turned to panic, I began racing up and down the store aisles. He was nowhere to be found. Apprised of my alarm, the store manager used the public-address system to ask customers to assist in looking for a missing child. Soon after, I passed the customer who had warned me. “I told you that you were going to lose him!” he now scorned. With visions of kidnapping (strangers routinely adored that beautiful child), I braced for the possibility that my negligence had caused me to lose what I loved above all else, and that I might have to return home and face my wife without our only child.

But then, as I passed the customer service counter yet again, there he was, having been found and returned by some obliging customer. In an instant, the arousal of terror spilled into ecstasy. Clutching my son, with tears suddenly flowing, I found myself unable to speak my thanks and stumbled out of the store awash in grateful joy.

Where do such emotions come from? Why do we have them? What are they made of? Emotions don’t exist just to give us interesting experiences. They are our body’s adaptive response, increasing our chances of survival. When we face challenges, emotions focus our attention and energize our actions (Cyders & Smith, 2008). Our heart races. Our pace quickens. All our senses go on high alert. Receiving unexpected good news, we may find our eyes tearing up. We raise our hands triumphantly. We feel exuberance and a newfound confidence.



Courtesy of David G. Myers

Not only emotion, but most psychological phenomena (vision, sleep, memory, sex, and so forth) can be approached these three ways—physiologically, behaviorally, and cognitively.

As my panicked search for Peter illustrates, **emotions** are a mix of:

- *bodily arousal* (heart pounding).
- *expressive behaviors* (quicken pace).
- *conscious experience*, including thoughts (“*Is this a kidnapping?*”) and feelings (panic, fear, joy).

The puzzle for psychologists is figuring out how these three pieces fit together. To do that, we need answers to two big questions:

1. A chicken-and-egg debate: Does your bodily arousal come *before* or *after* your emotional feelings? (Did I first notice my racing heart and faster step, and then feel terror about losing Peter? Or did my sense of fear come first, stirring my heart and legs to respond?)
2. How do *thinking* (cognition) and *feeling* interact? Does cognition always come before emotion? (Did I think about a kidnapping threat before I reacted emotionally?)

Historical emotion theories, as well as current research, have sought to answer these questions.

Historical Emotion Theories

James-Lange Theory: Arousal Comes Before Emotion

Common sense tells most of us that we cry because we are sad, lash out because we are angry, tremble because we are afraid. First comes conscious awareness, then the feeling. But to pioneering psychologist William James, this commonsense view of emotion had things backward. Rather, “We feel sorry because we cry, angry because we strike, afraid because we tremble” (1890, p. 1066). James’ idea was also proposed by Danish physiologist Carl Lange, and so is called the **James-Lange theory**. James and Lange might have guessed that I noticed my racing heart and then, shaking with fright, felt the whoosh of emotion—that my feeling of fear *followed* my body’s response.

Joy expressed According to the James-Lange theory, we don’t just smile because we share our teammates’ joy. We also share the joy because we are smiling with them.



REUTERS/Matt Sullivan

Cannon-Bard Theory: Arousal and Emotion Occur Simultaneously

Physiologist Walter Cannon (1871–1945) disagreed with James and Lange. Does a racing heart signal fear or anger or love? The body’s responses—heart rate, perspiration, and body temperature—are too similar, and they change too slowly, to *cause* the different emotions, said Cannon. He, and later another physiologist, Philip Bard, concluded that our bodily arousal and emotional experience occur simultaneously. So, according to the **Cannon-Bard theory**, my heart began pounding *as* I experienced fear. The emotion-triggering stimulus traveled to my sympathetic nervous system, causing my body’s arousal. *At the same time*, it traveled to my brain’s cortex, causing my awareness of my emotion. My pounding heart did not cause my feeling of fear, nor did my feeling of fear cause my pounding heart. Bodily responses and experienced emotions are separate.

The Cannon-Bard theory has been challenged by studies of people with severed spinal cords, including a survey of 25 soldiers who suffered such injuries in World War II (Hohmann, 1966). Those with *lower-spine injuries*, who had lost sensation only in their legs, reported little change in their emotions’ intensity. Those with *high spinal cord injuries*, who could feel nothing below the neck, did report changes. Some reactions were much less intense than before the injuries. Anger, one man confessed, “just doesn’t have the heat to it that it used to. It’s a mental kind of anger.” Other emotions, those expressed mostly in body areas above the neck, were felt *more* intensely. These men reported increases in weeping, lumps in the throat, and getting choked up when saying good-bye, worshiping, or watching a touching movie. Such evidence has led some researchers to view feelings as “mostly shadows” of our bodily responses and behaviors (Damasio, 2003).

But most researchers now agree that our emotions also involve cognition (Averill, 1993; Barrett, 2006). Whether we fear the man behind us on the dark street depends entirely on whether we interpret his actions as threatening or friendly.

RETRIEVE IT

- According to the Cannon-Bard theory, (a) our *physiological response* to a stimulus (for example, a pounding heart), and (b) the *emotion* we experience (for example, fear) occur _____ (simultaneously/sequentially). According to the James-Lange theory, (a) and (b) occur _____ (simultaneously/sequentially).

ANSWERS: simultaneously; sequentially (first the physiological response, and then the experienced emotion)

emotion a response of the whole organism, involving (1) physiological arousal, (2) expressive behaviors, and (3) conscious experience.

James-Lange theory the theory that our experience of emotion is our awareness of our physiological responses to emotion-arousing stimuli.

Cannon-Bard theory the theory that an emotion-arousing stimulus simultaneously triggers (1) physiological responses and (2) the subjective experience of emotion.

two-factor theory the Schachter-Singer theory that to experience emotion one must (1) be physically aroused and (2) cognitively label the arousal.

Schachter-Singer Two-Factor Theory: Arousal + Label = Emotion

Stanley Schachter and Jerome Singer (1962) proposed a third theory: Our physical reactions and our thoughts (perceptions, memories, and interpretations) together create emotion. In their **two-factor theory**, emotions therefore have two ingredients: physical arousal and cognitive appraisal. In their view, an emotional experience requires a conscious interpretation of arousal.

Consider how arousal spills over from one event to the next. Imagine arriving home after an invigorating run and finding a message that you got a longed-for job. With arousal lingering from the run, would you feel more elated than if you received this news after awakening from a nap?

To explore this *spillover effect*, Schachter and Singer injected college men with the hormone epinephrine, which triggers feelings of arousal. Picture yourself as a participant: After receiving the injection, you go to a waiting room, where you find yourself with another person (actually an accomplice of the experimenters) who is acting either euphoric or irritated. As you observe this person, you begin to feel your heart race, your body flush, and your breathing become more rapid. If you had been told to expect these effects from the injection, what would you feel? The actual volunteers felt little emotion—because they attributed their arousal to the drug. But if you had been told the injection would produce no effects, what would you feel? Perhaps you would react as another group of participants did. They “caught” the apparent emotion of the other person in the waiting room. They became happy if the accomplice was acting euphoric, and testy if the accomplice was acting irritated.

This discovery—that a stirred-up state can be experienced as one emotion or another, depending on how we interpret and label it—has been replicated in dozens of experiments (Reisenzein, 1983; Sinclair et al., 1994; Zillmann, 1986). As Daniel Gilbert (2006) noted, “Feelings that one interprets as fear in the presence of a sheer drop may be interpreted as lust in the presence of a sheer blouse.”

The point to remember: Arousal fuels emotion; cognition channels it.



Reuters/Corbis

The spillover effect Arousal from a soccer match can fuel anger, which can descend into rioting or other violent confrontations.

RETRIEVE IT

- According to Schachter and Singer, two factors lead to our experience of an emotion: (1) physiological arousal and (2) _____ appraisal.

ANSWER: cognitive

Zajonc, LeDoux, and Lazarus: Does Cognition Always Precede Emotion?

But is the heart always subject to the mind? Must we *always* interpret our arousal before we can experience an emotion? Robert Zajonc (pronounced ZI-yence; 1980, 1984a) contended that we actually have many emotional reactions apart from, or even before, our interpretation of a situation. Perhaps you can recall liking something or someone immediately, without knowing why.

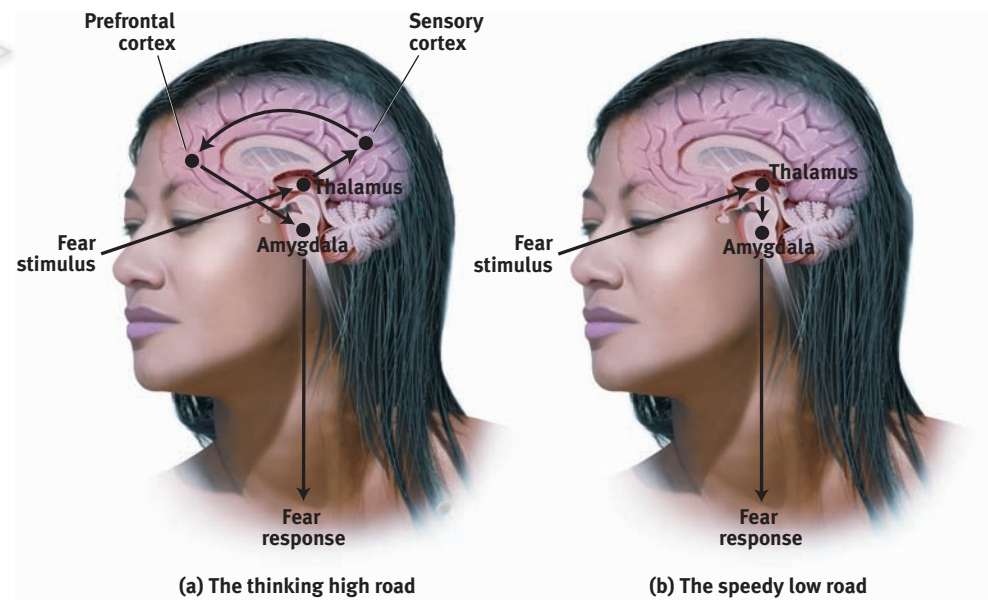
In earlier chapters, we noted that when people repeatedly view stimuli flashed too briefly for them to interpret, they come to prefer those stimuli. Unaware of having previously seen them, they nevertheless rather like them. We have an acutely sensitive automatic radar for emotionally significant information, such that even a subliminally flashed stimulus can prime us to feel better or worse about a follow-up stimulus (Murphy et al., 1995; Zeelenberg et al., 2006). In experiments, thirsty people were given a fruit-flavored drink after viewing a subliminally flashed (thus unperceived) face. Those exposed to a happy face drank about 50 percent more than those exposed to a neutral face (Berridge & Winkielman, 2003). Those flashed an angry face drank substantially less.

Neuroscientists are charting the neural pathways of both “bottom-up” and “top-down” emotions (Ochsner et al., 2009). Our emotional responses can follow two different brain pathways. Some emotions (especially more complex feelings like hatred and love) travel a “high road.” A stimulus following this path would travel (by way of the thalamus) to the brain’s cortex (FIGURE 10.11a). There, it would be analyzed and labeled before the command is sent out, via the amygdala (an emotion-control center), to respond.

But sometimes our emotions (especially simple likes, dislikes, and fears) take what Joseph LeDoux (2002) has called the “low road,” a neural shortcut that bypasses the cortex. Following the low-road pathway, a fear-provoking stimulus would travel from the eye or ear (again via the thalamus) directly to the amygdala (Figure 10.11b). This shortcut, bypassing the cortex, enables our greased-lightning emotional response before our intellect intervenes.

FIGURE 10.11

The brain’s pathways for emotions In the two-track brain, sensory input may be routed (a) to the cortex (via the thalamus) for analysis and then transmission to the amygdala; or (b) directly to the amygdala (via the thalamus) for an instant emotional reaction.



Like speedy reflexes that also operate apart from the brain’s thinking cortex, the amygdala reactions are so fast that we may be unaware of what’s transpired (Dimberg et al., 2000).

The amygdala sends more neural projections up to the cortex than it receives back, which makes it easier for our feelings to hijack our thinking than for our thinking to rule our feelings (LeDoux & Armony, 1999). Thus, in the forest, we can jump at the sound of rustling bushes nearby and leave it to our cortex to decide later whether the sound was made by a snake or by the wind. Such experiences support Zajonc’s belief that *some* of our emotional reactions involve no deliberate thinking.

Emotion researcher Richard Lazarus (1991, 1998) conceded that our brains process vast amounts of information without our conscious awareness, and that some emotional responses do not require *conscious* thinking. Much of our emotional life operates via the automatic, speedy low road. But, he asked, how would we *know* what we are reacting to if we did not in some way appraise the situation? The appraisal may be effortless and we may not be conscious of it, but it is still a mental function. To know whether a stimulus is good or bad, the brain must have some idea of what it is (Storbeck et al., 2006). Thus, said Lazarus, emotions arise when we *appraise* an event as harmless or dangerous, whether we truly *know* it is or not. We appraise the sound of the rustling bushes as the presence of a threat. Later, we realize that it was “just the wind.”

So, as Zajonc and LeDoux have demonstrated, some emotional responses—especially simple likes, dislikes, and fears—involve no conscious thinking (FIGURE 10.12). We may fear a big spider, even if we “know” it is harmless. Such responses are difficult to alter by changing our thinking. We may automatically like one person more than another. This instant appeal can even influence our political decisions if we vote (as many people do) for a candidate we *like* over the candidate expressing positions closer to our own (Westen, 2007).

But our feelings about politics are also subject to our memories, expectations, and interpretations, as Lazarus, Schachter, and Singer might have predicted. Moreover, highly emotional people are intense partly *because* of their interpretations. They may *personalize* events as being somehow directed at them, and they may *generalize* their experiences by blowing single incidents out of proportion (Larsen et al., 1987). Thus, learning to *think* more positively can help people *feel* better. Although the emotional low road functions automatically, the thinking high road allows us to retake some control over our emotional life. Together, automatic emotion and conscious thinking weave the fabric of our emotional lives. (TABLE 10.1 summarizes these emotion theories.)

FIGURE 10.12
Two pathways for emotions Zajonc and LeDoux have emphasized that some emotional responses are immediate, before any conscious appraisal. Lazarus, Schachter, and Singer emphasized that our appraisal and labeling of events also determine our emotional responses.

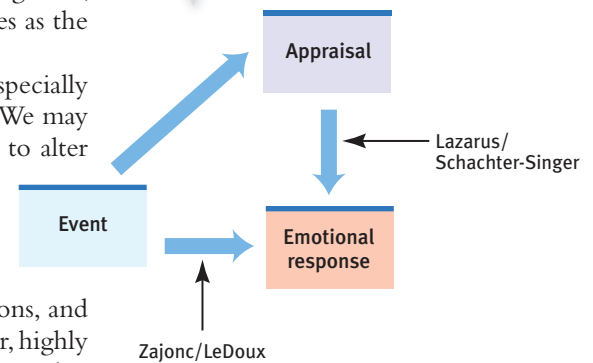


Table 10.1
Summary of Emotion Theories

Theory	Explanation of Emotions	Example
<i>James-Lange</i>	Emotions arise from our awareness of our specific bodily responses to emotion-arousing stimuli.	We observe our heart racing after a threat and then feel afraid.
<i>Cannon-Bard</i>	Emotion-arousing stimuli trigger our bodily responses and simultaneous subjective experience.	Our heart races at the same time that we feel afraid.
<i>Schachter-Singer</i>	Our experience of emotion depends on two factors: general arousal and a conscious cognitive label.	We may interpret our arousal as fear or excitement, depending on the context.
<i>Zajonc; LeDoux</i>	Some embodied responses happen instantly, without conscious appraisal.	We automatically feel startled by a sound in the forest before labeling it as a threat.
<i>Lazarus</i>	Cognitive appraisal (“Is it dangerous or not?”)—sometimes without our awareness—defines emotion.	The sound is “just the wind.”

RETRIEVE IT

- Emotion researchers have disagreed about whether emotional responses occur in the absence of cognitive processing. How would you characterize the approach of each of the following researchers: Zajonc, LeDoux, Lazarus, Schachter, and Singer?

ANSWER: Zajonc and LeDoux suggested that we experience some emotions without any conscious, cognitive appraisal. Lazarus, Schachter, and Singer emphasized the importance of appraisal and cognitive labeling in our experience of emotion.

Embodied Emotion

Whether you are falling in love or grieving a death, you need little convincing that emotions involve the body. Feeling without a body is like breathing without lungs. Some physical responses are easy to notice. Other emotional responses we experience without awareness. Before examining our physical responses to specific emotions, consider another big question: How many distinct emotions are there?

The Basic Emotions



10-9: What are some of the basic emotions?

Carroll Izard (1977) isolated 10 basic emotions (joy, interest–excitement, surprise, sadness, anger, disgust, contempt, fear, shame, and guilt), most present in infancy (**FIGURE 10.13**). Others (Tracey & Robins, 2004) believe that pride is also a distinct emotion, signaled by a small smile, head slightly tilted back, and an open posture. Love, too, may be a basic emotion (Shaver et al., 1996). Izard has argued that other emotions are combinations of these 10, with love, for example, being a mixture of joy and interest–excitement. But are these emotions biologically distinct?

“Fear lends wings to his feet.”

Virgil, Aeneid, 19 B.C.E.

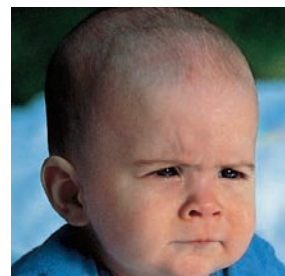
FIGURE 10.13

Infants’ naturally occurring emotions To identify the emotions present from birth, Carroll Izard analyzed the facial expressions of infants.



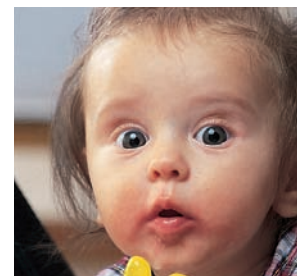
Tom McCarthy/Rainbow

(a) Joy (mouth forming smile, cheeks lifted, twinkle in eye)



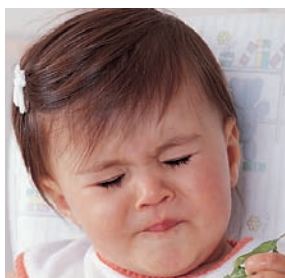
Patrick Donehue/Photo Researchers, Inc.

(b) Anger (brows drawn together and downward, eyes fixed, mouth squarish)



Bob Daemrich/The Image Works

(c) Interest (brows raised or knitted, mouth softly rounded, lips may be pursed)



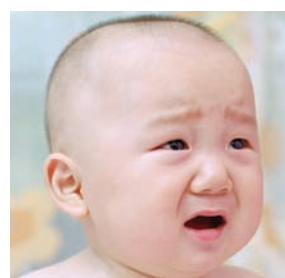
Lew Merrim/Photo Researchers, Inc.

(d) Disgust (nose wrinkled, upper lip raised, tongue pushed outward)



Nancy Brown/The Image Bank

(e) Surprise (brows raised, eyes widened, mouth rounded in oval shape)



iStockphoto/Thinkstock/Getty Images

(f) Sadness (brows’ inner corners raised, mouth corners drawn down)



Michael Newman/PhotoEdit

(g) Fear (brows level, drawn in and up, eyelids lifted, mouth corners retracted)

Emotions and the Autonomic Nervous System



10-10: What is the link between emotional arousal and the autonomic nervous system?

As we saw in Chapter 2, in a crisis, the *sympathetic division* of your *autonomic nervous system (ANS)* mobilizes your body for action (**FIGURE 10.14**). It triggers your adrenal glands to release the stress hormones epinephrine (adrenaline) and norepinephrine (noradrenaline). To provide energy, your liver pours extra sugar into your bloodstream. To help burn the sugar, your respiration increases to supply needed oxygen. Your heart rate and blood pressure increase. Your digestion slows, diverting blood from your internal organs to your muscles. With blood sugar driven into the large muscles, running becomes easier. Your pupils dilate, letting in more light. To cool your stirred-up body, you perspire. If wounded, your blood would clot more quickly.

When the crisis passes, the *parasympathetic division* of your ANS gradually calms your body, as stress hormones slowly leave your bloodstream. After your next crisis, think of this: Without any conscious effort, your body's response to danger is wonderfully coordinated and adaptive—preparing you to *fight or flee*. So, do the different emotions have distinct arousal fingerprints?

The Physiology of Emotions



10-11: Do different emotions activate different physiological and brain-pattern responses?

Imagine conducting an experiment measuring the physiological responses of emotion. In each of four rooms, you have someone watching a movie: In the first, the person is viewing a horror show; in the second, an anger-provoking film; in the third, a sexually arousing film; in the fourth, a boring film. From the control center you monitor each person's perspiration, breathing, and heart rate. Could you tell who is frightened? Who is angry? Who is sexually aroused? Who is bored?

With training, you could probably pick out the bored viewer. But discerning physiological differences among fear, anger, and sexual arousal would be much more difficult (Barrett, 2006). Different emotions do not have sharply distinct biological signatures.

FIGURE 10.14
Emotional arousal Like a crisis control center, the autonomic nervous system arouses the body in a crisis and calms it when danger passes.



Autonomic Nervous System Controls Physiological Arousal

Sympathetic division (arousing)		Parasympathetic division (calming)
Pupils dilate	EYES	Pupils contract
Decreases	SALIVATION	Increases
Perspires	SKIN	Dries
Increases	RESPIRATION	Decreases
Accelerates	HEART	Slows
Inhibits	DIGESTION	Activates
Secrete stress hormones	ADRENAL GLANDS	Decrease secretion of stress hormones
Reduced	IMMUNE SYSTEM FUNCTIONING	Enhanced



“No one ever told me that grief felt so much like fear. I am not afraid, but the sensation is like being afraid. The same fluttering in the stomach, the same restlessness, the yawning. I keep on swallowing.”

C. S. Lewis, *A Grief Observed*, 1967

Emotional arousal

Elated excitement and panicky fear involve similar physiological arousal. That allows us to flip rapidly between the two emotions.



FotoStor.co.uk/Alamy

Nor do they engage sharply distinct brain regions. Consider the broad emotional portfolio of the *insula*, a neural center deep inside the brain. The *insula* is activated when we experience various social emotions, such as lust, pride, and disgust. In brain scans, it becomes active when people bite into some disgusting food, smell the same disgusting food, think about biting into a disgusting cockroach, or feel moral disgust over a sleazy business exploiting a saintly widow (Sapolsky, 2010).

Nevertheless, despite their similarities, fear, anger, and sexual arousal *feel* different to you and me, and they often *look* different to others. We may appear “paralyzed with fear” or “ready to explode.” Research has pinpointed some real, though subtle, physiological distinctions among the emotions. For example, the finger temperatures and hormone secretions that accompany fear and rage do sometimes differ (Ax, 1953; Levenson, 1992). Fear and joy, although they prompt similar increased heart rate, stimulate different facial muscles. During fear, your brow muscles tense. During joy, muscles in your cheeks and

under your eyes pull into a smile (Witvliet & Vrana, 1995).

Some emotions also differ in their brain circuits (Panksepp, 2007). Observers watching (and subtly mimicking) fearful faces showed more activity in their amygdala, an emotional control center, than did other observers who watched angry faces (Whalen et al., 2001). Brain scans and EEG recordings show that emotions also activate different areas of the brain’s cortex. When you experience negative emotions such as disgust, your right prefrontal cortex tends to be more active than

the left. Depression-prone people, and those with generally negative personalities, also show more right frontal lobe activity (Harmon-Jones et al., 2002).

Positive moods tend to trigger more left frontal lobe activity. People with positive personalities—exuberant infants and alert, enthusiastic, energized, and persistently goal-directed adults—also show more activity in the left frontal lobe than in the right (Davidson, 2000, 2003; Urry et al., 2004).

To sum up, we can’t easily see differences in emotions from tracking heart rate, breathing, and perspiration. But facial expressions and brain activity can vary from one emotion to another. So, do we, like Pinocchio, give off telltale signs when we lie? For more on that question, see *Thinking Critically About: Lie Detection*.

RETRIEVE IT

- How do the two divisions of the autonomic nervous system affect our emotional responses?

ANSWER: The sympathetic division of the ANS arouses us for more intense experiences of emotion, pumping out stress hormones to prepare our body for fight or flight. The parasympathetic division of the ANS takes over when a crisis passes, restoring our body to a calm physiological and emotional state.

Expressed and Experienced Emotion

Expressive behavior implies emotion. Dolphins, with smiles seemingly plastered on their faces, appear happy. To decipher people’s emotions we read their bodies, listen to their voice tones, and study their faces. Does nonverbal language vary with culture—or is it universal? And do our expressions influence our experienced emotions?

“Your face, my thane, is a book where men may read strange matters.”

Lady Macbeth to her husband, in William Shakespeare’s Macbeth

THINKING CRITICALLY ABOUT:

Lie Detection



10-12: How effective are polygraphs in using body states to detect lies?

Can a *lie detector*—a **polygraph**—reveal lies? Polygraphs don't literally detect lies. Instead, they measure emotion-linked changes in breathing, cardiovascular activity, and perspiration. If you were taking this test, an examiner would monitor these responses as you answered questions. She might ask, "In the last 20 years, have you ever taken something that didn't belong to you?" This item is a control question, aimed at making everyone a little nervous. If you lied and said "No!" (as many people do) the polygraph would detect arousal. This response will establish a baseline, a

useful comparison for your responses to *critical questions* ("Did you ever steal anything from your previous employer?"). If your responses to critical questions are weaker than to control questions, the examiner will infer you are telling the truth.

Critics point out two problems: First, our physiological arousal is much the same from one emotion to another. Anxiety, irritation, and guilt all prompt similar physiological reactivity. Second, many innocent people do respond with heightened tension to the accusations implied by the critical questions (**FIGURE**

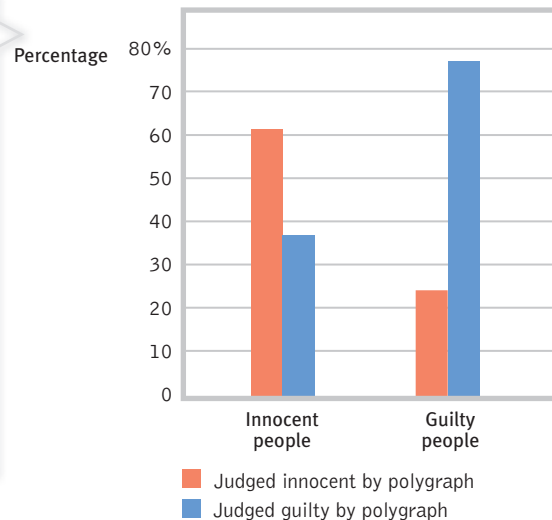
10.15). Many rape victims, for example, have "failed" these tests when reacting emotionally but truthfully (Lykken, 1991).

A 2002 U.S. National Academy of Sciences report noted that "no spy has ever been caught [by] using the polygraph." It is not for lack of trying. The FBI, CIA, and Departments of Defense and Energy in the United States have tested tens of thousands of employees, and polygraph use in Europe has also increased (Meijer & Verschuere, 2010). But Aldrich Ames, a Russian spy within the CIA, went undetected. Ames took many "polygraph tests and passed them all," noted Robert Park (1999). "Nobody thought to investigate the source of his sudden wealth—after all, he was passing the lie detector tests."

A more effective approach to lie detection uses a *guilty knowledge test*, which assesses a suspect's physiological responses to crime-scene details known only to the police and the guilty person (Ben-Shakhar & Elaad, 2003). If a camera and computer had been stolen, for example, only a guilty person should react strongly to the brand names of the stolen items. Given enough such specific probes, an innocent person will seldom be wrongly accused.

FIGURE 10.15

How often do lie detection tests lie? In one study, polygraph experts interpreted the polygraph data of 100 people who had been suspects in theft crimes (Kleinmuntz & Szucko, 1984). Half the suspects were guilty and had confessed; the other half had been proven innocent. Had the polygraph experts been the judges, more than one-third of the innocent would have been declared guilty, and one-fourth of the guilty would have been declared innocent.



.....
polygraph a machine, commonly used in attempts to detect lies, that measures several of the physiological responses (such as perspiration and cardiovascular and breathing changes) accompanying emotion.

Detecting Emotion in Others



10-13: How do we communicate nonverbally?

To Westerners, a firm handshake conveys an outgoing, expressive personality (Chaplin et al., 2000). A gaze, an averted glance, or a stare communicates intimacy, submission, or dominance (Kleinke, 1986). When two people are passionately in love, they typically spend time—quite a bit of time—gazing into each other's eyes (Rubin, 1970). Would such gazes stir these feelings between strangers? To find out, researchers have asked unacquainted male-female pairs to gaze intently for 2 minutes either at each other's hands or into each other's eyes. After separating, the eye gazers reported feeling a tingle of attraction and affection (Kellerman et al., 1989).



Network Photographers/Alamy

A silent language of emotion Hindu classic dance uses the face and body to effectively convey 10 different emotions (Hejmadi et al., 2000).

Most of us read nonverbal cues well. Shown 10 seconds of video from the end of a speed-dating interaction, people can often detect whether one person is attracted to another (Place et al., 2009). We are especially good at detecting nonverbal threats. In a series of subliminally flashed words, we more often sense the presence of negative ones, such as *snake* or *bomb* (Dijksterhuis & Aarts, 2003). In a crowd of faces, a single angry face “pops out” faster than a single happy one (Hansen & Hansen, 1988; Pinkham et al., 2010). And even when hearing another language, most of us readily detect anger (Scherer et al., 2001).

Experience can sensitize us to particular emotions, as shown by experiments using a series of faces (like those in **FIGURE 10.16**) that morph from anger to fear (or sadness). Viewing such faces, physically abused children are much quicker than other children to spot the signals of anger. Shown a face that is 60 percent fear and 40 percent anger, they are as likely to perceive anger as fear. Their perceptions become sensitively attuned to glimmers of danger that nonabused children miss.

Hard-to-control facial muscles reveal signs of emotions you may be trying to conceal. Lifting just the inner part of your eyebrows, which few people do consciously, reveals distress or worry. Eyebrows raised and pulled together signal fear. Activated muscles under the eyes and raised cheeks suggest a natural smile. A feigned smile, such as one we make for a photographer, often continues for more than 4 or 5 seconds. Most authentic expressions have faded by that time. Feigned smiles are also switched on and off more abruptly than is a genuine happy smile (Bugental, 1986).



Used by permission of S. D. Pollack, D. J. Kistler, and the National Academy of Sciences

FIGURE 10.16

Experience influences how we perceive emotions Viewing the morphed middle face, evenly mixing fear with anger, physically abused children were more likely than nonabused children to perceive the face as angry (Pollak & Kistler, 2002; Pollak & Tolley-Schell, 2003).

Our brains are rather amazing detectors of subtle expressions. Just *how* amazing was clear when researchers filmed teachers talking to unseen schoolchildren (Babad et al., 1991). A mere 10-second clip of the teacher’s voice or face provided enough clues for both young and old viewers to determine whether the teacher liked and admired a child. In other experiments, even glimpsing a face for one-tenth of a second enabled people to judge people’s attractiveness or trustworthiness or to rate politicians’ competence and predict their voter support (Willis & Todorov, 2006). “First impressions . . . occur with astonishing speed,” note Christopher Olivola and Alexander Todorov (2010).

Despite our brain’s emotion-detecting skill, we find it difficult to detect deceiving expressions (Porter & ten Brinke, 2008). In one digest of 206 studies of discerning truth from lies, people were just 54 percent accurate—barely better than a coin toss (Bond & DePaulo, 2006). Moreover, contrary to claims that some experts can spot lies, the available research indicates that virtually no one—save perhaps police professionals in high-stakes situations—beats chance by much (Bond & DePaulo, 2008; O’Sullivan et al., 2009). The behavioral differences between liars and truth tellers are too minute for most people to detect (Hartwig & Bond, 2011).

Some of us are, however, more sensitive than others to physical cues. In one study, hundreds of people were asked to

Which of researcher Paul Ekman’s smiles is feigned, which natural? The smile on the right engages the facial muscles of a natural smile.



Dr. Paul Ekman, University of California at San Francisco

name the emotion in brief film clips they watched. The clips showed portions of a person's emotionally expressive face or body, sometimes accompanied by a garbled voice (Rosenthal et al., 1979). For example, after a 2-second scene revealing only the face of an upset woman, the researchers would ask whether the woman was criticizing someone for being late or was talking about her divorce. Given such “thin slices,” some people were much better emotion detectors than others. Introverts tend to excel at reading others' emotions, while extraverts are generally easier to read (Ambady et al., 1995).

Gestures, facial expressions, and voice tones, which are absent in written communication, convey important information. The difference was clear in one study. In one group, participants heard 30-second recordings of people describing their marital separations. In the other group, participants read a script of the recording. Those who heard the recording were better able to predict a separated person's current and future adjustment (Mason et al., 2010). The absence of expressive emotion can make for ambiguous emotion in electronic communications. To partly remedy that, we sometimes embed visual cues to emotion (ROFL!) in our texts, e-mails, and online posts. Without the vocal nuances that signal whether a statement is serious, kidding, or sarcastic, we are in danger of what Piaget called *egocentrism*, by failing to perceive how others interpret our “just kidding” message (Kruger et al., 2005).

Gender and Emotion



10-14: How do women and men differ in their emotional expressions and experiences?

Is women's intuition, as so many believe, superior to men's? After analyzing 125 studies of sensitivity to nonverbal cues, Judith Hall (1984, 1987) concluded that women generally do surpass men at reading people's emotional cues when given thin slices of behavior. Women have also surpassed men in other assessments of emotional cues, such as deciding whether a male-female couple is a genuine romantic couple or a posed phony couple, and in discerning which of two people in a photo is the other's supervisor (Barnes & Sternberg, 1989).

Women's nonverbal sensitivity helps explain their greater emotional literacy. Invited to describe how they would feel in certain situations, men described simpler emotional reactions (Barrett et al., 2000). You might like to try this yourself: Ask some people how they might feel when saying good-bye to friends after graduation. Research suggests men are more likely to say, simply, “I'll feel bad,” and women to express more complex emotions: “It will be bittersweet; I'll feel both happy and sad.”

Women's skill at decoding others' emotions may also contribute to their greater emotional responsiveness (Vigil, 2009). In studies of 23,000 people from 26 cultures, women more than men reported themselves open to feelings (Costa et al., 2001). That helps explain the extremely strong perception that emotionality is “more true of women”—a perception expressed by nearly 100 percent of 18- to 29-year-old Americans (Newport, 2001).

One exception: Quickly—imagine an angry face. What gender is the person? If you're like 3 in 4 Arizona State University students, you imagined a male (Becker et al., 2007). The researchers also found that when a gender-neutral face was made to look angry, most people perceived it as male. If the face was smiling, they were more likely to perceive it as female (**FIGURE 10.17** on the next page). Anger strikes most people as a more masculine emotion.

The perception of women's emotionality feeds—and is fed by—people's attributing women's emotionality to their disposition and men's to their circumstances: “She's emotional. He's having a bad day” (Barrett & Bliss-Moreau, 2009). Nevertheless, there are some gender differences in descriptions of emotional experiences. When surveyed, women are far more likely than men to describe themselves as empathic. If you have



Obvious emotions Graphic novel authors use facial expressions and other design elements to express emotion, reducing the need to explain how the characters are feeling.

FIGURE 10.17

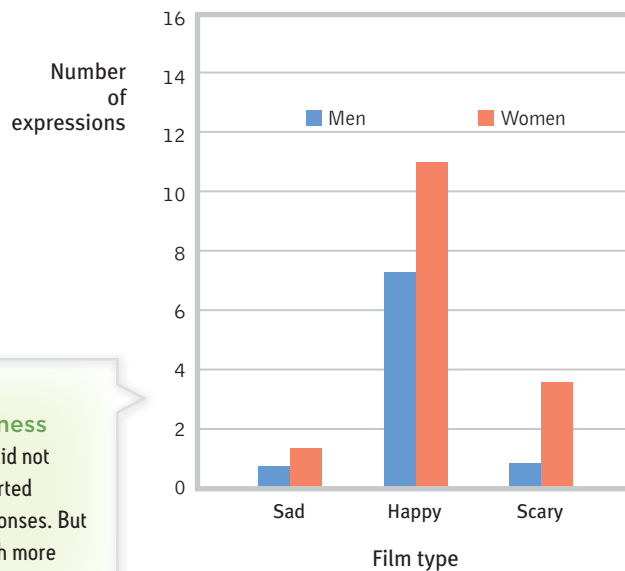
Male or female? Researchers manipulated a gender-neutral face. People were more likely to see it as a male when it wore an angry expression, and as a female when it wore a smile (Becker et al., 2007).



© APA/Vaughn Becker

empathy, you identify with others and imagine what it must be like to walk in their shoes. You rejoice with those who rejoice and weep with those who weep.

Physiological measures of empathy, such as one's heart rate while seeing another's distress, confirm a gender gap, though a smaller one than is indicated in survey self-reports (Eisenberg & Lennon, 1983; Rueckert et al., 2010). Females are also more likely to *express* empathy—to cry and to report distress when observing someone in distress. As **FIGURE 10.18** shows, this gender difference was clear in videotapes of male and female students watching film clips that were sad (children with a dying parent), happy (slapstick comedy), or frightening (a man nearly falling off the ledge of a tall building) (Kring & Gordon, 1998). Women also tend to experience emotional events, such as viewing pictures of mutilation, more deeply, displaying more activation in emotion-sensitive brain areas. And they better remember the scenes three weeks later (Canli et al., 2002).

**FIGURE 10.18****Gender and expressiveness**

Male and female film viewers did not differ dramatically in self-reported emotions or physiological responses. But the women's faces *showed* much more emotion. (From Kring & Gordon, 1998.)

RETRIEVE IT

- _____ (Women/Men) report experiencing emotions more deeply, and they tend to be more adept at reading nonverbal behavior.

ANSWER: Women

Culture and Emotion

10-15: Do gestures and facial expressions mean the same thing in all cultures?

The meaning of *gestures* varies from culture to culture. U.S. President Richard Nixon learned this after making the North American “A-OK” sign before a welcoming crowd of Brazilians, not realizing it was a crude insult in that country. In 1968, the cultural variability of gestures was again demonstrated when North Korea publicized photos of supposedly happy officers from a captured U.S. Navy spy ship. In the photo, three men had raised their middle finger, telling their captors it was a “Hawaiian good luck sign” (Fleming & Scott, 1991).

Do *facial expressions* also have different meanings in different cultures? To find out, two investigative teams showed photographs of various facial expressions to people in different parts of the world and asked them to guess the emotion (Ekman et al., 1975, 1987, 1994; Izard, 1977, 1994). You can try this matching task yourself by pairing the six emotions with the six faces of **FIGURE 10.19**.

Regardless of your cultural background, you probably did pretty well. A smile's a smile the world around. Ditto for anger, and to a lesser extent the other basic expressions (Elfenbein & Ambady, 1999). (There is no culture where people frown when they are happy.)

Facial expressions do convey some nonverbal accents that provide clues to one's culture (Marsh et al., 2003). Thus, data from 182 studies show that our judgments are slightly more accurate when we are interpreting emotional expressions from our own culture (Elfenbein & Ambady, 2002, 2003a,b). Still, the telltale signs of emotion generally cross cultures. The world over, children cry when distressed, shake their heads when defiant, and smile when they are happy. So, too, with blind children who have never seen a face (Eibl-Eibesfeldt, 1971). People blind from birth spontaneously exhibit the common facial expressions associated with such emotions as joy, sadness, fear, and anger (Galati et al., 1997).

Musical expressions of emotion also cross cultures. Happy and sad music feels happy and sad around the world. Whether you live in an African village or a European city, fast-paced music seems happy, and slow-paced music seems sadder (Fritz et al., 2009).

Do these shared emotional categories reflect shared *cultural* experiences, such as movies and TV broadcasts seen around the world? Apparently not. Paul Ekman and his team asked isolated people in New Guinea to respond to such statements as, "Pretend your child has died." When North American collegians viewed the taped responses, they easily read the New Guineans' facial reactions.

So we can say that facial muscles speak a universal language. This discovery would not have surprised Charles Darwin (1809–1882) who argued that in prehistoric times, before our ancestors communicated in words, they communicated threats, greetings, and submission with facial expressions. Their shared expressions helped them survive (Hess & Thibault, 2009). In confrontations, for example, a human sneer retains elements of an animal baring its teeth in a snarl. Emotional expressions may enhance our survival in other ways, too. Surprise raises the eyebrows and widens the eyes, enabling us to take in more information. Disgust wrinkles the nose, closing it from foul odors.

Smiles are social as well as emotional events. Bowlers seldom smile when they score a strike; they smile when they turn to face their companions (Jones et al., 1991; Kraut & Johnston, 1979). Euphoric Olympic gold-medal winners typically don't smile when they are awaiting their ceremony. But they wear broad grins when interacting with officials and facing the crowd and cameras (Fernández-Dols & Ruiz-Belda, 1995).

Although we share a universal facial language, it has been adaptive for us to interpret faces in particular contexts (**FIGURE 10.20** on the next page). People judge an angry face set in a frightening situation as afraid. They judge a fearful face set in a painful situation as pained (Carroll & Russell, 1996). Movie directors harness this phenomenon by creating contexts and soundtracks that amplify our perceptions of particular emotions.

Although cultures share a universal facial language for basic emotions, they differ in how *much* emotion they express. Those that encourage individuality, as in Western Europe, Australia, New Zealand, and North America, display mostly visible emotions (van Hemert et al., 2007). Those that encourage people to adjust to others, as in China, tend to have less visible displays of personal emotions (Matsumoto et al., 2009b; Tsai et al., 2007). In Japan, people infer emotion more from the surrounding context. Moreover, the mouth, which is so expressive in North Americans, conveys less emotion than do the telltale eyes (Masuda et al., 2008; Yuki et al., 2007).



Ekman & Matsumoto, Japanese and Caucasian Facial Expression of Emotion

FIGURE 10.19
Culture-specific or culturally universal expressions? As people of differing cultures, do our faces speak differing languages? Which face expresses disgust? Anger? Fear? Happiness? Sadness? Surprise? (From Matsumoto & Ekman, 1989.) See inverted answers below.

From left to right, top to bottom: happiness, surprise, fear, sadness, anger, disgust.

"For news of the heart, ask the face."

Guinean proverb

While weightless, astronauts' internal bodily fluids move toward their upper body and their faces become puffy. This has made nonverbal communication more difficult, especially among multinational crews (Gelman, 1989).



FIGURE 10.20

We read faces in context Tears on a face (above) make its expression seem sadder (Provine et al., 2009). Whether we perceive the man on the right as disgusted or angry depends on which body his face appears on (Aviezer et al., 2008).



Angry, Disgusted, or Afraid? Studies on the Malleability of Emotion Perception, Hillel Aviezer, Ran R. Hassin, Jennifer Ryan, Cheryl Grady, Josh Susskind, Adam Anderson, Morris Moscovitch, Shlomo Bentin

Cultural differences also exist *within* nations. The Irish and their Irish-American descendants tend to be more expressive than the Scandinavians and their Scandinavian-American descendants (Tsai & Chentsova-Dutton, 2003). And that reminds us of a familiar lesson: Like most psychological events, emotion is best understood not only as a biological and cognitive phenomenon, but also as a social-cultural phenomenon.

RETRIEVE IT

- Are people in different cultures more likely to differ in their interpretations of facial expressions, or of gestures?

ANSWER: gestures

The Effects of Facial Expressions



10-16: How do our facial expressions influence our feelings?

As William James (1890) struggled with feelings of depression and grief, he came to believe that we can control emotions by going “through the outward movements” of any emotion we want to experience. “To feel cheerful,” he advised, “sit up cheerfully, look around cheerfully, and act as if cheerfulness were already there.”

Studies of emotional effects of facial expressions reveal precisely what James might have predicted. Expressions not only communicate emotion, they also amplify and regulate it. In *The Expression of the Emotions in Man and Animals*, Charles Darwin (1872) contended that “the free expression by outward signs of an emotion intensifies it. . . . He who gives way to violent gestures will increase his rage.”

Want to test Darwin’s hypothesis? Try this: Fake a big grin. Now scowl. Can you feel the “smile therapy” difference? Participants in dozens of experiments have felt a difference. James Laird and his colleagues (1974, 1984, 1989) subtly induced students to make a frowning expression by asking them to “contract these muscles” and “pull your brows together” (supposedly to help the researchers attach facial electrodes). The results? The students reported feeling a little angry. So, too, for other basic emotions. For example, people reported feeling more fear than anger, disgust, or sadness when made to construct a fearful expression: “Raise your eyebrows. And open your eyes wide. Move your whole head back, so that your chin is tucked in a little bit, and let your mouth relax and hang open a little” (Duclos et al., 1989).

This **facial feedback effect** has been repeated many times, in many places, for many basic emotions (**FIGURE 10.21**). Just activating one of the smiling muscles by holding a pen in the teeth (rather than with the lips, which activates a frowning muscle) is enough to make cartoons seem more amusing (Strack et al., 1988). A heartier smile—made not just with the mouth but with raised cheeks that crinkle the eyes—enhances positive feelings even more when you are reacting to something pleasant or funny (Soussignan,

“Whenever I feel afraid
I hold my head erect
And whistle a happy tune.”

Richard Rodgers and Oscar
Hammerstein, *The King and I*, 1958

facial feedback effect the tendency of facial muscle states to trigger corresponding feelings, such as fear, anger, or happiness.

2001). Smile warmly on the outside and you feel better on the inside. When smiling, you will even more quickly understand sentences that describe pleasant events (Havas et al., 2007). Scowl and the whole world seems to scowl back.

A request from your author: Smile often as you read this book.

RETRIEVE IT

- (1) Based on the *facial feedback effect*, how might students in this experiment report feeling when the rubberbands raise their cheeks as though in a smile? (2) How might they report feeling when the rubberbands pull their cheeks downward?

ANSWERS: (1) Most report feeling more happy than sad when their cheeks are raised upward. (2) Most report feeling more sad than happy when their cheeks are pulled downward.

So your face is more than a billboard that displays your feelings; it also feeds your feelings. No wonder depressed patients reportedly feel better after between-the-eyebrows Botox injections that paralyze the frowning muscles (Finzi & Wasserman, 2006). Two months after the treatment, 9 of the 10 nonfrowning patients given this treatment were no longer depressed. Follow-up studies have found that Botox paralysis of the frowning muscles slows people's reading of sadness or anger-related sentences, and it slows activity in emotion-related brain circuits (Havas et al., 2010; Hennenlotter et al., 2008). In such ways, Botox smooths life's emotional wrinkles.

With studies of bodily posture and vocal expressions, researchers have observed a broader *behavior feedback effect* (Flack, 2006; Snodgrass et al., 1986). You can duplicate the participants' experience: Walk for a few minutes with short, shuffling steps, keeping your eyes downcast. Now walk around taking long strides, with your arms swinging and your eyes looking straight ahead. Can you feel your mood shift? Going through the motions awakens the emotions.

Likewise, people perceive ambiguous behaviors differently depending on which finger they move up and down while reading a story. (This was said to be a study of the effect of using finger muscles "located near the reading muscles on the motor cortex".) If participants read the story while moving an extended middle finger, the story behaviors seemed more hostile. If read with a thumb up, they seemed more positive. Hostile gestures prime hostile perceptions (Chandler & Schwarz, 2009; Goldin-Meadow & Beilock, 2010).

You can use your understanding of feedback effects to become more empathic: Let your own face mimic another person's expression. Acting as another acts helps us feel what another feels (Vaughn & Lanzetta, 1981). Our natural mimicry of others' emotions helps explain why emotions are contagious (Dimberg et al., 2000; Neumann & Strack, 2000). Indeed, losing this ability can leave us struggling to make emotional connections, as one social worker with Moebius syndrome, a rare facial paralysis disorder, discovered while working with Hurricane Katrina refugees: When people made a sad expression, "I wasn't able to return it. I tried to do so with words and tone of voice, but it was no use. Stripped of the facial expression, the emotion just dies there, unshared" (Carey, 2010).

We have seen how our motivated behaviors, triggered by the forces of nature and nurture, often go hand in hand with significant emotional responses. Our often-adaptive psychological emotions likewise come equipped with physical reactions. Nervous about an important encounter, we feel stomach butterflies. Anxious over public speaking, we frequent the bathroom. Smoldering over a family conflict, we get a splitting headache. Negative emotions and the prolonged high arousal that may accompany them can tax the body and harm our health. You'll hear more about this in Chapter 11.

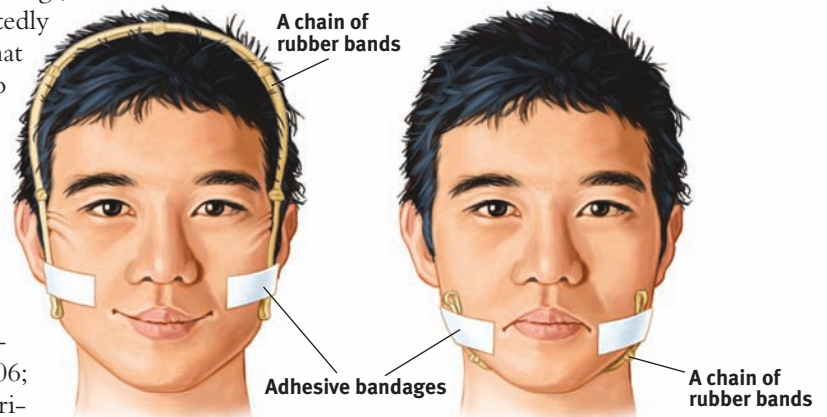
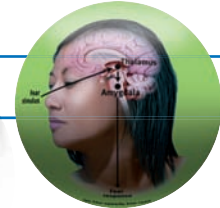
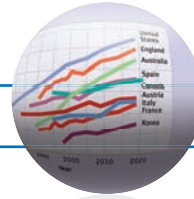


FIGURE 10.21

How to make people smile without telling them to smile Do as Kazuo Mori and Hideko Mori (2009) did with students in Japan: Attach rubberbands to the sides of the face with adhesive bandages, and then run them either over the head or under the chin.



CHAPTER REVIEW

Motivation and Emotion

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Motivational Concepts

10-1: How do psychologists define *motivation*? From what perspectives do they view motivated behavior?

Hunger

10-2: What physiological factors produce hunger?

10-3: What cultural and situational factors influence hunger?

10-4: What factors predispose some people to become and remain obese?

The Need to Belong

10-5: What evidence points to our human need to belong?

10-6: How does social networking influence us?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

motivation, p. 352

instinct, p. 352

drive-reduction theory, p. 353

homeostasis, p. 353

incentive, p. 353

Yerkes-Dodson law, p. 354

hierarchy of needs, p. 355

glucose, p. 357

set point, p. 358

basal metabolic rate, p. 358

Achievement Motivation

10-7: What is achievement motivation?

Emotion: Arousal, Behavior, and Cognition

10-8: How do arousal, cognition, and expressive behavior interact in emotion?

Embodied Emotion

10-9: What are some of the basic emotions?

10-10: What is the link between emotional arousal and the autonomic nervous system?

10-11: Do different emotions activate different physiological and brain-pattern responses?

10-12: How effective are polygraphs in using body states to detect lies?

Expressed and Experienced Emotion

10-13: How do we communicate nonverbally?

10-14: How do women and men differ in their emotional expressions and experiences?

10-15: Do gestures and facial expressions mean the same thing in all cultures?

10-16: How do our facial expressions influence our feelings?

achievement motivation, p. 370

emotion, p. 372

James-Lange theory, p. 372

Cannon-Bard theory, p. 372

two-factor theory, p. 373

polygraph, p. 379

facial feedback effect, p. 384

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Today's evolutionary psychology shares an idea that was an underlying assumption of instinct theory. That idea is that
 - physiological needs arouse psychological states.
 - genes predispose species-typical behavior.
 - physiological needs increase arousal.
 - external needs energize and direct behavior.
- An example of a physiological need is _____. An example of a psychological drive is _____.
 - hunger; a "push" to find food
 - a "push" to find food; hunger
 - curiosity; a "push" to reduce arousal
 - a "push" to reduce arousal; curiosity
- Jan walks into a friend's kitchen, smells bread baking, and begins to feel very hungry. The smell of baking bread is a(n) _____ (incentive/drive).
- _____ theory attempts to explain behaviors that do NOT reduce physiological needs.
- With a challenging task, such as taking a difficult exam, performance is likely to peak when arousal is
 - very high.
 - moderate.
 - very low.
 - absent.
- According to Maslow's hierarchy of needs, our most basic needs are physiological, including the need for food and water; just above these are _____ needs.
 - safety
 - self-esteem
 - belongingness
 - self-transcendence
- Journalist Dorothy Dix (1861–1951) once remarked, "Nobody wants to kiss when they are hungry." Which motivation theory best supports her statement?
- According to the concept of set point, our body maintains itself at a particular weight level. This "weight thermostat" is an example of _____.
- Which of the following is a genetically predisposed response to food?
 - An aversion to eating cats and dogs
 - An interest in novel foods
 - A preference for sweet and salty foods
 - An aversion to carbohydrates
- The blood sugar _____ provides the body with energy. When it is _____ (low/high), we feel hungry.
- The rate at which your body expends energy while at rest is referred to as the _____ rate.
- Obese people find it very difficult to lose weight permanently. This is due to several factors, including the fact that
 - dieting triggers neophobia.
 - the set point of obese people is lower than average.
 - with dieting, metabolism increases.
 - there is a genetic influence on body weight.
- Sanjay recently adopted the typical college diet high in fat and sugar. He knows he may gain weight, but he figures it's no big deal because he can lose the extra pounds in the future. How would you evaluate Sanjay's plan?
- Which of the following is NOT part of the evidence presented to support the view that humans are strongly motivated by a need to belong?
 - Students who rated themselves as "very happy" also tended to have satisfying close relationships.
 - Social exclusion—such as exile or solitary confinement—is considered a severe form of punishment.
 - As adults, adopted children tend to resemble their biological parents and to yearn for an affiliation with them.
 - Children who are extremely neglected become withdrawn, frightened, and speechless.
- What are some ways to manage our social networking time successfully?
- The _____-_____ theory of emotion maintains that a physiological response happens BEFORE we know what we are feeling.
- Assume that after spending an hour on a treadmill, you receive a letter saying that your scholarship request has been approved. The two-factor theory of emotion would predict that your physical arousal will
 - weaken your happiness.
 - intensify your happiness.
 - transform your happiness into relief.
 - have no particular effect on your happiness.
- Zajonc and LeDoux maintain that some emotional reactions occur before we have had the chance to label or interpret them. Lazarus disagreed. These psychologists differ about whether emotional responses occur in the absence of
 - physical arousal.
 - the hormone epinephrine.
 - cognitive processing.
 - learning.
- What does a polygraph measure and why are its results questionable?
- When people are induced to assume fearful expressions, they often report feeling a little fear. This result is known as the _____ effect.

Find answers to these questions in Appendix E, in the back of the book.



STRESS AND HEALTH

Stress: Some Basic Concepts

Stress and Illness

CLOSE-UP: Tips for Handling Anger

COPING WITH STRESS

Personal Control

Optimism Versus Pessimism

Social Support

CLOSE-UP: Pets Are Friends, Too

REDUCING STRESS

Aerobic Exercise

Relaxation and Meditation

Faith Communities and Health

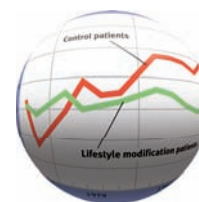
HAPPINESS

Positive Psychology

What Affects Our Well-Being?

What Predicts Our Happiness Levels?

CLOSE-UP: Want to Be Happier?



Stress, Health, and Human Flourishing

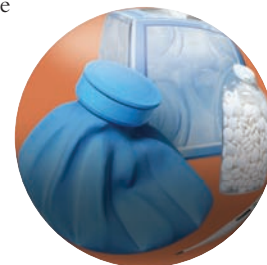


In *The How of Happiness*, social psychologist Sonja Lyubomirsky (2008) recalls Randy:

[He] endured a lot as a child. He lost two people close to him to suicide, at age twelve his father and at age seventeen his best friend. When he was in fifth grade, his mother left his father and moved the family out of state and away from everyone he knew in order that she could live with her boyfriend, Roy. Although Randy's bond with his mother was, and still is, strong, Roy belittled Randy, and their relationship was strained. [Randy married] too soon and too young. His marriage was fraught with difficulty and finally ended when he discovered the extent of his wife's infidelities. Still, he was devastated initially by the breakup and felt that he had more than his share of loss and death.

Today Randy is one of those happy people who make everyone around them smile and laugh. He picked himself up after his divorce, moved to another city, found work as a safety engineer, and eventually remarried. He is now forty-three, remarried for three years, and stepfather to three boys. How did he do it? Randy is an eternal optimist and claims that seeing the "silver lining in the cloud" has always been his key to survival. For example, although some of his coworkers find their jobs frustrating and stressful, he says that his allows him "to think outside the box." Moreover, while a friend of his struggles with stepchildren, Randy is overjoyed by "the opportunity to be a dad." (pp. 29–30)

Randy's life embodies what this chapter explores: the challenges of stress, the ways we interpret events and cope, and the possibilities for a happy, flourishing life.



Stress and Health

How often do you experience stress in your daily life? Never? Rarely? Sometimes? Or frequently? When pollsters put a similar question to other collegians, some 85 percent recalled experiencing stress during the last three months—and most said it had disrupted their school work at least once (AP, 2009). On entering college or university, 18 percent of men and 39 percent of women reported having been “frequently overwhelmed” by all they had to do during the past year (Pryor et al., 2011).

Stress often strikes without warning. Imagine being 21-year-old Ben Carpenter on the world’s wildest and fastest wheelchair ride. As he crossed an intersection on a sunny summer afternoon in 2007, the light changed. A large truck, whose driver didn’t see him, started moving into the intersection. As they bumped, the wheelchair turned to face forward, and its handles got stuck in the truck’s grille. Off they went, the driver unable to hear Ben’s cries for help. As they sped down the highway about an hour from my home, passing motorists caught the bizarre sight of a truck pushing a wheelchair at 50 miles per hour and started calling 911. (The first caller: “You are not going to believe this. There is a semi truck pushing a guy in a wheelchair on Red Arrow highway!”) Lucky for Ben, one passerby was an undercover police officer. Pulling a quick U-turn, he followed the truck to its destination a couple of miles from where the wild ride had started, and informed the disbelieving driver that he had a passenger hooked in his grille. “It was very scary,” said Ben, who has muscular dystrophy.



AP Photo/Michigan State Police

Extreme stress Ben Carpenter experienced the wildest of rides after his wheelchair got stuck in a truck’s grille.

In this chapter, we take a close look at stress and how it affects our health and well-being. Let’s begin with some basic terms.

Stress: Some Basic Concepts



11-1: What events provoke stress responses, and how do we respond and adapt to stress?

Stress is a slippery concept. We sometimes use the word informally to describe threats or challenges (“Ben was under a lot of stress”), and at other times our responses (“Ben experienced acute stress”). To a psychologist, the dangerous truck ride was a *stressor*. Ben’s physical and emotional responses were a *stress reaction*. And the process by which he related to the threat was *stress*. Thus, **stress** is the process of appraising and responding to a threatening or challenging event (**FIGURE 11.1**). Stress arises less from events themselves than from how we appraise them (Lazarus, 1998). One person, alone in a house, ignores its creaking sounds and experiences no stress; someone else suspects an intruder and becomes alarmed. One person regards a new job as a welcome challenge; someone else appraises it as risking failure.

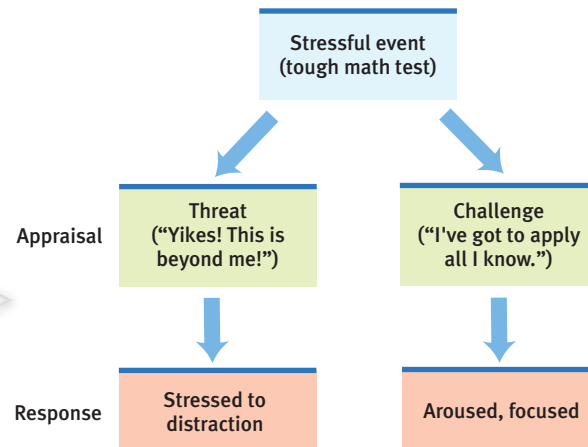


Image 100/Corbis

FIGURE 11.1
Stress appraisal The events of our lives flow through a psychological filter. How we appraise an event influences how much stress we experience and how effectively we respond.

When short-lived, or when perceived as challenges, stressors can have positive effects. A momentary stress can mobilize the immune system for fending off infections and healing wounds (Segerstrom, 2007). Stress also arouses and motivates us to conquer problems. Championship athletes, successful entertainers, and great teachers and leaders all thrive and excel when aroused by a challenge (Blascovich et al., 2004). Having conquered cancer or rebounded from a lost job, some people emerge with stronger self-esteem and a deepened spirituality and sense of purpose. Indeed, some stress early in life is conducive to later emotional resilience (Landauer & Whiting, 1979). Adversity can beget growth.

Extreme or prolonged stress can harm us. Children who suffer severe or prolonged abuse are later at risk of chronic disease (Repetti et al., 2002). Troops who had post-traumatic stress reactions to heavy combat in the Vietnam war later suffered greatly elevated rates of circulatory, digestive, respiratory, and infectious diseases (Boscarino, 1997). People who lose their jobs, especially later in their working life, are at increased risk of heart problems and death (Gallo et al., 2006; Sullivan & von Wachter, 2009).

So there is an interplay between our heads and our health. This isn't surprising. Psychological states are physiological events that influence other parts of our physiological system. Just pausing to *think* about biting into an orange section—the sweet, tangy juice from the pulpy fruit flooding across your tongue—can trigger salivation. We'll explore that interplay shortly, but first, let's look more closely at stressors and stress reactions.

Stressors—Things That Push Our Buttons

Stressors fall into three main types: catastrophes, significant life changes, and daily hassles. All can be toxic.

Catastrophes Catastrophes are unpredictable large-scale events, such as wars, earthquakes, and famines. After such events, damage to emotional and physical health can be significant. In surveys taken in the three weeks after the 9/11 terrorist attacks, two-thirds of Americans said they were having some trouble concentrating and sleeping (Wahlberg, 2001). In the New York area, people were especially likely to report such symptoms, and sleeping pill prescriptions rose by a reported 28 percent (HMHL, 2002). In the four months after Hurricane Katrina, New Orleans' suicide rate reportedly tripled (Saulny, 2006).

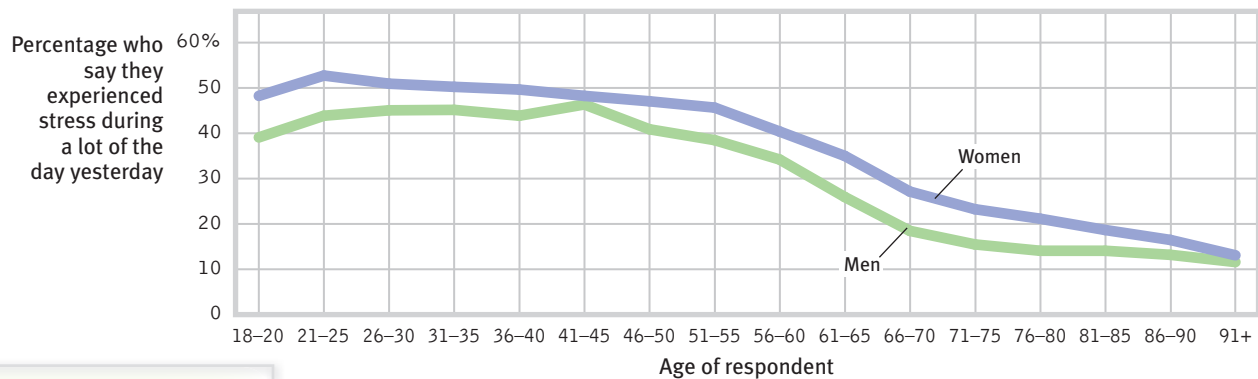
For those who respond to catastrophes by relocating to another country, the stress is twofold. The trauma of uprooting and family separation combine with the challenges of adjusting to the new culture's language, ethnicity, climate, and social norms (Pipher, 2002; Williams & Berry, 1991). In the first half-year, before their morale begins to rebound, newcomers often experience culture shock and deteriorating well-being (Markovizky & Samid, 2008). Such relocations may become increasingly common due to climate change in years to come.

stress the process by which we perceive and respond to certain events, called *stressors*, that we appraise as threatening or challenging.



Daniel More /AFP/Getty/Newscom

Toxic stress: Unpredictable large-scale events, such as the severe earthquake that devastated Haiti in 2010, trigger significant levels of stress-related ills. When an earthquake struck Los Angeles in 1994, sudden-death heart attacks increased fivefold. Most occurred in the first two hours after the quake and near its center and were unrelated to physical exertion (Muller & Verier, 1996).

**FIGURE 11.2**

Age and stress A Gallup-Healthways survey of more than 650,000 Americans during 2008 and 2009 found daily stress highest among younger adults (Newport & Pelham, 2009).

Significant Life Changes Life transitions—leaving home, becoming divorced, losing a job, having a loved one die—are often keenly felt. Even happy events, such as getting married, can be stressful. Many of these transitions happen during young adulthood. One survey, in which 15,000 Canadian adults were asked whether “You are trying to take on too many things at once,” found the highest stress levels among young adults. Young adult stress appeared again when 650,000 Americans were asked if they had experienced a lot of stress “yesterday” (**FIGURE 11.2**).

Some psychologists study the health effects of life changes by following people over time. Others compare the life changes recalled by those who have or have not suffered a specific health problem, such as a heart attack. In such studies, those recently widowed, fired, or divorced have been more vulnerable to disease (Dohrenwend et al., 1982; Strully, 2009). One Finnish study of 96,000 widowed people found that the survivor’s risk of death doubled in the week following a partner’s death (Kaprio et al., 1987). A cluster of crises—losing a job, home, and partner—puts one even more at risk.

Daily Hassles Events don’t have to remake our lives to cause stress. Stress also comes from *daily hassles*—rush-hour traffic, aggravating housemates, long lines at the store, too many things to do, family frustrations, and friends who won’t pick up their phone (Kohn & Macdonald, 1992; Repetti et al., 2009; Ruffin, 1993). Some people can simply shrug off such hassles. For others, the everyday annoyances add up and take a toll on health and well-being.

Many people face more significant daily hassles. As the Great Recession of 2008–2009 bottomed out, Americans’ most oft-cited stressors related to money (76 percent), work (70 percent), and the economy (65 percent) (APA, 2010). In impoverished areas—where many people routinely face inadequate income, unemployment, solo parenting, and overcrowding—such stressors are part of daily life.

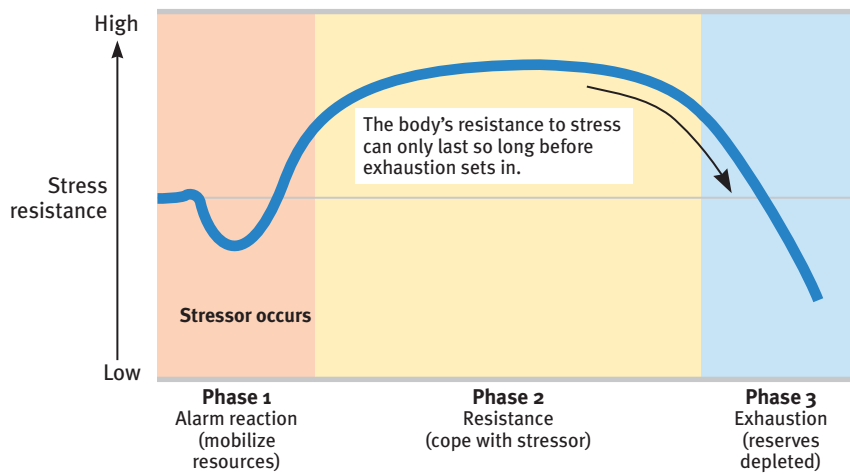
Daily economic pressures may be compounded by anti-gay prejudice or racism, which—like other stressors—can have both psychological and physical consequences (Pascoe & Richman, 2009; Rostosky et al., 2010; Swim et al., 2009). Thinking that some of the people you encounter each day will dislike you, distrust you, or doubt your abilities makes daily life stressful. When prolonged, such stress takes a toll on our health, especially our cardiovascular system. For many African-Americans, stress helps drive up blood pressure levels (Mays et al., 2007; Ong et al., 2009).

The Stress Response System

Medical interest in stress dates back to Hippocrates (460–377 B.C.E.). In the 1920s, Walter Cannon (1929) confirmed that the stress response is part of a unified mind-body system. He observed that extreme cold, lack of oxygen, and emotion-arousing events all trigger an outpouring of the stress hormones epinephrine and norepinephrine from the core of the adrenal glands. When alerted by any of a number of brain pathways, the sympathetic nervous system arouses us, preparing the body for the wonderfully adaptive response

“You’ve got to know when to hold’ em; know when to fold’ em. Know when to walk away, and know when to run.”

Kenny Rogers, “The Gambler,” 1978



that Cannon called *fight or flight*. It increases heart rate and respiration, diverts blood from digestion to the skeletal muscles, dulls feelings of pain, and releases sugar and fat from the body's stores (see Figure 10.14).

Canadian scientist Hans Selye's (1936, 1976) 40 years of research on stress extended Cannon's findings. His studies of animals' reactions to various stressors, such as electric shock and surgery, helped make stress a major concept in both psychology and medicine. Selye proposed that the body's adaptive response to stress is so general that, like a single burglar alarm, it sounds, no matter what intrudes. He named this response the **general adaptation syndrome (GAS)**, and he saw it as a three-phase process (**FIGURE 11.3**). Let's say you suffer a physical or an emotional trauma. In Phase 1, you have an *alarm reaction*, as your sympathetic nervous system is suddenly activated. Your heart rate zooms. Blood is diverted to your skeletal muscles. You feel the faintness of shock.

With your resources mobilized, you are now ready to fight back. During Phase 2, *resistance*, your temperature, blood pressure, and respiration remain high. Your adrenal glands pump hormones into your bloodstream. You are fully engaged, summoning all your resources to meet the challenge.

As time passes, with no relief from stress, your body's reserves dwindle. You have reached Phase 3, *exhaustion*. With exhaustion, you become more vulnerable to illness or even, in extreme cases, collapse and death.

Selye's basic point: Although the human body copes well with temporary stress, prolonged stress can damage it. Even fearful, stressed rats have been found to die sooner (after about 600 days) than their more confident siblings, which average 700-day life spans (Cavigelli & McClintock, 2003).

There are other options for dealing with stress. One is a common response to a loved one's death: Withdraw. Pull back. Conserve energy. Faced with an extreme disaster, such as a ship sinking, some people become paralyzed by fear. Another **tend-and-befriend** stress response, found especially among women, is to seek and give support (Taylor et al., 2000, 2006).

Facing stress, men more often than women tend to withdraw socially, turn to alcohol, or become aggressive. Women more often respond to stress by nurturing and banding together. This may in part be due to *oxytocin*, a stress-moderating hormone associated with pair-bonding in animals and released by cuddling, massage, and breast-feeding in humans (Campbell, 2010; Taylor, 2006).

It often pays to spend our resources in fighting or fleeing an external threat. But we do so at a cost. When stress is momentary, the cost is small. When stress persists, we may pay a much higher price, with lowered resistance to infections and other threats to mental and physical well-being.



Luis Hidalgo/Associated Press



Associated Press

FIGURE 11.3**Selye's general adaptation syndrome**

When a gold and copper mine in Chile collapsed in 2010, family and friends rushed to the scene, fearing the worst. Many of those holding vigil outside the mine were nearly exhausted with the stress of waiting and worrying when, after 18 days, they received news that all 33 of the miners inside were alive and well.



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"You may be suffering from what's known as *full-nest syndrome*."

general adaptation syndrome (GAS)

Selye's concept of the body's adaptive response to stress in three phases—alarm, resistance, exhaustion.

tend and befriend under stress, people (especially women) often provide support to others (*tend*) and bond with and seek support from others (*befriend*).

health psychology a subfield of psychology that provides psychology's contribution to behavioral medicine.

psychoneuroimmunology the study of how psychological, neural, and endocrine processes together affect the immune system and resulting health.

RETRIEVE IT

- Stress response system: When alerted to a negative, uncontrollable event, our _____ nervous system arouses us. Heart rate and respiration _____ (increase/decrease). Blood is diverted from digestion to the skeletal _____. The body releases sugar and fat. All this prepares the body for the _____ - _____ - _____ response.

ANSWERS: sympathetic; increase; fight-or-flight; muscles; fight-or-flight

Stress and Illness



11-2: How does stress make us more vulnerable to disease?

To study how stress and healthy and unhealthy behaviors influence health and illness, psychologists and physicians have created the interdisciplinary field of *behavioral medicine*, integrating behavioral and medical knowledge. One subfield, **health psychology**, provides psychology's contribution to behavioral medicine. Another subfield, **psychoneuroimmunology**, focuses on mind-body interactions (Kiecolt-Glaser, 2009). This awkward name makes sense when said slowly: Your thoughts and feelings (*psycho*) influence your brain (*neuro*), which influences the endocrine hormones that affect your disease-fighting immune system. And this subfield is the study of (*ology*) those interactions.

If you've ever had a stress headache, or felt your blood pressure rise with anger, you don't need to be convinced that our psychological states have physiological effects. Stress can even leave you less able to fight off disease because your nervous and endocrine systems influence your immune system (Sternberg, 2009). You can think of your immune system as a complex surveillance system. When it functions properly, it keeps you healthy by isolating and destroying bacteria, viruses, and other invaders. Four types of cells are active in these search-and-destroy missions (**FIGURE 11.4**):

- *B lymphocytes* (white blood cells) mature in the bone marrow and release antibodies that fight bacterial infections.
- *T lymphocytes* (white blood cells) mature in the thymus and other lymphatic tissue and attack cancer cells, viruses, and foreign substances.
- *Macrophages* ("big eaters") identify, pursue, and ingest harmful invaders and worn-out cells.
- *Natural killer cells* (NK cells) pursue diseased cells (such as those infected by viruses or cancer).

Your age, nutrition, genetics, body temperature, and stress all influence your immune system's activity. If it doesn't function properly, your immune system can err in two directions:

1. Responding too strongly, the immune system may attack the body's own tissues, causing an allergic reaction or a self-attacking disease such as lupus, multiple sclerosis, or some forms of arthritis. Women, who are immunologically stronger than men, are more susceptible to self-attacking diseases (Morell, 1995; Pido-Lopez et al., 2001).
2. Underreacting, the immune system may allow a bacterial infection to flare, a dormant virus to erupt, or cancer cells to multiply. To protect transplanted organs, which the recipient's immune system would view as a foreign substance, surgeons may deliberately suppress the patient's immune system.

Stress can also trigger immune suppression by reducing the release of disease-fighting lymphocytes. This has been observed when animals were stressed by physical restraints, unavoidable electric shocks, noise, crowding, cold water, social defeat, or separation from their mothers (Maier et al., 1994). One six-month study monitored immune responses in 43 monkeys (Cohen et al., 1992). Half were left in stable groups. The others (21) were

"In the eyes of God or biology or what have you, it is just very important to have women."

Immunologist Norman Talal (1995)

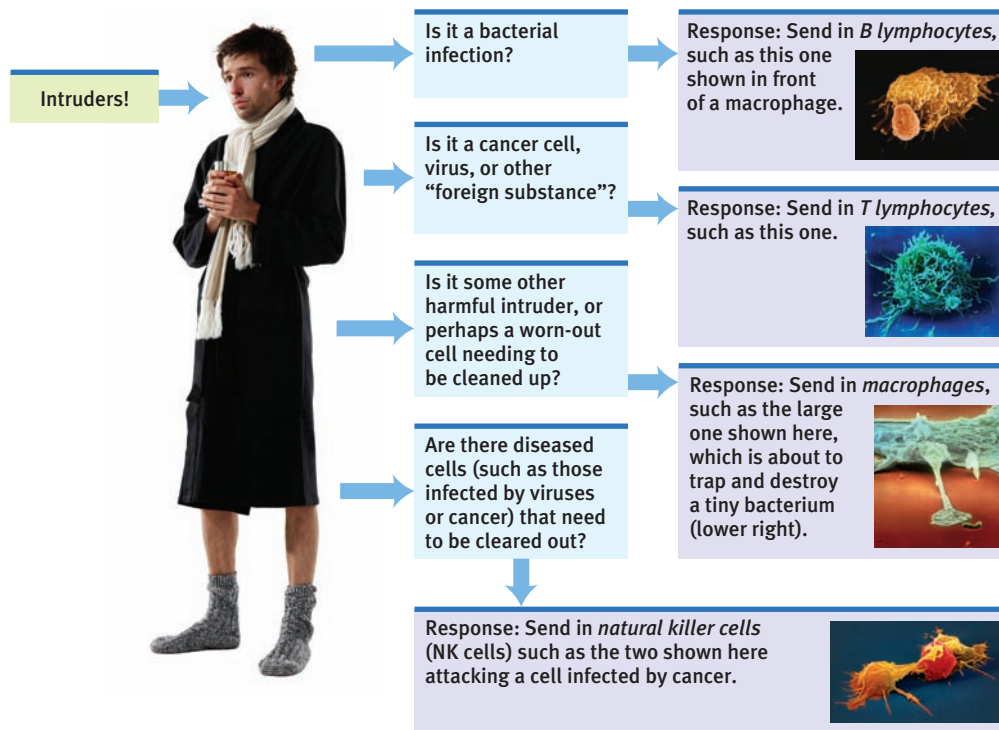


FIGURE 11.4
A simplified view of immune responses

Man at far left: Fuse/Getty Images
Right-hand photos:
Top: CNRI/Photo Researchers, Inc.
Second: NIBSC/Photo Researchers, Inc.
Third: Eye of Science/Photo Researchers, Inc.
Fourth (bottom): Lennart Nilsson/Boehringer Ingelheim International GmbH

stressed by being housed with new roommates—3 or 4 new monkeys each month. By the end of the experiment, the socially disrupted monkeys had weaker immune systems. Human immune systems react similarly. Two examples:

- *Surgical wounds heal more slowly in stressed people.* In one experiment, dental students received punch wounds (precise small holes punched in the skin). Compared with wounds placed during summer vacation, those placed three days before a major exam healed 40 percent more slowly (Kiecolt-Glaser et al., 1998). In other studies, marriage conflict has also slowed punch-wound healing (Kiecolt-Glaser et al., 2005).
- *Stressed people are more vulnerable to colds.* Major life stress increases the risk of a respiratory infection (Pedersen et al., 2010). When researchers dropped a cold virus into the noses of stressed and relatively unstressed people, 47 percent of those living stress-filled lives developed colds (FIGURE 11.5). Among those living relatively free of stress, only 27 percent did. In follow-up research, the happiest and most relaxed people were likewise markedly less vulnerable to an experimentally delivered cold virus (Cohen et al., 2003, 2006).

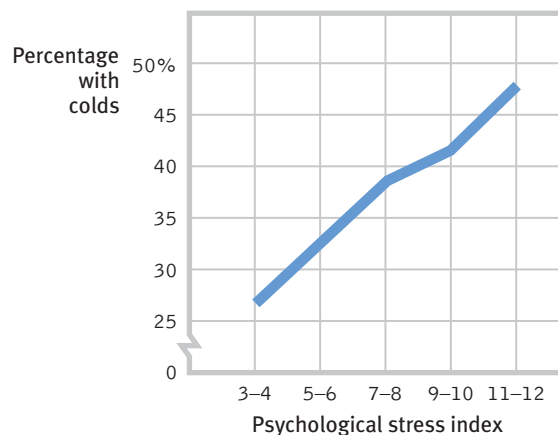


FIGURE 11.5
Stress and colds In an experiment by Sheldon Cohen and colleagues (1991), people with the highest life stress scores were also most vulnerable when exposed to an experimentally delivered cold virus.

The stress effect on immunity makes physiological sense. It takes energy to track down invaders, produce swelling, and maintain fevers. Thus, when diseased, your body reduces its muscular energy output by decreasing activity and increasing sleep. Stress does the opposite. It creates a competing energy need. During an aroused fight-or-flight reaction, your stress responses divert energy from your disease-fighting immune system and send it to your muscles and brain (see Figure 10.14). This increases your vulnerability to illness.

The point to remember: Stress does not make us sick, but it does alter our immune functioning, which leaves us less able to resist infection.



D. Hurst/Alamy

RETRIEVE IT

- _____ provides psychology's contribution to behavioral medicine. _____ focuses on mind-body interactions, including the effects of psychological, neural, and endocrine functioning on the immune system and overall health.

ANSWERS: Health psychology; Psychoneuroimmunology

- What general effect does stress have on our overall health?

ANSWER: Stress tends to reduce our immune system's ability to function properly, so that higher stress generally leads to a greater incidence of physical illness.

Stress and AIDS

We know that stress suppresses immune functioning. What does this mean for people with AIDS (*acquired immune deficiency syndrome*)? As its name tells us, AIDS is an immune disorder, caused by the *human immunodeficiency virus (HIV)*. AIDS has become the world's fourth-leading cause of death and Africa's number-one killer.

Ironically, if a disease is spread by human contact (as AIDS is, through the exchange of bodily fluids, primarily semen and blood), and if it kills slowly (as AIDS does), it can be lethal to more people. Those who acquire HIV often spread it in the highly contagious first few weeks before they know they are infected. Worldwide, some 2.7 million people—slightly more than half of them women—became infected with HIV in 2010, often without their awareness (UNAIDS, 2011). Years after the initial infection, when AIDS appears, people have difficulty fighting off other diseases, such as pneumonia. More than 25 million people worldwide have died of AIDS (UNAIDS, 2010).

Stress cannot give people AIDS. But could stress and negative emotions speed the transition from HIV infection to AIDS in someone already infected? Might stress predict a faster decline in those with AIDS? The answer to both questions seems to be *Yes* (Bower et al., 1998; Kiecolt-Glaser & Glaser, 1995; Leserman et al., 1999). HIV-infected men who experience stressful events, such as the loss of a partner, exhibit somewhat greater immune suppression and travel a faster disease course.

Would efforts to reduce stress help control the disease? Again, the answer appears to be *Yes*. Educational initiatives, bereavement support groups, cognitive therapy, relaxation training, and exercise programs that reduce distress have all had positive consequences for HIV-positive people (Baum & Posluszny, 1999; McCain et al., 2008; Schneiderman, 1999). But the benefits are small, compared with available drug treatments.

Although AIDS is now more treatable than ever before, preventing HIV infection is a far better option. This is the focus of many educational programs, such as the comprehensive ABC (*Abstinence, Be faithful, use Condoms*) program that has been used with seeming success in Uganda (Altman, 2004; UNAIDS, 2005).

In North America and Western Europe, 74 percent of people with AIDS are men. In sub-Saharan Africa, 60 percent of people with AIDS are women (UNAIDS, 2010).

Africa is ground zero for AIDS In Lesotho, Uganda, and elsewhere, prevention efforts have included the “ABC” Campaign—Abstinence, *Be faithful*, and use *Condoms*.



Stress and Cancer

Stress does not create cancer cells. But in a healthy, functioning immune system, lymphocytes, macrophages, and NK cells search out and destroy cancer cells and cancer-damaged cells. If stress weakens the immune system, might this weaken a person's ability to fight off cancer? To explore a possible connection between stress and cancer, experimenters have implanted tumor cells in rodents or given them *carcinogens* (cancer-producing substances). They then exposed some rodents to uncontrollable stress, such as inescapable shocks, which weakened their immune systems. Those rodents were indeed more prone to developing cancer (Sklar & Anisman, 1981). Their tumors developed sooner and grew larger than in nonstressed rodents.

Does this stress-cancer link also hold with humans? The results are mixed. Some studies find that people are at increased risk for cancer within a year after experiencing depression, helplessness, or bereavement (Chida et al., 2008; Steptoe et al., 2010). In one large Swedish study, the risk of colon cancer was 5.5 times greater among people with a history of workplace stress than among those who reported no such problems. This difference was not attributable to group differences in age, smoking, drinking, or physical characteristics (Courtney et al., 1993). Other studies, however, have found no link between stress and human cancer (Coyne et al., 2010; Petticrew et al., 1999, 2002). Concentration camp survivors and former prisoners of war, for example, do not have elevated cancer rates.

One danger in hyping reports on emotions and cancer is that some patients may then blame themselves for their illness: "If only I had been more expressive, relaxed, and hopeful." A corollary danger is a "wellness macho" among the healthy, who take credit for their "healthy character" and lay a guilt trip on the ill: "She has cancer? That's what you get for holding your feelings in and being so nice." Dying thus becomes the ultimate failure.

It's important enough to repeat: *Stress does not create cancer cells.* At worst, it may affect their growth by weakening the body's natural defenses against multiplying malignant cells (Antoni & Lutgendorf, 2007). Although a relaxed, hopeful state may enhance these defenses, we should be aware of the thin line that divides science from wishful thinking. The powerful biological processes at work in advanced cancer or AIDS are not likely to be completely derailed by avoiding stress or maintaining a relaxed but determined spirit (Anderson, 2002; Kessler et al., 1991). And that explains why research consistently indicates that psychotherapy does not extend cancer patients' survival (Coyne et al., 2007, 2009; Coyne & Tennen, 2010).

coronary heart disease the clogging of the vessels that nourish the heart muscle; the leading cause of death in many developed countries.

"I didn't give myself cancer."

Mayor Barbara Boggs Sigmund
(1939–1990), Princeton, New Jersey

When organic causes of illness are unknown, it is tempting to invent psychological explanations. Before the germ that causes tuberculosis was discovered, personality explanations of TB were popular (Sontag, 1978).

Stress and Heart Disease



11-3: Why are some of us more prone than others to coronary heart disease?

Stress is much more closely linked to North America's leading cause of death. In **coronary heart disease**, the blood vessels that nourish the heart muscle gradually close. *Hypertension* (high blood pressure) and a family history of the disease increase the risk of coronary heart disease. So do many behavioral factors (smoking, obesity, a high-fat diet, physical inactivity), physiological factors (an elevated cholesterol level), and psychological factors (stress responses and personality traits).

In a classic study, Meyer Friedman, Ray Rosenman, and their colleagues tested the idea that stress increases heart disease risk by measuring the blood cholesterol level and clotting speed of 40 U.S. male tax accountants at different times of year (Friedman & Ulmer, 1984). From January through March, the test results were completely normal. Then, as the accountants began scrambling to finish their clients' tax returns before the April 15 filing deadline, their cholesterol and clotting measures rose to dangerous levels. In May and June, with the deadline past, the measures

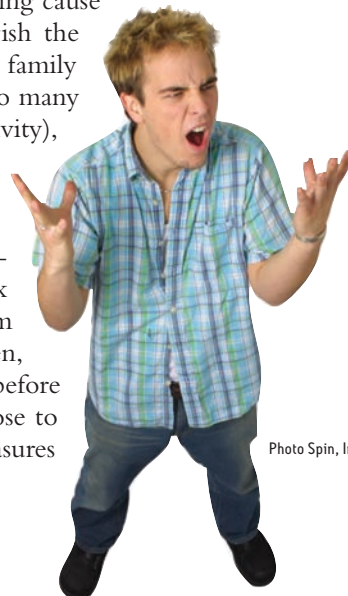


Photo Spin, Inc./Alamy

In both India and America, Type A bus drivers are literally hard-driving: They brake, pass, and honk their horns more often than their more easygoing Type B colleagues (Evans et al., 1987).

“The fire you kindle for your enemy often burns you more than him.”

Chinese proverb

CLOSE UP:

Tips for Handling Anger



11-4: What are some healthful ways to cope with feelings of anger?

Behavioral medicine research provides a reminder of one of contemporary psychology’s overriding themes: *Mind and body interact; everything psychological is simultaneously physiological*. When we face a threat or challenge, fear triggers flight but anger triggers fight—each at times an adaptive behavior. Yet chronic hostility, as in the Type A personality, is linked to heart disease. How, then, can we rid ourselves of our anger?

Individualistic cultures encourage people to vent their rage. Such advice is seldom heard in cultures where people’s identity is centered more on the group. People who keenly sense their *interdependence* see anger as a threat to group harmony (Markus & Kitayama, 1991). In Tahiti, for instance, people learn to be considerate and gentle. In Japan, from infancy on, angry expressions are less common than in Western cultures, where in recent politics, anger seems all the rage.

The Western vent-your-anger advice presumes that we can achieve emotional release, or **catharsis**, through aggressive action or fantasy.

returned to normal. Stress predicted heart attack risk for these men. The researchers’ hunch had paid off, launching a nine-year study of more than 3000 healthy men, aged 35 to 59.

At the start of the study, the researchers interviewed each man for 15 minutes, noting his work and eating habits, manner of talking, and other behavior patterns. Those who seemed the most reactive, competitive, hard driving, impatient, time conscious, super-motivated, verbally aggressive, and easily angered they called **Type A**. The roughly equal number who were more easygoing they called **Type B**. Which group do you suppose turned out to be the most prone to coronary heart disease?

Nine years later, 257 men had suffered heart attacks, and 69 percent of them were Type A. Moreover, not one of the “pure” Type Bs—the most mellow and laid back of their group—had suffered a heart attack.

As often happens in science, this exciting discovery provoked enormous public interest. But after that initial honeymoon period, researchers wanted to know more. Was the finding reliable? If so, what was the toxic component of the Type A profile: Time consciousness? Competitiveness? Anger?

More than 700 studies have now explored possible psychological correlates or predictors of cardiovascular health (Chida & Hamer, 2008; Chida & Steptoe, 2009). These reveal that Type A’s toxic core is negative emotions—especially the anger associated with an aggressively reactive temperament. When we are harassed or challenged, our active sympathetic nervous system redistributes bloodflow to our muscles, pulling it away from our internal organs. One of those organs, the liver, which normally removes

likely to repeat whatever relieved your anger in the past.

What, then, is the best way to handle our anger? Experts offer two suggestions. First, wait. You can bring down the level of physiological arousal of anger by waiting. “It is true of the body as of arrows,” noted Carol Tavris (1982), “what goes up must come down. Any emotional arousal will simmer down if you just wait long enough.” Second, deal with anger in a way that involves neither being chronically angry over every little annoyance, nor sulking and rehearsing your grievances. Ruminating inwardly about the causes of your anger serves only to increase it (Rusting & Nolen-Hoeksema, 1998). Calm yourself by exercising, playing an instrument, or talking it through with a friend.

Anger is not always wrong. Used wisely, it can communicate strength and competence (Tiedens, 2001). It can benefit a relationship when it expresses a grievance in ways that promote reconciliation rather than retaliation. Controlled expressions of anger are more adaptive than either hostile outbursts or pent-up angry feelings. Civility means not only keeping silent about trivial irritations but also communicating important ones clearly

Anger can indeed be *temporarily* calming if it does not leave us feeling guilty or anxious (Geen & Quanty, 1977; Hokanson & Edelman, 1966).

However, catharsis usually fails to cleanse one’s rage. More often, expressing anger breeds more anger. For one thing, it may provoke further retaliation, thus escalating a minor conflict into a major confrontation. For another, expressing anger can magnify anger. (Recall the behavior feedback research from Chapter 10: *Acting angry can make us feel angrier.*)

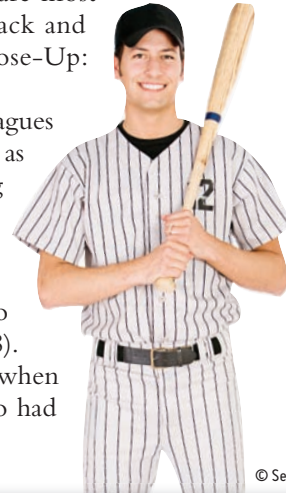
In one study, people who had been provoked were asked to wallop a punching bag while ruminating about the person who had angered them. Later, when given a chance for revenge, they became even more aggressive (Bushman, 2002). Angry outbursts that temporarily calm us are dangerous in another way: They may be reinforcing and therefore habit forming. If stressed managers find they can drain off some of their tension by berating an employee, then the next time they feel irritated and tense they may be more likely to explode again. Think about it: The next time you are angry you are

cholesterol and fat from the blood, can't do its job. Type A individuals are more often "combat ready." Thus, excess cholesterol and fat may continue to circulate in their blood and later get deposited around the heart. Further stress—sometimes conflicts brought on by their own abrasiveness—may trigger altered heart rhythms. In people with weakened hearts, this altered pattern can cause sudden death (Kamarck & Jennings, 1991). Hostility also correlates with other risk factors, such as smoking, drinking, and obesity (Bunde & Suls, 2006). In important ways, people's minds and hearts interact.

Hundreds of other studies of young and middle-aged men and women have confirmed the finding that people who react with anger over little things are most prone to heart disease. As researchers have noted, rage "seems to lash back and strike us in the heart muscle" (Spielberger & London, 1982). (See Close-Up: Tips for Handling Anger.)

Pessimism seems to be similarly toxic. Laura Kubzansky and her colleagues (2001) studied 1306 initially healthy men who a decade earlier had scored as optimists, pessimists, or neither. Even after other risk factors such as smoking had been ruled out, pessimists were more than twice as likely as optimists to develop coronary heart disease (FIGURE 11.6 on the next page). (More on optimism and pessimism in the next section, Coping With Stress.)

Depression, too, can be lethal. Happy people tend to be healthier and to outlive their unhappy peers (Diener & Chan, 2011; Siahpush et al., 2008). Even a big, happy smile predicts longevity, as researchers discovered when they examined the photographs of 150 Major League Baseball players who had



© Sean Locke/istockphoto



Mike Hutchings/Reuters/Newscom

Blowing off steam My daughter, now a resident of South Africa, experienced a temporary catharsis while cheering on her new country in a World Cup soccer match. "Every time I got angry at Uruguay, blowing that vuvuzela and joining the chorus of dissent released something in me."



and assertively. A nonaccusing statement of feeling—perhaps letting one's housemate know that "I get irritated when the dirty dishes are left for me to clean up"—can help resolve the conflicts that cause anger.

What if someone's behavior really hurts you, and you cannot resolve the conflict? Research commends the age-old response of forgiveness. Without letting the offender off the hook or inviting further harm, forgiveness

Type A Friedman and Rosenman's term for competitive, hard-driving, impatient, verbally aggressive, and anger-prone people.

Type B Friedman and Rosenman's term for easygoing, relaxed people.

catharsis in psychology, the idea that "releasing" aggressive energy (through action or fantasy) relieves aggressive urges.

releases anger and calms the body. To explore the bodily effects of forgiveness, Charlotte Witvliet and her co-researchers (2001) invited college students to recall an incident where someone had hurt them. As the students mentally rehearsed forgiveness, their negative feelings—and their perspiration, blood pressure, heart rate, and facial tension—all were lower than when they rehearsed their grudges.

"Venting to reduce anger is like using gasoline to put out a fire."

Researcher Brad Bushman (2002)

"Anger will never disappear so long as thoughts of resentment are cherished in the mind."

The Buddha 500 B.C.E.

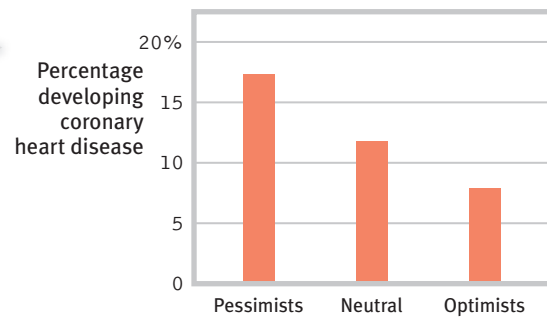
RETRIEVE IT

- Which one of the following IS an effective strategy for reducing angry feelings?
 - a. Retaliate verbally or physically.
 - b. Wait or "simmer down."
 - c. Express anger in action or fantasy.
 - d. Review the grievance silently.

ANSWER: D.

FIGURE 11.6

Pessimism and heart disease A Harvard School of Public Health team found pessimistic men at doubled risk of developing heart disease over a 10-year period. (From Kubzansky et al., 2001.)



“A cheerful heart is a good medicine, but a downcast spirit dries up the bones.”

Proverbs 17:22

appeared in the 1952 *Baseball Register* and had died by 2009 (Abel & Kruger, 2010). On average, the nonsmilers had died at 73, compared with an average 80 years for those with a broad, genuine smile.

The accumulated evidence from 57 studies suggests that “depression substantially increases the risk of death, especially death by unnatural causes and cardiovascular disease” (Wulsin et al., 1999). After following 63,469 women over a dozen years, researchers found more than a doubled rate of heart attack death among those who initially scored as depressed (Whang et al., 2009). In the years following a heart attack, people with high depression scores were four times more likely than their low-scoring counterparts to develop further heart problems (Frasure-Smith & Lesperance, 2005). Depression is disheartening.

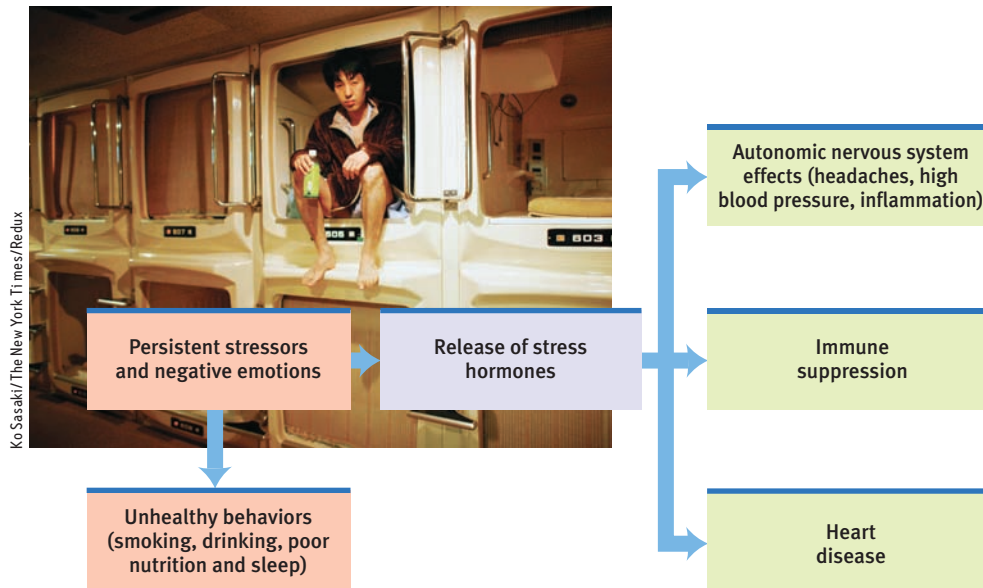
Depressed people tend to smoke more and exercise less (Whooley et al., 2008), but stress itself is also disheartening:

- When following 17,415 middle-aged American women, researchers found an 88 percent increased risk of heart attacks among those facing significant work stress (Slopen et al., 2010).
- In Denmark, a study of 12,116 female nurses found that those reporting “much too high” work pressures had a 40 percent increased risk of heart disease (Allesøe et al., 2010).
- In the United States, a 10-year study of middle-aged workers found that involuntary job loss more than doubled their risk of a heart attack (Gallo et al., 2006). A 14-year study of 1059 women found that those with five or more trauma-related stress symptoms had three times the normal risk of heart disease (Kubzansky et al., 2009).

Heart disease and depression may both result when stress triggers persistent inflammation (Matthews, 2005; Miller & Blackwell, 2006). As the body focuses its energies on fleeing or fighting a threat, stress hormones boost the production of proteins that contribute to inflammation. Persistent inflammation can lead to asthma or clogged arteries and can worsen depression.

We can view the stress effect on our disease resistance as a price we pay for the benefits of stress. Stress invigorates our lives by arousing and motivating us. An unstressed life would hardly be challenging or productive. But as we have seen, stress can also harm us (**FIGURE 11.7**). Knowing that, we can work to promote and maintain our health.

Traditionally, people have thought about their health only when something goes wrong—visiting a physician for diagnosis and treatment. That, say health psychologists, is like ignoring a car’s maintenance and going to a mechanic only when the car breaks down. Health maintenance begins with implementing strategies that prevent illness by alleviating stress and enhancing well-being.

**FIGURE 11.7**

Stress can have a variety of health-related consequences This is especially so when stress is experienced by angry, depressed, or anxious people. Job and income loss caused by the recent economic recession has created stress for many people, such as this jobless Japanese man living in a Tokyo “capsule hotel.”

Coping With Stress



11-5: In what two ways do people try to alleviate stress?

Stressors are unavoidable. This fact, coupled with the fact that persistent stress correlates with heart disease, depression, and lowered immunity, gives us a clear message: We need to learn to **cope** with the stress in our lives, alleviating it with emotional, cognitive, or behavioral methods.

Some stressors we address directly, with **problem-focused coping**. If our impatience leads to a family fight, we may go directly to that family member to work things out. We tend to use problem-focused strategies when we feel a sense of control over a situation and think we can change the circumstances, or at least change ourselves to deal with the circumstances more capably.

We turn to **emotion-focused coping** when we cannot—or *believe* we cannot—change a situation. If, despite our best efforts, we cannot get along with that family member, we may search for stress relief by reaching out to friends for support and comfort. Emotion-focused strategies can move us toward better long-term health, as when we exercise or keep busy with hobbies to avoid thinking about an old addiction. Emotion-focused strategies can be maladaptive, however, as when students worried about not keeping up with the reading in class go out to party to get it off their mind. Sometimes a problem-focused strategy (catching up with the reading) more effectively reduces stress and promotes long-term health and satisfaction.

When challenged, some of us tend to respond with cool problem-focused coping, others with emotion-focused coping (Connor-Smith & Flachsbart, 2007). Our feelings of personal control, our explanatory style, and our supportive connections all influence our ability to cope successfully.

Personal Control



11-6: How does a perceived lack of control affect health?

Picture the scene: Two rats receive simultaneous shocks. One can turn a wheel to stop the shocks. The helpless rat, but not the wheel turner, becomes more susceptible to ulcers and lowered immunity to disease (Laudenslager & Reite, 1984). In humans, too, uncontrollable threats trigger the strongest stress responses (Dickerson & Kemeny, 2004).

coping alleviating stress using emotional, cognitive, or behavioral methods.

problem-focused coping attempting to alleviate stress directly—by changing the stressor or the way we interact with that stressor.

emotion-focused coping attempting to alleviate stress by avoiding or ignoring a stressor and attending to emotional needs related to one’s stress reaction.

learned helplessness the hopelessness and passive resignation an animal or human learns when unable to avoid repeated aversive events.

Feeling helpless and oppressed may lead to a state of passive resignation called **learned helplessness** (FIGURE 11.8). Experimenter Martin Seligman (1975, 1991) discovered this in some long-ago experiments in which dogs were strapped in a harness and given repeated shocks, with no opportunity to avoid them. Later, when placed in another situation where they *could* escape the punishment by simply leaping a hurdle, the dogs cowered as if without hope. In contrast, animals able to escape the first shocks learned personal control and easily escaped the shocks in the new situation.

Humans can also learn helplessness. When repeatedly faced with traumatic events over which they have no control, people come to feel helpless, hopeless, and depressed.

Perceiving a loss of control, we become more vulnerable to ill health. A famous study of elderly nursing home residents with little perceived control over their activities found that they declined faster and died sooner than those given more control (Rodin, 1986). Workers able to adjust office furnishings and control interruptions and distractions in their work environment have experienced less stress (O’Neill, 1993). Such findings may help explain why British civil service workers at the executive grades have tended to outlive those at clerical or laboring grades, and why Finnish workers with low job stress have been less than half as likely to die of strokes or heart disease as those with a demanding job and little control. The more control workers have, the longer they live (Bosma et al., 1997, 1998; Kivimaki et al., 2002; Marmot et al., 1997).

Increasing self-control—allowing prisoners to move chairs and control room lights and the TV, having workers participate in decision making, offering nursing home patients choices about their environment—noticeably improves health and morale (Humphrey et al., 2007; Wang et al., 2010). In the case of the nursing home patients, 93 percent of those encouraged to exert more control became more alert, active, and happy (Rodin, 1986). As researcher Ellen Langer (1983, p. 291) concluded, “Perceived control is basic to human functioning.”

Control may also help explain a well-established link between economic status and longevity (Jokela et al., 2009). In one study of 843 grave markers in an old graveyard in Glasgow, Scotland, those with the costliest, highest pillars (indicating the most affluence) tended to have lived the longest (Carroll et al., 1994). Likewise, those living in Scottish regions with the least overcrowding and unemployment have the greatest longevity. There and elsewhere, high economic status predicts a lower risk of heart and respiratory diseases (Sapolsky, 2005). Wealthy predicts healthy among children, too (Chen, 2004). With higher economic status come reduced risks of low birth weight, infant mortality, smoking, and violence. Even among other primates, individuals at the bottom of the social pecking order have been more likely than their higher-status companions to become sick when exposed to a cold-like virus (Cohen et al., 1997). But high status also entails stress: High-status baboons and monkeys who frequently have to physically defend their dominant position show high stress levels (Sapolsky, 2005).

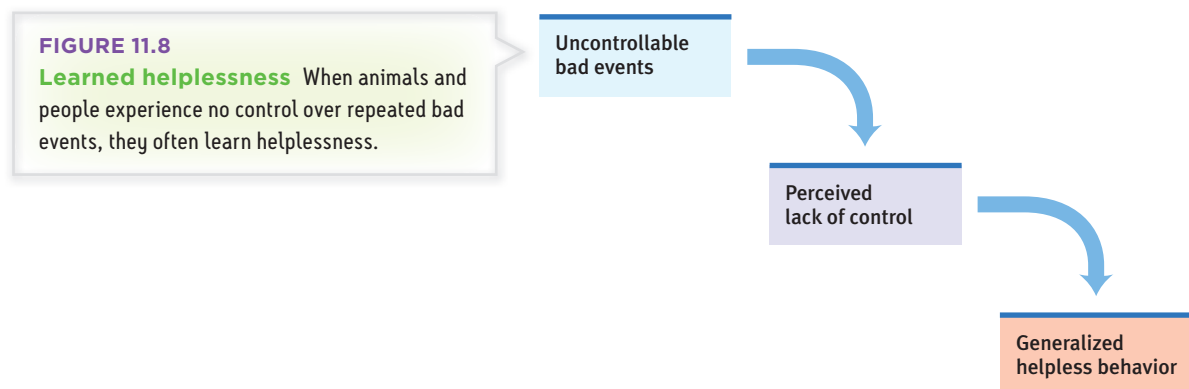
Why does perceived loss of control predict health problems? Because losing control provokes an outpouring of stress hormones. When rats cannot control shock or when primates or humans feel unable to control their environment, stress hormone levels rise, blood pressure increases, and immune responses drop (Rodin, 1986; Sapolsky, 2005).

FIGURE 11.8
Learned helplessness When animals and people experience no control over repeated bad events, they often learn helplessness.

Uncontrollable
bad events

Perceived
lack of control

Generalized
helpless behavior



Captive animals therefore experience more stress and are more vulnerable to disease than are wild animals (Roberts, 1988). Human studies have confirmed that crowding in high-density neighborhoods, prisons, and college and university dorms is another source of diminished feelings of control—and of elevated levels of stress hormones and blood pressure (Fleming et al., 1987; Ostfeld et al., 1987).

RETRIEVE IT

- To cope with stress, we tend to use _____-focused (emotion/problem) strategies when we feel in control of our world, and _____-focused (emotion/problem) strategies when we believe we cannot change a situation.

ANSWERS: problem; emotion

Internal Versus External Locus of Control

If experiencing a loss of control can be stressful and unhealthy, do people who generally feel in control of their lives enjoy better health? Consider your own feelings of control. Do you believe that your life is beyond your control? That getting a good job depends mainly on being in the right place at the right time? Or do you more strongly believe that what happens to you is your own doing? That being a success is a matter of hard work? Did your parents influence your feelings of control? Did your culture?

Hundreds of studies have compared people who differ in their perceptions of control. On one side are those who have what psychologist Julian Rotter called an **external locus of control**—the perception that chance or outside forces determine their fate. On the other are those who perceive an **internal locus of control**, who believe that they control their own destiny. In study after study, “internals” have achieved more in school and work, acted more independently, enjoyed better health, and felt less depressed than did “externals” (Lefcourt, 1982; Ng et al., 2006). Moreover, they were better at delaying gratification and coping with various stressors, including marital problems (Miller & Monge, 1986). One study followed 7551 British people for two decades. Those who expressed a more internal locus of control at age 10 exhibited less obesity, hypertension, and distress at age 30 (Gale et al., 2008). Other studies have found that people who believe in free will, or that willpower is controllable, learn better, perform better at work, and are more helpful (Job et al., 2010; Stillman et al., 2010).

Compared with their parents’ generation, more Americans now endorse an external locus of control (Twenge et al., 2004). This shift may help explain an associated increase in rates of depression and other psychological disorders in the new generation (Twenge et al., 2010).

Depleting and Strengthening Self-Control

Self-control is the ability to control impulses and delay short-term gratification for longer-term rewards. In studies, this ability has predicted good adjustment, better grades, and social success (Tangney et al., 2004). Students who planned their day’s activities and then lived out their day as planned were also at low risk for depression (Nezlek, 2001).

Self-control often fluctuates. Like a muscle, self-control temporarily weakens after an exertion, replenishes with rest, and becomes stronger with exercise (Baumeister & Exline, 2000; Hagger et al., 2010; Vohs & Baumeister, 2011). Exercising willpower temporarily depletes the mental energy needed for self-control on other tasks (Gailliot & Baumeister, 2007). In one experiment, hungry people who had resisted the temptation to eat chocolate chip cookies abandoned a tedious task sooner than those who had not resisted the cookies. And after expending willpower on laboratory tasks, such as stifling prejudice or saying the color of words (for example, “red” even if the red-colored word was *green*), people were less restrained in their aggressive responses to provocation and in their sexuality (DeWall et al., 2007; Gaillot & Baumeister, 2007).

external locus of control the perception that chance or outside forces beyond our personal control determine our fate.

internal locus of control the perception that you control your own fate.

self-control the ability to control impulses and delay short-term gratification for greater long-term rewards.

AP Photo/Marty Lederhandler



Extreme self-control Our ability to exert self-control increases with practice, and some of us have practiced more than others! Magician David Blaine (left) endured standing in a block of ice (in which a small space had been carved out for him) for nearly 62 hours for a stunt in New York's Times Square. A number of performing artists make their living as very convincing human statues, as does this actress (right) performing on The Royal Mile in Edinburgh, Scotland.

Latitude Stock/Brian Fairbrother/Getty



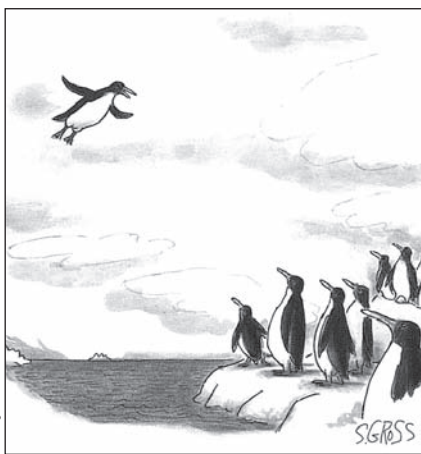
tasks and their improved self-management of eating, drinking, smoking, and household chores (Oaten & Cheng, 2006a,b). *The bottom line:* We can grow our willpower muscles—our capacity for self-regulation. But doing so requires some (dare I say it?) willpower.

Optimism Versus Pessimism



11-7: What are the links among basic outlook on life, social support, stress, and health?

Positive expectations often motivate eventual success.



"We just haven't been flapping them hard enough."

The oldest Holocaust survivor explaining her 107 years: "In a word: optimism. I look at the good. When you are relaxed, your body is always relaxed."

Alice Herz-Sommer, 2010

We have seen that our outlook—what we expect from the world—influences our risk of heart disease. Our outlook also affects our ability to cope with stress and our overall health. *Pessimists* attribute their poor performance to a basic lack of ability ("I can't do this") or to situations enduringly beyond their control ("There is nothing I can do about it"). *Optimists* expect to have more control, to cope better with stressful events, and to enjoy better health (Aspinwall & Tedeschi, 2010; Carver et al., 2010; Rasmussen et al., 2010). During a semester's last month, students previously identified as optimistic reported less fatigue and fewer coughs, aches, and pains. And during the stressful first few weeks of law school, those who were optimistic ("It's unlikely that I will fail") enjoyed better moods and stronger immune systems (Segerstrom et al., 1998). Optimists also respond to stress with smaller increases in blood pressure, and they recover more quickly from heart bypass surgery.

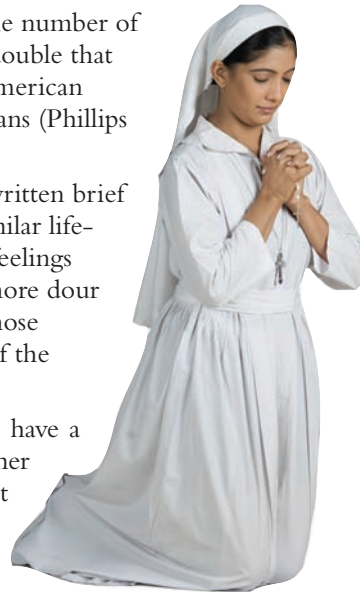
Optimistic students have also tended to get better grades because they often respond to setbacks with the hopeful attitude that effort, good study habits, and self-discipline make a difference (Noel et al., 1987; Peterson & Barrett, 1987). When dating couples wrestle with conflicts, optimists and their partners see each other as engaging constructively, and they then tend to feel more supported and satisfied with the resolution and with their relationship (Srivastava et al., 2006). Optimism also relates to well-being and success in China and Japan (Qin & Piao, 2011). Realistic positive expectations fuel motivation and success (Oettingen & Mayer, 2002).

Consider the consistency and startling magnitude of the optimism and positive emotions factor in several other studies:

- One research team followed 941 Dutch people, ages 65 to 85, for nearly a decade (Giltay et al., 2004, 2007). Among those in the lowest optimism quartile, 57 percent died, as did only 30 percent of the top optimism quartile.

- When Finnish researchers followed 2428 men for up to a decade, the number of deaths among those with a bleak, hopeless outlook was more than double that found among their optimistic counterparts (Everson et al., 1996). American researchers found the same when following 4256 Vietnam-era veterans (Phillips et al., 2009).
- A now-famous study followed up on 180 Catholic nuns who had written brief autobiographies at about 22 years of age and had thereafter lived similar lifestyles. Those who had expressed happiness, love, and other positive feelings in their autobiographies lived an average 7 years longer than their more dour counterparts (Danner et al., 2001). By age 80, some 54 percent of those expressing few positive emotions had died, as had only 24 percent of the most positive spirited.

Optimism runs in families, so some people truly are predisposed to have a sunny, hopeful outlook. In identical twins, if one is optimistic, the other will often independently show signs of optimism as well (Mosing et al., 2009). One genetic marker of optimism is a receptor gene for the social-bonding hormone *oxytocin* (Saphire-Bernstein et al., 2011).



PhotosIndia.com LLC/Alamy

Social Support

Social support—feeling liked and encouraged by intimate friends and family—promotes both health and happiness. In massive investigations, some following thousands of people for several years, close relationships have predicted health. People are less likely to die early if supported by close relationships (Uchino, 2009). When Brigham Young University researchers combined data from 148 studies totaling more than 300,000 people worldwide, they confirmed a striking effect of social support (Holt-Lunstad et al., 2010). Those with ample social connections had survival rates about 50 percent greater than those with meager connections. The meager-connections health handicap appeared roughly equal to the effect of smoking 15 cigarettes a day or of being alcohol dependent, and it was double the effect of not exercising or being obese.

People need people. Some fill this need by connecting with friends, family, co-workers, members of a faith community, or other support groups. Others connect in positive, happy, supportive marriages. People in low-conflict marriages live longer, healthier lives than the unmarried (De Vogli et al., 2007; Kaplan & Kronick, 2006; Sbarra, 2009). This correlation holds regardless of age, sex, race, and income (National Center for Health Statistics, 2004). One seven-decades-long study found that at age 50, healthy aging is better predicted by a good marriage than by a low cholesterol level (Vaillant, 2002). But the married versus never-married health gap has shrunk (Liu, 2009).

What explains the link between social support and health? Are middle-aged and older adults who live with little social engagement more likely to smoke, be obese, and have high cholesterol—and therefore to have a doubled risk of heart attacks (Nielsen et al., 2006)? Or are healthy people simply more sociable? Research suggests that social support itself creates health benefits.

Social support calms us and reduces blood pressure and stress hormones. More than 50 studies support this finding (Graham et al., 2006; Uchino et al., 1996, 1999). To see if social support might calm people's response to threats, one research team subjected happily married women, while lying in an fMRI machine, to the threat of electric shock to an ankle (Coan et al., 2006). During the experiment, some women held their husband's hand. Others held the hand of an unknown person or no hand at all. While awaiting the occasional shocks, women holding their husband's hand showed less activity in threat-responsive areas. This soothing benefit was greatest for those reporting the highest-quality marriages. Supportive family and friends—human and nonhuman—help buffer threats. After stressful events, Medicare patients who have a dog or other companionable pet are less likely to visit their doctor (Siegel, 1990). (See Close-Up: Pets Are Friends, Too on the next page.)

Laughter among friends is good medicine Laughter arouses us, massages muscles, and then leaves us feeling relaxed (Robinson, 1983). Humor (though not hostile sarcasm) may defuse stress, ease pain, and strengthen immune activity (Ayan, 2009; Berk et al., 2001; Kimata, 2001). People who laugh a lot also tend to have lower rates of heart disease (Clark et al., 2001).

Getty Images/Rubberball



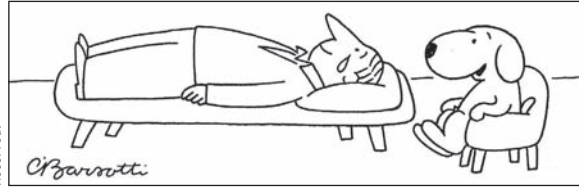
CLOSE UP:

Pets Are Friends, Too

Have you ever wished for a friend who would love you just as you are? One who would never judge you? Who would be there for you, no matter your mood? For many tens of millions of people that friend exists, and it is a loyal dog or a friendly cat.

Many people describe their pet as a cherished family member who helps them feel calm, happy, and valued. Can pets also help people handle stress? If so, might pets have healing power? The evidence is, as yet, mixed and meager (Herzog, 2010). But Karen Allen (2003), Deborah Wells (2009), and Allen McConnell and colleagues (2011) have reported that pets have sometimes been found to provide social support, to increase the odds of survival after a heart attack, to relieve depression among AIDS patients, and to lower the level of blood pressure and blood lipids that contribute to cardiovascular risk. As nursing pioneer Florence

The New Yorker Collection,
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"Well, I think you're wonderful"

Nightingale (1860) foresaw, "A small pet animal is often an excellent companion for the sick." In one study, women's blood pressure rose as they struggled with challenging math problems in the presence of a best friend or even a spouse, but much less so when accompanied by their dog (Allen, 2003).

So, would pets be good medicine for people who do not have pets? To find out, Karen Allen experimented. The participants were a group of stockbrokers who lived alone, described their work as stressful, and had high blood

pressure. She randomly selected half to adopt an animal shelter cat or dog. When later facing stress, all participants experienced higher blood pressure. But among the new pet owners, the increase was less than half as high as the increase in the no-pet group. The effect was greatest for pet owners with few social contacts or friends. Allen's conclusion: For lowering blood pressure, pets are no substitute for effective drugs and exercise. But for people who enjoy animals, and especially for those who live alone, pets are a healthy pleasure.

Social support fosters stronger immune functioning. Volunteers in studies of resistance to cold viruses showed this benefit (Cohen et al., 1997, 2004). Healthy volunteers inhaled nasal drops laden with a cold virus and were quarantined and observed for five days. (In these experiments, more than 600 volunteers received \$800 each to endure this experience.) Age, race, sex, smoking, and other health habits being equal, those with the most social ties were least likely to catch a cold. If they did catch one, they produced less mucus. More sociability meant less susceptibility. The cold fact is that the effect of social ties is nothing to sneeze at!

Close relationships give us an opportunity for "open heart therapy," a chance to confide painful feelings (Frattaroli, 2006). Talking about a stressful event can temporarily arouse us, but in the long run it calms us, by calming limbic system activity (Lieberman et al., 2007; Mendolia & Kleck, 1993). In one study, 33 Holocaust survivors spent two hours recalling their experiences, many in intimate detail never before disclosed (Pennebaker et al., 1989). In the weeks following, most watched a tape of their recollections and showed it to family and friends. Those who were most self-disclosing had the most improved health 14 months later. Confiding is good for the body and the soul. In another study of surviving spouses of people who had committed suicide or died in car accidents, those who bore their grief alone had more health problems than those who could express it openly (Pennebaker & O'Heeron, 1984).

"Woe to one who is alone and falls and does not have another to help."

Ecclesiastes 4:10

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Suppressing emotions can be detrimental to physical health. When health psychologist James Pennebaker (1985) surveyed more than 700 undergraduate women, about 1 in 12 reported a traumatic childhood sexual experience. The sexually abused women—especially those who had kept their secret to themselves—reported more headaches and stomach ailments than did other women who had experienced nonsexual traumas, such as parental death or divorce. Another study, of 437 Australian ambulance drivers, confirmed the ill effects of suppressing one’s emotions after witnessing traumas (Wastell, 2002).

Even writing about personal traumas in a diary can help (Burton & King, 2008; Hemenover, 2003; Lyubomirsky et al., 2006). In one experiment, volunteers who did so had fewer health problems during the ensuing four to six months (Pennebaker, 1990). As one participant explained, “Although I have not talked with anyone about what I wrote, I was finally able to deal with it, work through the pain instead of trying to block it out. Now it doesn’t hurt to think about it.”

If we are aiming to exercise more, drink less, quit smoking, or attain a healthy weight, our social ties can tug us away from or toward our goal. Studies of networks of thousands of people followed over years suggest that clusters of friends may “infect” one another with either bad health practices or good behaviors (Christakis & Fowler, 2009). Obesity, for example, spreads within networks in ways that seem not merely to reflect people’s seeking out similar others.

RETRIEVE IT

- Some research finds that people with companionable pets are less likely than those without pets to visit their doctors after stressful events (Siegel, 1990). How can the health benefits from social support shed light on this finding?

ANSWER: Feeling social support—even from a pet—might calm people and lead to lower levels of stress hormones and blood pressure.



Photos.com/Getty Images

Reducing Stress

Having a sense of control, developing more optimistic thinking, and building social support can help us *experience* less stress and thus improve our health. Moreover, these factors interrelate: People who are upbeat about themselves and their future tend also to enjoy health-promoting social ties (Stinson et al., 2008). But sometimes we cannot alleviate stress and simply need to *manage* our stress. Aerobic exercise, relaxation, meditation, and active spiritual engagement may help us gather inner strength and lessen stress effects.

Aerobic Exercise



11-8: How effective is aerobic exercise as a way to manage stress and improve well-being?

Aerobic exercise is sustained, oxygen-consuming exercise—such as jogging, swimming, or biking—that increases heart and lung fitness. It’s hard to find bad things to say about exercise. By one estimate, moderate exercise adds not only quantity of life—two additional years, on average—but also quality of life, with more energy and better mood (Seligman, 1994).

Exercise helps fight heart disease by strengthening the heart, increasing bloodflow, keeping blood vessels open, and lowering both blood pressure and the blood pressure reaction to stress (Ford, 2002; Manson, 2002). Inactivity can be toxic. People who exercise suffer half as many heart attacks as do others who are inactive (Powell et al., 1987; Visich & Fletcher, 2009). Exercise makes your muscles hungry for the fats that, if not used by muscles, can contribute to clogged arteries (Barinaga, 1997). In one 20-year study of adult Finnish twins, daily conditioning exercise (other things being equal) reduced death risk by 43 percent (Kujala et al., 1998). Regular exercise in later life also

aerobic exercise sustained exercise that increases heart and lung fitness; may also alleviate depression and anxiety.



Kathryn Brownson

The mood boost When energy or spirits are sagging, few things reboot the day better than exercising (as I can confirm from my daily noontime basketball). Aerobic exercise appears to counteract depression partly by increasing arousal (replacing depression’s low-arousal state) and by doing naturally what Prozac does—increasing the brain’s serotonin activity.

predicts better cognitive functioning and reduced risk of dementia and Alzheimer’s disease (Kramer & Erickson, 2007).

Does exercise also boost the spirit? Many studies reveal that aerobic exercise can reduce stress, depression, and anxiety. Americans, Canadians, and Britons who have at least three weekly aerobic exercise sessions manage stress better, exhibit more self-confidence, and feel more vigor and less depression and fatigue than do their inactive peers (McMurray, 2004; Mead et al., 2010; Puetz et al., 2006). And in a 21-country survey of university students, physical exercise was a “strong” and consistent predictor of life satisfaction (Grant et al., 2009).

But we could state this observation another way: Stressed and depressed people exercise less. These findings are correlations, and cause and effect are unclear. To sort out cause and effect, researchers experiment. They randomly assign stressed, depressed, or anxious people either to an aerobic exercise group or to a control group. One classic experiment randomly assigned mildly depressed female collegians to three groups. One-third participated in a program of aerobic exercise. Another third took part in a program of relaxation exercises. The remaining third (the control group) formed a no-treatment group (McCann & Holmes, 1984). As **FIGURE 11.9** shows, 10 weeks later, the women in the aerobic exercise program reported the greatest decrease in depression. Many had, quite literally, run away from their troubles.

Dozens of other experiments confirm that exercise prevents or reduces depression and anxiety (Conn, 2010; Rethorst et al., 2009; Windle et al., 2010). Vigorous exercise provides a substantial and immediate mood boost (Watson, 2000). Even a 10-minute walk stimulates 2 hours of increased well-being by raising energy levels and lowering tension (Thayer, 1987, 1993).

Some studies have indicated that not only is exercise as effective as drugs, it better prevents symptom recurrence (Babyak et al., 2000; Salmon, 2001). *Why?* Because exercise in some ways works like an antidepressant drug. It increases arousal, thus counteracting depression’s low arousal state. It often leads to muscle relaxation and sounder sleep. It also orders up mood-boosting chemicals from our body’s internal pharmacy—neurotransmitters such as norepinephrine, serotonin, and the endorphins (Jacobs, 1994; Salmon, 2001). Exercise may even foster *neurogenesis*. In mice, exercise causes the brain to produce a molecule that stimulates the production of new, stress-resistant neurons (Hunsberger et al., 2007; Reynolds, 2009; van Praag, 2009).



Paik Photography/Alamy

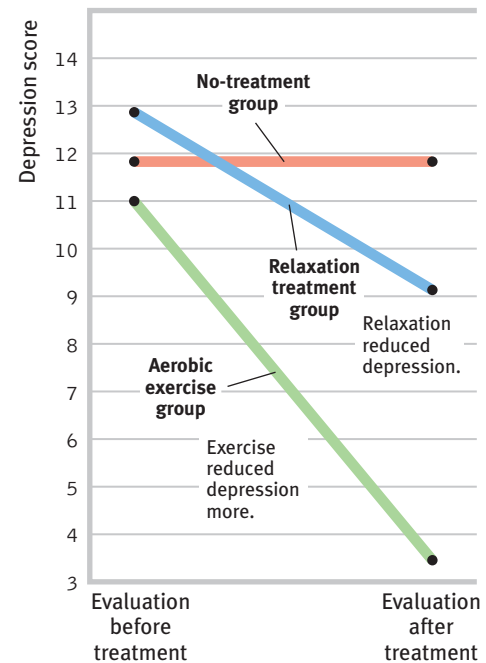


FIGURE 11.9
Aerobic exercise and depression Mildly depressed college women who participated in an aerobic exercise program showed markedly reduced depression, compared with those who did relaxation exercises or received no treatment. (From McCann & Holmes, 1984.)

On a simpler level, the sense of accomplishment and improved physique and body image that often accompany a successful exercise routine may enhance one’s self-image, leading to a better emotional state. Exercising at least a half-hour on 5 or more days each week is like taking a drug that prevents and treats disease, increases energy, calms anxiety, and boosts mood—a drug we would all take, if available. Yet few people (only 1 in 4 in the United States) take advantage of it (Mendes, 2010).

Relaxation and Meditation



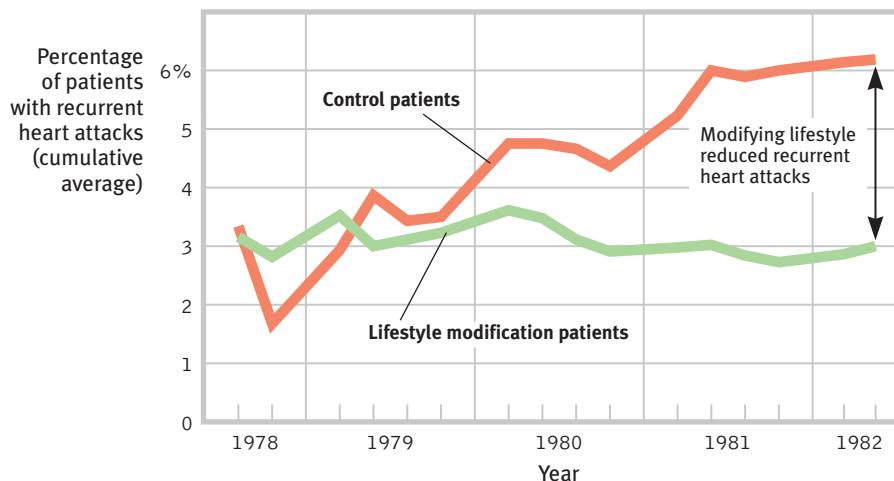
11-9: In what ways might relaxation and meditation influence stress and health?

Knowing the damaging effects of stress, could we learn to counteract our stress responses by altering our thinking and lifestyle? In the late 1960s, some respected psychologists, including Neal Miller, began experimenting with *biofeedback*, a system of recording, amplifying, and feeding back information about subtle physiological responses, many controlled by the autonomic nervous system. Biofeedback instruments mirror the results of a person’s own efforts, enabling the person to learn which techniques do (or do not) control a particular physiological response. After a decade of study, however, the initial claims for biofeedback seemed overblown and oversold (Miller, 1985). In 1995, a National Institutes of Health panel declared that biofeedback works best on tension headaches.

Simple methods of relaxation, which require no expensive equipment, produce many of the results biofeedback once promised. Figure 11.9 pointed out that aerobic exercise reduces depression. But did you notice in that figure that depression also decreased among women in the relaxation treatment group? More than 60 studies have found that relaxation procedures can also help alleviate headaches, hypertension, anxiety, and insomnia (Nestoriuc et al., 2008; Stetter & Kupper, 2002).

Such findings would not surprise Meyer Friedman and his colleagues. They tested relaxation in a program designed to help Type A heart attack survivors reduce their risk of future attacks. They randomly assigned hundreds of middle-aged men to one of two groups. The first group received standard advice from cardiologists about medications, diet, and exercise habits. The second group received similar advice, but they also were taught ways of modifying their lifestyles. They learned to slow down and relax by walking, talking, and eating more slowly. They learned to smile at others and laugh at themselves. They learned to admit their mistakes, to take time to enjoy life, and to renew their religious faith. The training paid off (**FIGURE 11.10**). During the next three years, the lifestyle modification group had half as many repeat heart attacks as did the first group. This, wrote the exuberant Friedman, was an unprecedented, spectacular reduction in

FIGURE 11.10
Recurrent heart attacks and lifestyle modification The San Francisco Recurrent Coronary Prevention Project offered counseling from a cardiologist to survivors of heart attacks. Those who were also guided in modifying their Type A lifestyle suffered fewer repeat heart attacks. (From Friedman & Ulmer, 1984.)



David Madison/Jupiterimages

Meditation is a modern phenomenon with a long history: “Sit down alone and in silence. Lower your head, shut your eyes, breathe out gently, and imagine yourself looking into your own heart. . . . As you breathe out, say ‘Lord Jesus Christ, have mercy on me.’ . . . Try to put all other thoughts aside. Be calm, be patient, and repeat the process very frequently” (Gregory of Sinai, died 1346).

And then there are the mystics who seek to use the mind’s power to enable novocaine-free cavity repair. Their aim: transcendental medication.



Dean Mitchell/Shutterstock

heart-attack recurrence. A smaller-scale British study similarly divided heart-attack-prone people into control and lifestyle modification groups (Eysenck & Grossarth-Maticek, 1991). During the next 13 years, people trained to alter their thinking and lifestyle showed a 50 percent reduction in death rate. After suffering a heart attack at age 55, Friedman started taking his own behavioral medicine—and lived to age 90 (Wargo, 2007).

Cardiologist Herbert Benson (1996) became intrigued with reports that experienced meditators could lower their blood pressure, heart rate, and oxygen consumption and raise their fingertip temperature. His research led to what he has called the *relaxation response*, a state of calm marked by relaxed muscles, slowed breathing and heart rate, and decreased blood pressure. According to Benson, relaxation practiced once or twice daily has lasting stress-reducing benefits.

To experience the relaxation response, the Benson-Henry Institute for Mind Body Medicine recommends these steps: Sit quietly in a comfortable position. Close your eyes. Relax your muscles, starting with your feet, then your calves, and upward through your thighs, shoulders, neck, and head. Breathe slowly. As you exhale each breath, repeat a focus word, phrase, or prayer—something drawn from your own belief system. When other thoughts intrude, don’t worry. Just return to your repetition and continue for 10 to 20 minutes. When finished, sit quietly for another minute or two, then open your eyes and sit for a few more moments.

Tibetan Buddhists deep in meditation and Franciscan nuns deep in centering prayer report a diminished sense of self, space, and time. Brain scans reveal the neural footprints of such spiritual feelings during these mystical experiences: A part of the parietal lobe that tracks our location in space is less active than usual, and a frontal lobe area involved in focused attention is more active (Cahn & Polich, 2006; Newberg & D’Aquili, 2001). Another difference appears in the brain’s left frontal lobe. In Buddhist monks experienced in meditation, this area displays elevated levels of activity usually associated with positive emotions.

Was this high rate of activity a *result* of meditation, or simply a correlation unrelated to cause and effect? To find out, the researchers experimented, comparing “before” and “after” brain scans of volunteers who were not experienced meditators (Davidson et al., 2003). First, they took baseline scans of volunteers’ normal levels of brain activity. They then randomly assigned them either to a control group or to an eight-week course in *mindfulness meditation*, which has been shown to lessen anxiety and depression (Hofmann et al., 2010). Compared with both the control group and their own baseline, the meditation participants showed noticeably more left-hemisphere activity after the training, and they also had improved immune functioning. Such effects may help explain the results of another study, which found that hypertension patients assigned to meditation training had (compared with other treatment groups) a 30 percent lower cardiovascular death rate over the ensuing 19 years (Schneider et al., 2005). This benefit may have resulted from the lessened anxiety and improved mood that accompanies meditation (Hofmann et al., 2010).

Exercise and meditation are not the only routes to relaxation. As we noted in earlier chapters, massage has proven therapeutic for both premature infants and those suffering pain. A meta-analysis of 17 clinical experiments revealed another benefit: Massage therapy relaxes muscles and helps alleviate depression (Hou et al., 2010).

Faith Communities and Health



11-10: What is the faith factor, and what are some possible explanations for the link between faith and health?

A wealth of studies—some 1800 of them in the twenty-first century’s first decade alone—has revealed another curious correlation: the *faith factor* (Koenig et al., 2011). Religiously active people tend to live longer than those who are not religiously active. One such study compared the death rates for 3900 people living in two Israeli communities. The first community contained 11 religiously orthodox collective settlements; the second contained 11 matched, nonreligious collective settlements (Kark et al., 1996). Over a 16-year

period, “belonging to a religious collective was associated with a strong protective effect” not explained by age or economic differences. In every age group, religious community members were about half as likely to have died as were their nonreligious counterparts. This difference is roughly comparable to the gender difference in mortality.

How should we interpret such findings? Correlations are not cause-effect statements, and they leave many factors uncontrolled (Sloan et al., 1999, 2000, 2002, 2005). Here is another possible interpretation: Women are more religiously active than men, and women outlive men. Might religious involvement merely reflect this gender-longevity link? Apparently not. One 8-year National Institutes of Health study followed 92,395 women (ages 50 to 79). After controlling for many factors, researchers found that women attending religious services weekly (or more) experienced an approximately 20 percent reduced risk of death during the study period (Schnall et al., 2010). Moreover, the association between religious involvement and life expectancy is also found among men (Benjamins et al., 2010; McCullough et al., 2000, 2005, 2009). A 28-year study that followed 5286 Californians found that, after controlling for age, gender, ethnicity, and education, frequent religious attendees were 36 percent less likely to have died in any year (FIGURE 11.11). In another 8-year controlled study of more than 20,000 people (Hummer et al., 1999), this effect translated into a life expectancy at age 20 of 83 years for frequent attendees at religious services and 75 years for infrequent attendees.

These correlational findings do not indicate that people who have not been religiously active can suddenly add 8 years to their lives if they start attending services and change nothing else. But the findings do indicate that religious involvement, like non-smoking and exercise, is a *predictor* of health and longevity.

Recall that when Friedman and Rosenman’s studies showed that Type A people were more prone to heart attacks, other researchers wanted to know more. What was the toxic ingredient? Similarly, researchers have wanted to know *why* religious involvement predicts health and longevity. Can you imagine what intervening variables might account for the correlation? Research points to three possible sets of influences (FIGURE 11.12 on the next page):

- *Healthy behaviors:* Religion promotes self-control (McCullough & Willoughby, 2009), and religiously active people tend to smoke and drink much less and to have healthier lifestyles (Koenig & Vaillant, 2009; Park, 2007; Strawbridge et al., 2001). In one Gallup survey of 550,000 Americans, 15 percent of the very religious were smokers, as were 28 percent of those nonreligious (Newport et al., 2010). But such lifestyle differences are not great enough to explain the dramatically reduced mortality in the Israeli religious settlements. In American studies, too, about 75 percent of the longevity difference remained when researchers controlled for unhealthy behaviors, such as inactivity and smoking (Musick et al., 1999).

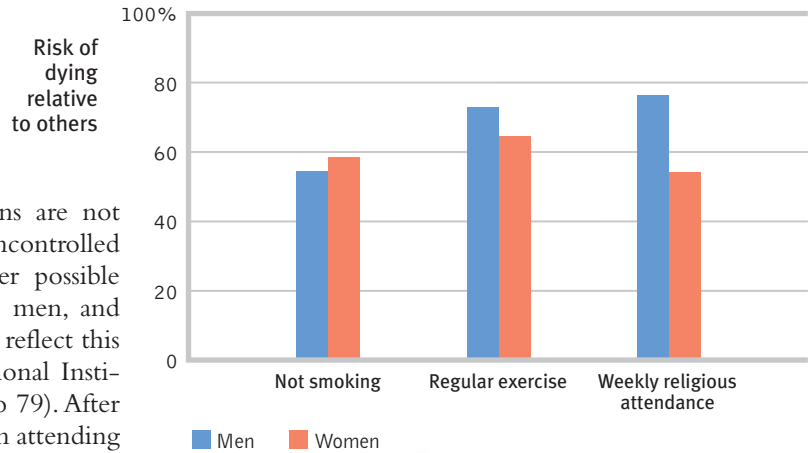


FIGURE 11.11
Predictors of longer life: Not smoking, frequent exercise, and regular religious attendance
 Epidemiologist William Strawbridge and his co-workers (1997, 1999; Oman et al., 2002) followed 5286 Alameda, California, adults over 28 years. After adjusting for age and education, the researchers found that not smoking, regular exercise, and religious attendance all predicted a lowered risk of death in any given year. Women attending weekly religious services, for example, were only 54 percent as likely to die in a typical study year as were nonattendees.

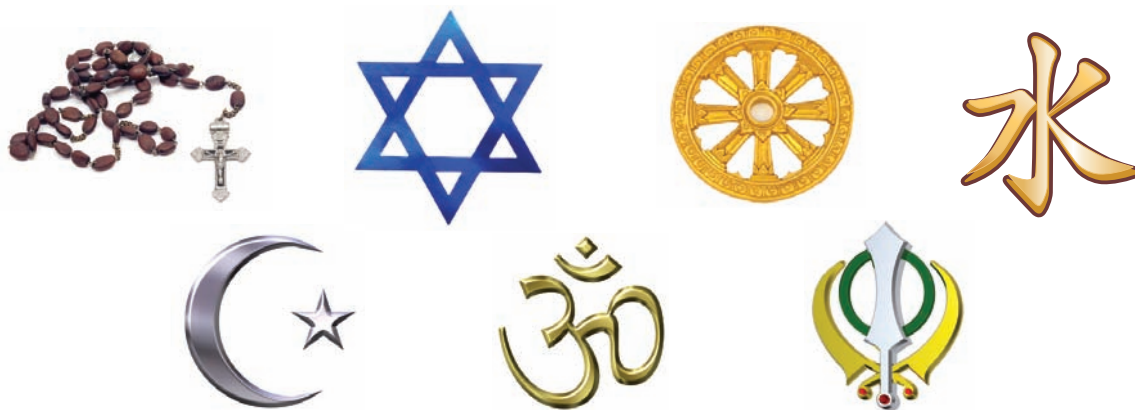
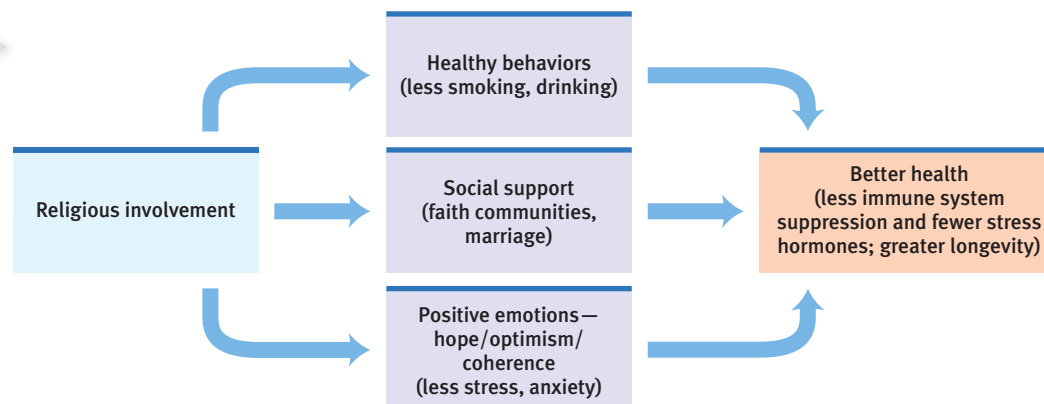


FIGURE 11.12

Possible explanations for the correlation between religious involvement and health/longevity



- *Social support*: Could social support explain the faith factor (Ai et al., 2007; George et al., 2002)? In Judaic, Christian, and Islamic religions, faith is a communal experience. To belong to one of these faith communities is to have access to a support network. Religiously active people are there for one another when misfortune strikes. Moreover, religion encourages marriage, another predictor of health and longevity. In the Israeli religious settlements, for example, divorce has been almost nonexistent.
- *Positive emotions*: Even after controlling for gender, unhealthy behaviors, preexisting health problems, and social support, the mortality studies still find that religiously engaged people tend to live longer (Chida et al., 2009). Researchers therefore speculate that religiously active people may benefit from a stable, coherent worldview, a sense of hope for the long-term future, feelings of ultimate acceptance, and the relaxed meditation of prayer or Sabbath observance. These intervening variables may also help to explain why the religiously active seem to have healthier immune functioning, fewer hospital admissions, and, for AIDS patients, fewer stress hormones and longer survival (Ironson et al., 2002; Koenig & Larson, 1998; Lutgendorf et al., 2004).

RETRIEVE IT

- What are some of the tactics we can use to manage the stress we cannot avoid?

ANSWERS: Aerobic exercise, relaxation procedures, meditation, and religious engagement

Happiness



11-11: What are the main effects of being happy?

People aspire to, and wish one another, health and happiness. And for good reason. Our state of happiness or unhappiness colors everything. Happy people perceive the world as safer and feel more confident. They are more decisive, cooperative, and tolerant. They rate job applicants more favorably, savor their positive past experiences without dwelling on the negative, and are more socially connected. They live healthier and more energized and satisfied lives (Briñol et al., 2007; Liberman et al., 2009; Mauss et al., 2011).

When your mood is gloomy, life as a whole seems depressing and meaningless—and you think more skeptically and attend more critically to your surroundings. Let your mood brighten, and your thinking broadens and becomes more playful and creative (Baas et al., 2008; Forgas, 2008b; Fredrickson, 2006). Relationships, self-image, and

hopes for the future also seem more promising. One study that surveyed thousands of U.S. college students in 1976 and restudied them at age 37 found that happy students had gone on to earn significantly more money than their less-happy-than-average peers (Diener et al., 2002).

Moreover—and this is one of psychology’s most consistent findings—happiness doesn’t just feel good, it does good. In study after study, a mood-boosting experience (finding money, succeeding on a challenging task, recalling a happy event) has made people more likely to give money, pick up someone’s dropped papers, volunteer time, and do other good deeds. Psychologists call it the **feel-good, do-good phenomenon** (Salovey, 1990). (The reverse is also true: Doing good also promotes good feeling, a phenomenon some happiness coaches harness when they have clients perform a daily “random act of kindness” and keep records of the results.)

Positive Psychology



11-12: What is subjective well-being, and what topics do positive psychology researchers explore? What are the three “pillars” of the movement?

William James was writing about the importance of happiness (“the secret motive for all [we] do”) as early as 1902. By the 1960s, the *humanistic psychologists* were interested in advancing human fulfillment. In the twenty-first century, under the leadership of American Psychological Association past-president Martin Seligman, **positive psychology** is using scientific methods to study human flourishing. This young subfield includes studies of **subjective well-being**—our feelings of happiness (sometimes defined as a high ratio of positive to negative feelings) or sense of satisfaction with life. For example, researchers are exploring:

- *positive emotions* by assessing exercises and interventions aimed at increasing happiness (Schueller, 2010; Sin & Lyubomirsky, 2009).
- *positive health* by studying how positive emotions enhance and sustain physical well-being (Seligman, 2008; Seligman et al., 2011).
- *positive neuroscience* by examining the biological foundations of positive emotions, resilience, and social behavior.
- *positive education* by evaluating educational efforts to increase students’ engagement, resilience, character strengths, optimism, and sense of meaning (Seligman et al., 2009).

Taken together, satisfaction with the past, happiness with the present, and optimism about the future define the movement’s first pillar: *positive well-being*. Seligman views happiness as a by-product of a pleasant, engaged, and meaningful life.

Positive psychology is about building not just a pleasant life, says Seligman, but also a good life that engages one’s skills, and a meaningful life that points beyond oneself. Thus, the second pillar, *positive character*, focuses on exploring and enhancing creativity, courage, compassion, integrity, self-control, leadership, wisdom, and spirituality.

The third pillar, *positive groups, communities, and cultures*, seeks to foster a positive social ecology. This includes healthy families, communal neighborhoods, effective schools, socially responsible media, and civil dialogue.

“Positive psychology,” say Seligman and colleagues (2005), “is an umbrella term for the study of positive emotions, positive character traits, and enabling institutions.” Its focus differs from psychology’s traditional interests during its first century, when attention was directed toward understanding and alleviating negative states—abuse and anxiety, depression and disease, prejudice and poverty. Indeed, articles on selected negative emotions since 1887 have outnumbered those on positive emotions by 17 to 1.



Courtesy of Martin E. P. Seligman, Ph.D., Director, Positive Psychology Center/University of Pennsylvania

Martin E. P. Seligman “The main purpose of a positive psychology is to measure, understand, and then build the human strengths and the civic virtues.”

feel-good, do-good phenomenon people’s tendency to be helpful when already in a good mood.

positive psychology the scientific study of optimal human functioning; aims to discover and promote strengths and virtues that enable individuals and communities to flourish.

subjective well-being self-perceived happiness or satisfaction with life. Used along with measures of objective well-being (for example, physical and economic indicators) to evaluate people’s quality of life.

In ages past, times of relative peace and prosperity have enabled cultures to turn their attention from repairing weakness and damage to promoting what Seligman (2002) has called “the highest qualities of life.” Prosperous fifth-century Athens nurtured philosophy and democracy. Flourishing fifteenth-century Florence nurtured great art. Victorian England, flush with the bounty of the British Empire, nurtured honor, discipline, and duty. In this millennium, Seligman believes, thriving Western cultures have a parallel opportunity to create, as a “humane, scientific monument,” a more positive psychology, concerned not only with weakness and damage but also with strength and virtue. Thanks to his leadership, the movement has gained strength, with supporters in 77 countries from Croatia to China (IPPA, 2009, 2010; Seligman, 2004, 2011). Their research on human flourishing has given us insights into many aspects of our well-being, including studies of the predictors of happiness, as we’ll see in the following pages.

What Affects Our Well-Being?



11-13: How do time, wealth, adaptation, and comparison affect our happiness levels?

The Short Life of Emotional Ups and Downs

Are some days of the week happier than others? In what is surely psychology’s biggest-ever data sample, social psychologist Adam Kramer (at my request and in cooperation with Facebook) did a naturalistic observation of emotion words in “billions” of status updates. After eliminating exceptional days, such as holidays, he tracked the frequency of positive and negative emotion words by day of the week. The most positive moods days? Friday and Saturday (**FIGURE 11.13**). A similar analysis of emotion-related words in 59 million Twitter messages found Friday to Sunday the week’s happiest days (Golder & Macy, 2011). For you, too?

Over the long run, our emotional ups and downs tend to balance out. This is true even over the course of the day. Positive emotion rises over the early to middle part of most days and then drops off (Kahneman et al., 2004; Watson, 2000). A stressful event—an argument, a sick child, a car problem—can trigger a bad mood. No surprise there. But by the next day, the gloom nearly always lifts (Affleck et al., 1994; Bolger et al., 1989; Stone & Neale, 1984). If anything, people tend to rebound from bad days to a *better-than-usual* good mood the following day.

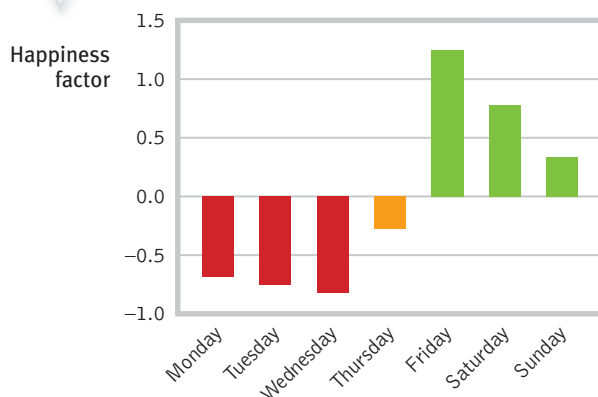
Even when negative events drag us down for longer periods, our bad mood usually ends. Romantic breakups feel devastating, but eventually the wound heals. Faculty members up for tenure expect their lives would be deflated by a negative decision. Actually, 5 to 10 years later, their happiness level is about the same as for those who received tenure (Gilbert et al., 1998).

Grief over the loss of a loved one or anxiety after a severe trauma (such as child abuse, rape, or the terrors of war) can linger. But usually, even tragedy is not permanently depressing. People who become blind or paralyzed usually recover near-normal levels of day-to-day happiness. So do those who must go on kidney dialysis or have permanent colostomies (Gerhart et al., 1994; Riis et al., 2005; Smith et al., 2009). And in European studies, 8- to 12-year-olds with cerebral palsy experienced normal psychological well-being (Dickinson et al., 2007).

People mostly cope well with a permanent disability, although they may not rebound all the way back to their former emotions (Diener et al., 2006; Smith et al., 2009). A major disability leaves people somewhat less happy than average, yet much happier than able-bodied people with depression (Kübler et al., 2005; Lucas, 2007a,b; Oswald & Powdthavee, 2006; Schwartz & Estrin, 2004). “If you are a paraplegic,” explained

FIGURE 11.13

Using web science to track happy days Adam Kramer (personal correspondence, 2010) tracked positive and negative emotion words in many “billions” (the exact number is proprietary information) of status updates of U.S. users of Facebook between September 7, 2007, and November 17, 2010.



Daniel Kahneman (2005), “you will gradually start thinking of other things, and the more time you spend thinking of other things the less miserable you are going to be.” Contrary to what many people believe, most patients “locked in” a motionless body do not say they want to die (Bruno et al., 2008, 2011; Smith & Delargy, 2005).

The surprising reality: *We overestimate the duration of our emotions and underestimate our resiliency.*

“Weeping may tarry for the night, but joy comes with the morning.”

Psalm 30:5

Wealth and Well-Being

“Do you think you would be happier if you made more money?” Yes, replied 73 percent of Americans in a 2006 Gallup poll. How important is “being very well off financially”? *Very important*, say 80 percent of entering U.S. collegians (FIGURE 11.14).

Indeed, having enough money to buy your way out of hunger and hopelessness does buy some happiness (Diener & Biswas-Diener, 2009; Howell & Howell, 2008; Lucas & Schimmack, 2009). As Robert Cummins (2006) confirmed with Australian data, the power of more money to increase happiness is significant at low incomes and diminishes as income rises. A \$1000 annual wage increase does a lot more for the average person in Malawi than for the average person in Switzerland. This implies, he adds, that raising low incomes will do more to increase happiness than raising high incomes.

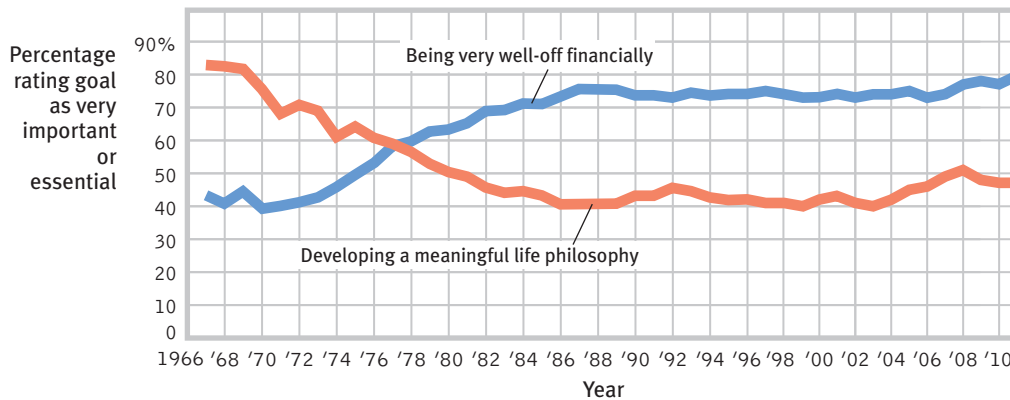


FIGURE 11.14
The changing materialism of entering collegians Surveys of more than 200,000 entering U.S. collegians per year have revealed an increasing desire for wealth after 1970. (From *The American Freshman* surveys, UCLA, 1966 to 2011.)

Once one has enough money for comfort and security, piling up more and more matters less and less. Experiencing luxury diminishes our savoring of life’s simpler pleasures (Quoidbach et al., 2010). If you’ve skied the Alps, your neighborhood sledging hill pales.

And consider this: During the last half-century, the average U.S. citizen’s buying power almost tripled. Did this greater wealth—enabling twice as many cars per person, not to mention laptops, smartphones, and HDTVs—also buy more happiness? As FIGURE 11.15 on the next page shows, the average American, though certainly richer, is not a bit happier. In 1957, some 35 percent said they were “very happy,” as did slightly fewer—29 percent—in 2010. Much the same has been true of Europe, Australia, and Japan, where increasing real incomes have *not* produced increasing happiness (Australian Unity, 2008; Diener & Biswas-Diener, 2002, 2009; Di Tella & MacCulloch, 2010). Ditto China, where living standards have risen but satisfaction has not (Brockmann et al., 2009). These findings lob a bombshell at modern materialism: *Economic growth in affluent countries has provided no apparent boost to morale or social well-being.*

Ironically, in every culture, those who strive hardest for wealth have tended to live with lower well-being (Ryan, 1999), especially when those hard-driving people were seeking money to prove themselves, gain power, or show off rather than support their families (Niemiec et al., 2009; Srivastava et al., 2001). Those who instead strive for intimacy, personal growth, and contribution to the community experience a higher quality of life (Kasser, 2002, 2011).



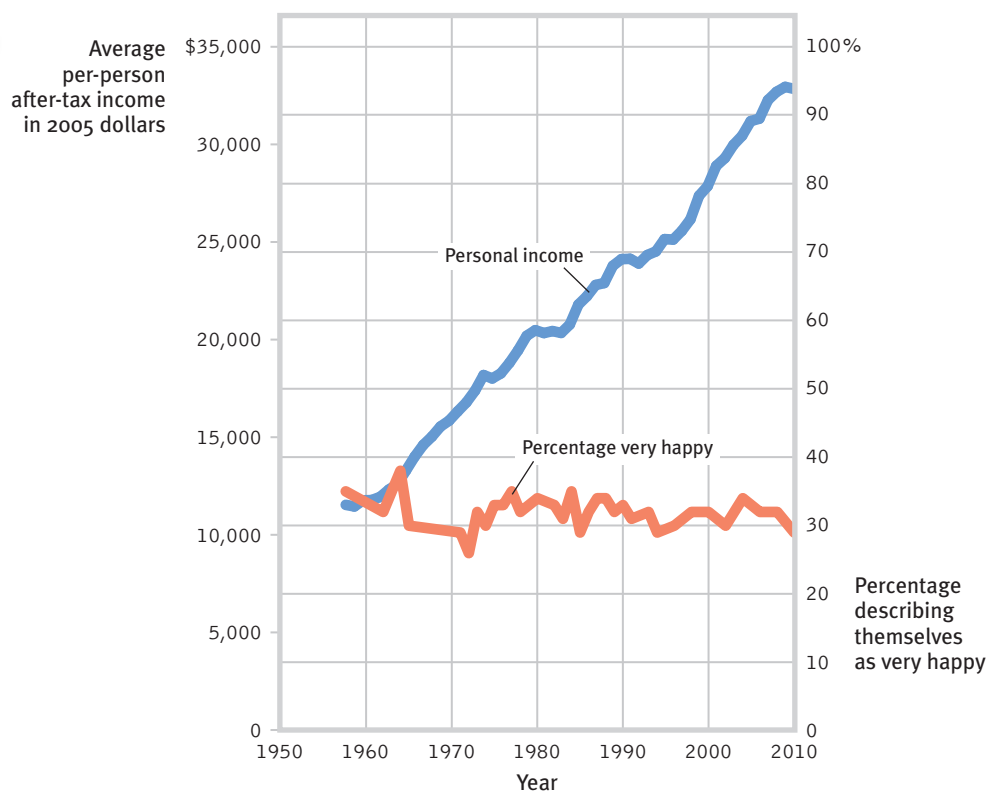
© H. L. Schwadron
“But on the positive side, money can’t buy happiness—so who cares?”

“Australians are three times richer than their parents and grandparents were in the 1950s, but they are not happier.”

A Manifesto for Well-Being, 2005

FIGURE 11.15

Does money buy happiness? It surely helps us to avoid certain types of pain. Yet, though buying power has almost tripled since the 1950s, the average American's reported happiness has remained almost unchanged. (Happiness data from National Opinion Research Center surveys; income data from *Historical Statistics of the United States and Economic Indicators*.)



“No happiness lasts for long.”

Seneca, Agamemnon, c.E. 60

“Continued pleasures wear off. . . . Pleasure is always contingent upon change and disappears with continuous satisfaction.”

Dutch psychologist Nico Frijda (1988)

“I have a ‘fortune cookie maxim’ that I’m very proud of: Nothing in life is quite as important as you think it is while you are thinking about it. So, nothing will ever make you as happy as you think it will.”

Nobel laureate psychologist Daniel Kahneman, Gallup interview, “What Were They Thinking?” 2005

Happiness Is Relative: Adaptation and Comparison

Two psychological principles explain why, for those who are not poor, more money buys little more than a temporary surge of happiness and why our emotions seem attached to elastic bands that pull us back from highs or lows. In its own way, each principle suggests that happiness is relative.

Happiness Is Relative to Our Own Experience The **adaptation-level phenomenon** describes our tendency to judge various stimuli in comparison with our past experiences. As psychologist Harry Helson (1898–1977) explained, we adjust our *neutral* levels—the points at which sounds seem neither loud nor soft, temperatures neither hot nor cold, events neither pleasant nor unpleasant—based on our experience. We then notice and react to variations up or down from these levels. Thus, after an initial surge of pleasure, improvements become our “new normal,” and we require something even better to give us a happiness boost.

So, could we ever create a permanent social paradise? Probably not (Campbell, 1975; Di Tella & MacCulloch, 2010). People who have experienced a recent windfall—from a lottery, an inheritance, or a surging economy—typically feel some elation (Diener & Oishi, 2000; Gardner & Oswald, 2007). So would you, if you woke up tomorrow to your utopia—perhaps a world with no bills, no ills, perfect scores, someone who loves you unreservedly. But after a time, you would gradually recalibrate your adaptation level, and you would adjust your new neutral level to include these new experiences. Before long, you would again sometimes feel gratified (when events exceed your expectations) and sometimes feel deprived (when they fall below), and sometimes feel neutral. *The point to remember:* Feelings of satisfaction and dissatisfaction, success and failure are judgments we make based on our prior experience. Satisfaction, as Richard Ryan (1999) said, “has a short half life.” Ditto disappointment, which means that you may bounce back from a setback sooner than you expect.

Happiness Is Relative to Others' Success We are always comparing ourselves with others. And whether we feel good or bad depends on who those others are (Lyu-bomirsky, 2001). We are slow-witted or clumsy only when others are smarter or more agile. This sense that we are worse off than others with whom we compare ourselves is called **relative deprivation**.

When expectations soar above attainments, the result is disappointment. Thus, the middle- and upper-income people in a given country, who can compare themselves with the relatively poor, tend to be more satisfied with life than are their less-fortunate compatriots. Nevertheless, once people reach a moderate income level, further increases buy little more happiness. Why? Because as people climb the ladder of success they mostly compare themselves with local peers who are at or above their current level (Gruder, 1977; Suls & Tesch, 1978; Zell & Alicke, 2010). “Beggars do not envy millionaires, though of course they will envy other beggars who are more successful,” noted British philosopher Bertrand Russell (1930, p. 90). Thus, “Napoleon envied Caesar, Caesar envied Alexander, and Alexander, I daresay, envied Hercules, who never existed. You cannot, therefore, get away from envy by means of success alone, for there will always be in history or legend some person even more successful than you are” (pp. 68–69).

Just as comparing ourselves with those who are better off creates envy, so counting our blessings as we compare ourselves with those worse off boosts our contentment. In one study, University of Wisconsin–Milwaukee women considered others' deprivation and suffering (Dermer et al., 1979). They viewed vivid depictions of how grim life was in Milwaukee in 1900. They imagined and then wrote about various personal tragedies, such as being burned and disfigured. Later, the women expressed greater satisfaction with their own lives. Similarly, when mildly depressed people have read about someone who was even more depressed, they felt somewhat better (Gibbons, 1986). “I cried because I had no shoes,” states a Persian saying, “until I met a man who had no feet.”

adaptation-level phenomenon our tendency to form judgments (of sounds, of lights, of income) relative to a neutral level defined by our prior experience.

relative deprivation the perception that one is worse off relative to those with whom one compares oneself.

The effect of comparison with others helps explain why students of a given level of academic ability tend to have a higher academic self-concept if they attend a school where most other students are not exceptionally able (Marsh & Parker, 1984). If you were near the top of your graduating class, you might feel inferior upon entering a college or university where all students were near the top of their class.

What Predicts Our Happiness Levels?



11-14: What are some predictors of happiness, and how can we be happier?

Happy people share many characteristics (**TABLE 11.1**). But why are some people normally so joyful and others so somber? Here, as in so many other areas, the answer is found in the interplay between nature and nurture.

Happiness is genetically influenced. In one study of 254 identical and fraternal twins, about 50 percent of the difference among people's happiness ratings was



“Researchers say I’m not happier for being richer, but do you know how much researchers make?”

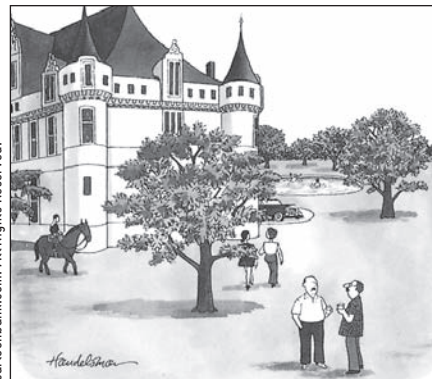
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Table 11.1
Happiness Is . . .

Researchers Have Found That Happy People Tend to	However, Happiness Seems Not Much Related to Other Factors, Such As
Have high self-esteem (in individualistic countries).	Age.
Be optimistic, outgoing, and agreeable.	Gender (women are more often depressed, but also more often joyful).
Have close friendships or a satisfying marriage.	Parenthood (having children or not).
Have work and leisure that engage their skills.	Physical attractiveness.
Have an active religious faith.	
Sleep well and exercise.	

Sources: Summarized from DeNeve & Cooper (1998); Diener et al. (2003); Headey et al. (2010); Lucas et al. (2004); Myers (1993, 2000); Myers & Diener (1995, 1996); and Steel et al. (2008). Veenhoven (2009) offers a database of more than 11,000 correlates of happiness at worlddatabaseofhappiness.eur.nl.

Studies of chimpanzees in zoos reveal that happiness in chimpanzees, as rated by 200 employees, is also genetically influenced (Weiss et al., 2000, 2002).



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“I could cry when I think of the years I wasted accumulating money, only to learn that my cheerful disposition is genetic.”

CLOSE UP:

Want to Be Happier?

Your happiness, like your cholesterol level, is genetically influenced. Yet as cholesterol is also influenced by diet and exercise, so happiness is partly under your control (Nes, 2010; Sin & Lyubomirsky, 2009). Here are some research-based suggestions for improving your mood and increasing your satisfaction with life.

Realize that enduring happiness may not come from financial success. We adapt to change by adjusting our expectations. Neither wealth, nor any other circumstance we long for, will guarantee happiness.

Take control of your time. Happy people feel in control of their lives. To master your use of time, set goals and break them into daily aims. This may be frustrating at first because we all tend to overestimate how much we will accomplish in any given day. The good news is that we generally *underestimate* how much we can accomplish in a year, given just a little progress every day.

Act happy. As you saw in Chapter 10, people who were manipulated into a smiling expression felt better. So put on a happy face. Talk as if you feel positive self-esteem, are optimistic, and are outgoing. We can often act our way into a happier state of mind.

Seek work and leisure that engage your skills. Happy people often are in a zone called

heritable—attributable to genes (Lykken & Tellegen, 1996). Other twin studies report similar or slightly less heritability (Bartels & Boomsma, 2009; Lucas, 2008; Nes et al., 2010). Identical twins raised apart are often similarly happy.

But our personal history and our culture matter, too. On the personal level, as we have seen, our emotions tend to balance around a level defined by our experience. On the cultural level, groups vary in the traits they value. Self-esteem and achievement matter more to Westerners, who value individualism. Social acceptance and harmony matter more to those in communal cultures such as Japan that stress family and community (Diener et al., 2003; Uchida & Kitayama, 2009).

Depending on our genes, our outlook, and our recent experiences, our happiness seems to fluctuate around our “happiness set point,” which disposes some people to be ever upbeat and others more negative. Even so, after following thousands of lives over two decades, researchers have determined that our satisfaction with life is not fixed (Lucas & Donnellan, 2007). Happiness rises and falls, and it can be influenced by factors that are under our control. A striking example: In a long-term German study, married partners were as similarly satisfied with their lives as were identical twins (Schimmack & Lucas, 2007). Genes matter. But as this study hints, relationship quality matters, too. (For research-based hints on enhancing your own happiness, see Close-Up: Want to Be Happier?)

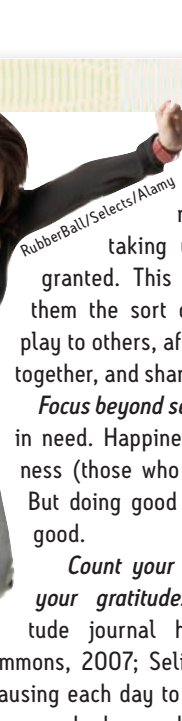
If we can enhance our happiness on an *individual* level, could we use happiness research to refocus our *national* priorities more on advancing psychological well-being? Many

flow—absorbed in tasks that challenge but don’t overwhelm them. The most expensive forms of leisure (sitting on a yacht) often provide less flow experience than simpler forms, such as gardening, socializing, or craft work. Money also buys more happiness when spent on experiences you can look forward to, enjoy, and remember than when spent on material stuff (Carter & Gilovich, 2010). As pundit Art Buchwald said, “The best things in life aren’t things.”

Join the “movement” movement. Aerobic exercise can relieve mild depression and anxiety as it promotes health and energy. Sound minds reside in sound bodies. Off your duffs, couch potatoes!

Give your body the sleep it wants. Happy people live active lives yet reserve time for renewing sleep and solitude. Many people suffer from sleep debt, with resulting fatigue, diminished alertness, and gloomy moods.

Give priority to close relationships. Intimate friendships can help you weather difficult times. Confiding is good for soul and body. Compared with unhappy people, happy people engage in less superficial small talk and more meaningful conversations (Mehl et al., 2010).



RubberBall/Selects/Alamy

So resolve to nurture your closest relationships by *not* taking your loved ones for granted. This means displaying to them the sort of kindness you display to others, affirming them, playing together, and sharing together.

Focus beyond self. Reach out to those in need. Happiness increases helpfulness (those who feel good do good). But doing good also makes one feel good.

Count your blessings and record your gratitude. Keeping a gratitude journal heightens well-being (Emmons, 2007; Seligman et al., 2005). Try pausing each day to savor good moments and to record when and why positive events occurred. Express your gratitude to others.

Nurture your spiritual self. For many people, faith provides a support community, a reason to focus beyond self, and a sense of purpose and hope. That helps explain why people active in faith communities report greater-than-average happiness, and why they often cope well in crises.

psychologists believe we could. Ed Diener (2006, 2009), supported by 52 colleagues, has proposed ways in which nations might measure national well-being. Happiness research offers new ways to assess the impacts of various public policies, argue Diener and his colleagues. Happy societies are not only prosperous but are also places where people trust one another, feel free, and enjoy close relationships (Oishi & Schimmack, 2010). Thus, when debating such issues as economic inequality, tax rates, divorce laws, and health care, people's psychological well-being should be a prime consideration—a point now affirmed by the Canadian, French, German, and British governments. Each has added well-being measures to their national agendas (Cohen, 2011; Gertner, 2010; Stiglitz, 2009). Such measures may help guide nations toward policies that decrease stress and foster human flourishing.

RETRIEVE IT

- Which of the following factors do NOT predict self-reported happiness? Which factors are better predictors?

a. Age	d. Gender
b. Personality traits	e. Engaging work and leisure
c. Close relationships	f. Active religious faith

ANSWERS: Age and gender (a. and d.) do NOT effectively predict happiness levels. Better predictors are personality traits, close relationships, "flow" in work and leisure, and religious faith (b., c., e., and f.).

CHAPTER REVIEW

Stress, Health, and Human Flourishing

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Stress and Health

- 11-1:** What events provoke stress responses, and how do we respond and adapt to stress?
- 11-2:** How does stress make us more vulnerable to disease?
- 11-3:** Why are some of us more prone than others to coronary heart disease?
- 11-4:** What are some healthful ways to cope with feelings of anger?

Coping With Stress

- 11-5:** In what two ways do people try to alleviate stress?
- 11-6:** How does a perceived lack of control affect health?
- 11-7:** What are the links among basic outlook on life, social support, stress, and health?

Reducing Stress

- 11-8:** How effective is aerobic exercise as a way to manage stress and improve well-being?
- 11-9:** In what ways might relaxation and meditation influence stress and health?
- 11-10:** What is the faith factor, and what are some possible explanations for the link between faith and health?



Happiness

11-11: What are the main effects of being happy?

11-12: What is subjective well-being, and what topics do positive psychology researchers explore? What are the three “pillars” of the movement?

11-13: How do time, wealth, adaptation, and comparison affect our happiness levels?

11-14: What are some predictors of happiness, and how can we be happier?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

stress, p. 390

general adaptation syndrome (GAS), p. 393

tend and befriend, p. 393

health psychology, p. 394

psychoneuroimmunology, p. 394

coronary heart disease, p. 397

Type A, p. 398

Type B, p. 398

catharsis, p. 398

coping, p. 401

problem-focused coping, p. 401

emotion-focused coping, p. 401

learned helplessness, p. 402

external locus of control, p. 403

internal locus of control, p. 403

self-control, p. 403

aerobic exercise, p. 407

feel-good, do-good phenomenon, p. 413

positive psychology, p. 413

subjective well-being, p. 413

adaptation-level phenomenon, p. 416

relative deprivation, p. 417

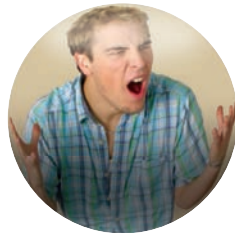
EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Selye's general adaptation syndrome (GAS) consists of an alarm reaction followed by _____, then _____.
- When faced with stress, women are more likely than men to experience the _____-and-_____ response.
- The number of short-term illnesses and stress-related psychological disorders was higher than usual in the months following an earthquake. Such findings suggest that
 - daily hassles have adverse health consequences.
 - experiencing a very stressful event increases a person's vulnerability to illness.
 - the amount of stress a person feels is directly related to the number of stressors experienced.
 - small, bad events don't cause stress, but large ones can be toxic.
- Which of the following is NOT one of the three main types of stressors?
 - Catastrophes
 - Significant life changes
 - Daily hassles
 - Threatening events that we hear about
- Stress hormones released in response to a signal from the brain suppress _____, the immune cells that ordinarily attack bacteria, viruses, cancer cells, and other foreign substances.
- Research has shown that people are at increased risk for cancer a year or so after experiencing depression, helplessness, or bereavement. In describing this link, researchers are quick to point out that
 - accumulated stress causes cancer.
 - anger is the negative emotion most closely linked to cancer.
 - stress does not create cancer cells, but it weakens the body's natural defenses against them.
 - feeling optimistic about chances of survival ensures that a cancer patient will get well.
- A Chinese proverb warns, “The fire you kindle for your enemy often burns you more than him.” How is this true of Type A individuals?
- The components of the Type A personality that have been linked most closely to coronary heart disease are anger and other _____ feelings.
- When faced with a situation over which you feel you have no sense of control, it is most effective to use _____ (emotion/problem)-focused coping.

10. Seligman's research showed that a dog will respond with learned helplessness if it has received repeated shocks and has had
- the opportunity to escape.
 - no control over the shocks.
 - pain or discomfort.
 - no food or water prior to the shocks.
11. When elderly patients take an active part in managing their own care and surroundings, their morale and health tend to improve. Such findings indicate that people do better when they experience an _____ (internal/external) locus of control.
12. People who have close relationships are less likely to die prematurely than those who do not, supporting the idea that
- social ties can be a source of stress.
 - gender influences longevity.
 - Type A behavior is responsible for many premature deaths.
 - social support has a beneficial effect on health.
13. Because it triggers the release of mood-boosting neurotransmitters such as norepinephrine, serotonin, and the endorphins, _____ exercise raises energy levels and helps alleviate depression and anxiety.
14. Research on the faith factor has found that
- pessimists tend to be healthier than optimists.
 - our expectations influence our feelings of stress.
 - religiously active people tend to outlive those who are not religiously active.
 - religious engagement promotes isolation, repression, and ill health.
15. One of the most consistent findings of psychological research is that happy people are also
- more likely to express anger.
 - generally luckier than others.
 - concentrated in the wealthier nations.
 - more likely to help others.
16. _____ psychology is a scientific field of study focused on how humans thrive and flourish.
17. After moving to a new apartment, you find the street noise irritatingly loud, but after a while, it no longer bothers you. This reaction illustrates the
- relative deprivation principle.
 - adaptation-level phenomenon.
 - feel-good, do-good phenomenon.
 - catharsis principle.
18. A philosopher observed that we cannot escape envy, because there will always be someone more successful, more accomplished, or richer with whom to compare ourselves. In psychology, this observation is embodied in the _____ principle.

Find answers to these questions in Appendix E, in the back of the book.



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Assessing Unconscious Processes

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Abraham Maslow's Self-Actualizing Person

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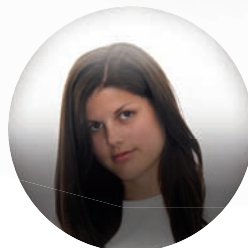
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EXPLORING THE SELF

The Benefits of Self-Esteem

Self-Serving Bias

Culture and the Self





Personality

Lord of the Rings hobbit-hero Frodo Baggins knew that throughout his difficult journey there was one who would never fail him—his loyal and ever-cheerful companion, Sam Gamgee. Even before they left their beloved homes in the Shire, Frodo warned Sam that the journey would not be easy.

“It is going to be very dangerous, Sam. It is already dangerous.

Most likely neither of us will come back.”

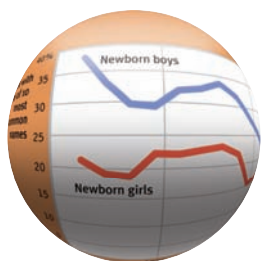
“If you don’t come back, sir, then I shan’t, that’s certain,” said Sam. “[The Elves told me] ‘Don’t you leave him!’ Leave him! I said. I never mean to. I am going with him, if he climbs to the Moon; and if any of those Black Riders try to stop him, they’ll have Sam Gamgee to reckon with.” (J.R.R. Tolkien, *The Fellowship of the Ring*, p. 96)

And so they did! Later in the story, when it becomes clear that Frodo’s path will lead him into the dreaded land of Mordor, it is Sam who insists he will be at Frodo’s side, come what may. It is Sam who lifts Frodo’s spirits with songs and stories from their boyhood. And it is Sam whom Frodo leans upon when he can barely take another step. When Frodo is overcome by the evil of the ring he carries, it is Sam who saves him. In the end, it is Sam who helps Frodo successfully reach the end of his journey. Sam Gamgee—cheerful, optimistic, emotionally stable—never falters in his faithfulness or his belief that they will overcome the threatening darkness.

As he appears and reappears throughout the series, Tolkien’s Sam Gamgee exhibits the distinctive and enduring behaviors that define **personality**—a person’s characteristic pattern of thinking, feeling, and acting. Earlier chapters have focused on our similar ways of developing, perceiving, learning, remembering, thinking, and feeling. This chapter focuses on what makes us each unique.

Much of this book deals with personality. We have considered biological influences on personality, personality development across the life span, and personality-related aspects of learning, motivation, emotion, and health. In later chapters we will study social influences on personality and disorders of personality.

Two historically significant theories have become part of our cultural legacy. Sigmund Freud’s *psychoanalytic* theory proposed that childhood sexuality and unconscious motivations influence personality. The *humanistic* approach focused on our inner capacities for growth and self-fulfillment. These sweeping perspectives on human nature laid the foundation for later personality theorists and are complemented by what this chapter goes on to explore: newer scientific research on specific aspects of personality. Today’s personality researchers study the basic dimensions of personality, the biological roots of these dimensions, and the interaction of persons and environments. They also study self-esteem, self-serving bias, and cultural influences on one’s sense of self. And they study the unconscious mind—with findings that probably would have surprised Freud himself.



personality an individual's characteristic pattern of thinking, feeling, and acting.



Sigmund Freud, 1856–1939 “I was the only worker in a new field.”

© Bettman/Corbis

“The female . . . acknowledges the fact of her castration, and with it, too, the superiority of the male and her own inferiority; but she rebels against this unwelcome state of affairs.”

Sigmund Freud, Female Sexuality, 1931

psychodynamic theories view personality with a focus on the unconscious and the importance of childhood experiences.

psychoanalysis Freud's theory of personality that attributes thoughts and actions to unconscious motives and conflicts; the techniques used in treating psychological disorders by seeking to expose and interpret unconscious tensions.

unconscious according to Freud, a reservoir of mostly unacceptable thoughts, wishes, feelings, and memories. According to contemporary psychologists, information processing of which we are unaware.

free association in psychoanalysis, a method of exploring the unconscious in which the person relaxes and says whatever comes to mind, no matter how trivial or embarrassing.

Psychodynamic Theories

Psychodynamic theories of personality view human behavior as a dynamic interaction between the conscious and unconscious mind, including associated motives and conflicts. These theories are descended from Freud's **psychoanalysis**, Freud's theory of personality and the associated techniques for treating psychological disorders. Freud's work was the first to focus clinical attention on our unconscious mind.

Freud's Psychoanalytic Perspective: Exploring the Unconscious



12-1: How did Sigmund Freud's treatment of psychological disorders lead to his view of the unconscious mind?

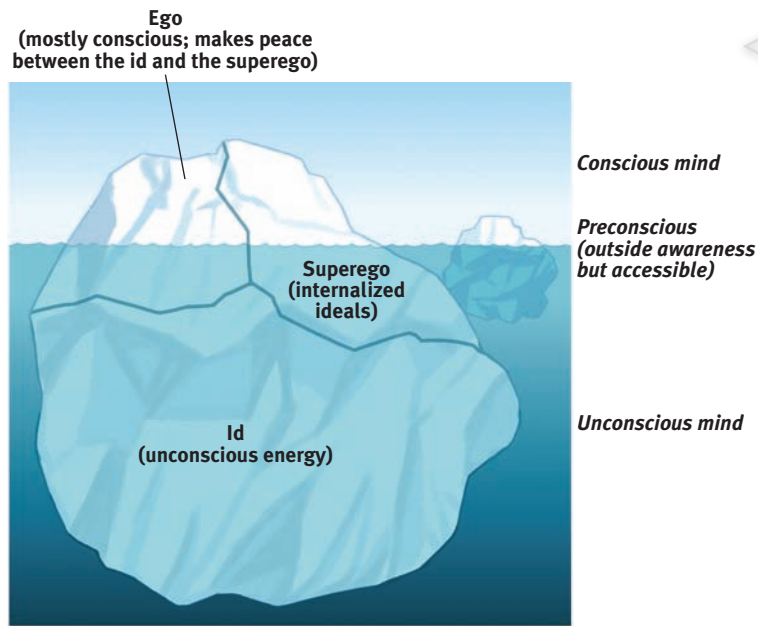
Ask 100 people on the street to name a notable deceased psychologist, suggested Keith Stanovich (1996, p. 1), and “Freud would be the winner hands down.” In the popular mind, he is to psychology's history what Elvis Presley is to rock music's history. Freud's influence lingers in psychiatry and clinical psychology, but also in literary and film interpretation. Almost 9 in 10 American college courses that reference psychoanalysis are outside of psychology departments (Cohen, 2007). Today's psychological science is, as we will see, skeptical about many of Freud's ideas and methods. Yet his early twentieth-century concepts penetrate our twenty-first-century language. Without realizing their source, we may speak of *ego*, *repression*, *projection*, *sibling rivalry*, *Freudian slips*, and *fixation*. So, who was Freud, and what did he teach?

Like all of us, Sigmund Freud was a product of his times. His Victorian era was a time of tremendous discovery and scientific advancement, but it is also known today as a time of sexual repression and male dominance. Men's and women's roles were clearly defined, with male superiority assumed and only male sexuality generally acknowledged (discreetly).

Long before entering the University of Vienna in 1873, young Freud showed signs of independence and brilliance. He so loved reading plays, poetry, and philosophy that he once ran up a bookstore debt beyond his means. As a teen he often took his evening meal in his tiny bedroom in order to lose no time from his studies. After medical school he set up a private practice specializing in nervous disorders. Before long, however, he faced patients whose disorders made no neurological sense. For example, a patient might have lost all feeling in a hand—yet there is no sensory nerve that, if damaged, would numb the entire hand and nothing else. Freud's search for a cause for such disorders set his mind running in a direction destined to change human self-understanding.

Might some neurological disorders have psychological causes? Observing patients led Freud to his belief that beneath our awareness is a larger **unconscious** mind, a dwelling place of largely unacceptable thoughts, wishes, feelings, and memories. He speculated that lost feeling in one's hand might be caused by a fear of touching one's genitals; that unexplained blindness or deafness might be caused by not wanting to see or hear something that aroused intense anxiety. How might such disorders be treated? After some early unsuccessful trials with hypnosis, Freud turned to **free association**, in which he told the patient to relax and say whatever came to mind, no matter how embarrassing or trivial. He assumed that a line of mental dominoes had fallen from his patients' distant past to their troubled present, and that the chain of thought revealed by free association would allow him to retrace that line into a patient's unconscious. Painful memories, often from childhood, could then be retrieved from the unconscious and brought into conscious awareness.

Basic to Freud's theory was his belief that the mind is mostly hidden (**FIGURE 12.1**). Our *conscious* awareness is like the part of an iceberg that floats above the surface. Beneath our awareness is the larger *unconscious* mind, with its thoughts, wishes, feelings, and memories. Some of these thoughts we store temporarily in a *preconscious* area, from which we can retrieve them into conscious awareness. Of greater interest to Freud was the mass of unacceptable passions and thoughts that he believed we *repress*, or forcibly block from our

**FIGURE 12.1****Freud's idea of the mind's structure**

Psychologists have used an iceberg image to illustrate Freud's idea that the mind is mostly hidden beneath the conscious surface. Note that the id is totally unconscious, but the ego and superego operate both consciously and unconsciously. Unlike the parts of an iceberg, however, the id, ego, and superego interact.

consciousness because they would be too unsettling to acknowledge. Freud believed that without our awareness, these troublesome feelings and ideas powerfully influence us. Such feelings, he said, sometimes surface in disguised forms—the work we choose, the beliefs we hold, our daily habits, our troubling symptoms.

Personality Structure



12-2: What was Freud's view of personality?

In Freud's view, human personality—including its emotions and strivings—arises from a conflict between impulse and restraint—between our aggressive, pleasure-seeking biological urges and our internalized social controls over these urges. Freud believed personality arises from our efforts to resolve this basic conflict—to express these impulses in ways that bring satisfaction without also bringing guilt or punishment. To understand the mind's dynamics during this conflict, Freud proposed three interacting systems: the *id*, *ego*, and *superego* (Figure 12.1).

The **id's** unconscious psychic energy constantly strives to satisfy basic drives to survive, reproduce, and aggress. The id operates on the *pleasure principle*: It seeks immediate gratification. To envision an id-dominated person, think of a newborn infant crying out for satisfaction, caring nothing for the outside world's conditions and demands. Or think of people with a present rather than future time perspective—those who heavily use tobacco, alcohol, and other drugs, and would sooner party now than sacrifice today's pleasure for future success and happiness (Keough et al., 1999).

As the **ego** develops, the young child responds to the real world. The ego, operating on the *reality principle*, seeks to gratify the id's impulses in realistic ways that will bring long-term pleasure. (Imagine what would happen if, lacking an ego, we expressed all our unrestrained sexual or aggressive impulses.) The ego contains our partly conscious perceptions, thoughts, judgments, and memories.

Around age 4 or 5, Freud theorized, a child's ego recognizes the demands of the newly emerging **superego**, the voice of our moral compass (conscience) that forces the ego to consider not only the real but the *ideal*. The superego focuses on how we *ought* to behave. It strives for perfection, judging actions and producing positive feelings of pride or negative feelings of guilt. Someone with an exceptionally strong superego may be virtuous yet guilt ridden; another with a weak superego may be wantonly self-indulgent and remorseless.



"Fifty is plenty." "Hundred and fifty."

The ego struggles to reconcile the demands of superego and id, said Freud.

id a reservoir of unconscious psychic energy that, according to Freud, strives to satisfy basic sexual and aggressive drives. The id operates on the *pleasure principle*, demanding immediate gratification.

ego the largely conscious, "executive" part of personality that, according to Freud, mediates among the demands of the id, superego, and reality. The ego operates on the *reality principle*, satisfying the id's desires in ways that will realistically bring pleasure rather than pain.

superego the part of personality that, according to Freud, represents internalized ideals and provides standards for judgment (the conscience) and for future aspirations.

Because the superego's demands often oppose the id's, the ego struggles to reconcile the two. It is the personality "executive," mediating among the impulsive demands of the id, the restraining demands of the superego, and the real-life demands of the external world. If chaste Jane feels sexually attracted to John, she may satisfy both id and superego by joining a volunteer organization that John attends regularly.

Personality Development



12-3: What developmental stages did Freud propose?

Analysis of his patients' histories convinced Freud that personality forms during life's first few years. He concluded that children pass through a series of **psychosexual stages**, during which the id's pleasure-seeking energies focus on distinct pleasure-sensitive areas of the body called *erogenous zones* (TABLE 12.1). Each stage offers its own challenges, which Freud saw as conflicting tendencies.

Freud believed that during the *phallic stage*, for example, boys seek genital stimulation, and they develop both unconscious sexual desires for their mother and jealousy and hatred for their father, whom they consider a rival. Given these feelings, he thought, boys also experience guilt and a lurking fear of punishment, perhaps by castration, from their father. Freud called this collection of feelings the **Oedipus complex** after the Greek legend of Oedipus, who unknowingly killed his father and married his mother. Some psychoanalysts in Freud's era believed that girls experienced a parallel *Electra complex*.

Children eventually cope with the threatening feelings, said Freud, by repressing them and by trying to become like the rival parent. It's as though something inside the child decides, "If you can't beat 'em [the same-sex parent], join 'em." Through this **identification** process, children's superegos gain strength as they incorporate many of their parents' values. Freud believed that identification with the same-sex parent provides what psychologists now call our *gender identity*—our sense of being male or female. Freud presumed that our early childhood relations—especially with our parents and caregivers—influence our developing identity, personality, and frailties.

In Freud's view, conflicts unresolved during earlier psychosexual stages could surface as maladaptive behavior in the adult years. At any point in the oral, anal, or phallic stages, strong conflict could lock, or **fixate**, the person's pleasure-seeking energies in that stage. A person who had been either orally overindulged or deprived (perhaps by abrupt, early weaning) might fixate at the oral stage. This orally fixated adult could exhibit either passive dependence (like that of a nursing infant) or an exaggerated denial of this dependence (by acting tough or uttering biting sarcasm). Or the person might continue to seek oral gratification by smoking or excessive eating. In such ways, Freud suggested, the twig of personality is bent at an early age.



Science Cartoons Plus

"I heard that as soon as we become aware of our sexual impulses, whatever they are, we'll have to hide them."



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"Oh, for goodness' sake! Smoke!"

psychosexual stages the childhood stages of development (oral, anal, phallic, latency, genital) during which, according to Freud, the id's pleasure-seeking energies focus on distinct erogenous zones.

Oedipus [ED-uh-puss] **complex** according to Freud, a boy's sexual desires toward his mother and feelings of jealousy and hatred for the rival father.

identification the process by which, according to Freud, children incorporate their parents' values into their developing superegos.

fixation according to Freud, a lingering focus of pleasure-seeking energies at an earlier psychosexual stage, in which conflicts were unresolved.

Table 12.1
Freud's Psychosexual Stages

Stage	Focus
Oral (0–18 months)	Pleasure centers on the mouth—sucking, biting, chewing
Anal (18–36 months)	Pleasure focuses on bowel and bladder elimination; coping with demands for control
Phallic (3–6 years)	Pleasure zone is the genitals; coping with incestuous sexual feelings
Latency (6 to puberty)	A phase of dormant sexual feelings
Genital (puberty on)	Maturation of sexual interests

Freud’s ideas of sexuality were controversial in his own time. “Freud was called a dirty-minded pansexualist and Viennese libertine,” noted Morton Hunt, historian of psychology (2007, p. 211). Today Freud’s ideas of Oedipal conflict and castration anxiety are disputed even by psychodynamic theorists and therapists (Shedler, 2010b). Yet we still teach them as part of the history of Western ideas.

defense mechanisms in psychoanalytic theory, the ego’s protective methods of reducing anxiety by unconsciously distorting reality.

repression in psychoanalytic theory, the basic defense mechanism that banishes from consciousness anxiety-arousing thoughts, feelings, and memories.

Defense Mechanisms



12-4: How did Freud think people defended themselves against anxiety?

Anxiety, said Freud, is the price we pay for civilization. As members of social groups, we must control our sexual and aggressive impulses, not act them out. But sometimes the ego fears losing control of this inner id-superego war. The presumed result is a dark cloud of unfocused anxiety that leaves us feeling unsettled but unsure why.

Freud proposed that the ego protects itself with **defense mechanisms**—tactics that reduce or redirect anxiety by distorting reality. *All defense mechanisms function indirectly and unconsciously.* Just as the body unconsciously defends itself against disease, so also does the ego unconsciously defend itself against anxiety. For example, **repression** banishes anxiety-arousing wishes and feelings from consciousness. According to Freud, *repression underlies all the other defense mechanisms.* However, because repression is often incomplete, repressed urges may appear as symbols in dreams or as slips of the tongue in casual conversation.

Freud believed he could glimpse the unconscious seeping through when a financially stressed patient, not wanting any large pills, said, “Please do not give me any bills, because I cannot swallow them.” Similarly, he viewed jokes as expressions of repressed sexual and aggressive tendencies, and dreams as the “royal road to the unconscious.” The remembered content of dreams (their *manifest content*) he believed to be a censored expression of the dreamer’s unconscious wishes (the dream’s *latent content*). In his dream analyses, Freud searched for patients’ inner conflicts.

TABLE 12.2 describes a sampling of six other well-known defense mechanisms.



“Good morning, beheaded—uh, I mean beloved.”

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Table 12.2
Six Defense Mechanisms

Freud believed that *repression*, the basic mechanism that banishes anxiety-arousing impulses, enables other defense mechanisms, six of which are listed here.

Defense Mechanism	Unconscious Process Employed to Avoid Anxiety-Arousing Thoughts or Feelings	Example
<i>Regression</i>	Retreating to a more infantile psychosexual stage, where some psychic energy remains fixated.	A little boy reverts to the oral comfort of thumb sucking in the car on the way to his first day of school.
<i>Reaction formation</i>	Switching unacceptable impulses into their opposites.	Repressing angry feelings, a person displays exaggerated friendliness.
<i>Projection</i>	Disguising one’s own threatening impulses by attributing them to others.	“The thief thinks everyone else is a thief” (an El Salvadoran saying).
<i>Rationalization</i>	Offering self-justifying explanations in place of the real, more threatening unconscious reasons for one’s actions.	A habitual drinker says she drinks with her friends “just to be sociable.”
<i>Displacement</i>	Shifting sexual or aggressive impulses toward a more acceptable or less threatening object or person.	A little girl kicks the family dog after her mother sends her to her room.
<i>Denial</i>	Refusing to believe or even perceive painful realities.	A partner denies evidence of his loved one’s affair.

Regression Faced with a mild stressor, children and young orangutans seek protection and comfort from their caregivers. Freud might have interpreted these behaviors as regression, a retreat to an earlier developmental stage.



VStock/Alamy



Barbara Von Hoffmann/Animals Animals

collective unconscious Carl Jung's concept of a shared, inherited reservoir of memory traces from our species' history.

projective test a personality test, such as the Rorschach, that provides ambiguous stimuli designed to trigger projection of one's inner dynamics.

Rorschach inkblot test the most widely used projective test, a set of 10 inkblots, designed by Hermann Rorschach; seeks to identify people's inner feelings by analyzing their interpretations of the blots.

RETRIEVE IT

- According to Freud's ideas about the three-part personality structure, the _____ operates on the *reality principle* and tries to balance demands in a way that produces long-term pleasure rather than pain; the _____ operates on the *pleasure principle* and seeks immediate gratification; and the _____ represents the voice of our internalized ideals (our *conscience*).
- In the psychoanalytic view, conflicts unresolved during the first three psychosexual stages may lead to _____ at that stage.
- Freud believed that our defense mechanisms operate _____ (consciously/unconsciously) and defend us against _____.

ANSWERS: ego; id; superego

ANSWER: fixation

ANSWERS: unconsciously; anxiety

The Neo-Freudian and Later Psychodynamic Theorists



12-5: Which of Freud's ideas did his followers accept or reject?

Freud's writings were controversial, but they soon attracted followers, mostly young, ambitious physicians who formed an inner circle around their strong-minded leader. These pioneering psychoanalysts, whom we often call *neo-Freudians*, accepted Freud's basic ideas: the personality structures of id, ego, and superego; the importance of the unconscious; the shaping of personality in childhood; and the dynamics of anxiety and the defense mechanisms. But they broke away from Freud in two important ways. First, they placed more emphasis on the conscious mind's role in interpreting experience and in coping with the environment. And second, they doubted that sex and aggression were all-consuming motivations. Instead, they tended to emphasize loftier motives and social interactions.

Alfred Adler and Karen Horney [HORN-eye], for example, agreed with Freud that childhood is important. But they believed that childhood *social*, not sexual, tensions are crucial for personality formation (Ferguson, 2003). Adler (who had proposed the still-popular idea of the *inferiority complex*) himself struggled to overcome childhood illnesses and accidents, and he believed that much of our behavior is driven by efforts to conquer childhood inferiority feelings that trigger our strivings for superiority and power. Horney said childhood anxiety triggers our desire for love and security. She also countered Freud's assumptions, arising as they did in his conservative culture, that women have weak superegos and suffer "penis envy," and she attempted to balance the bias she detected in his masculine view of psychology.

Carl Jung—Freud's disciple-turned-dissenter—placed less emphasis on social factors and agreed with Freud that the unconscious exerts a powerful influence. But to Jung [Yoong], the unconscious contains more than our repressed thoughts and feelings. He believed we also have a **collective unconscious**, a common reservoir of images, or *archetypes*, derived from our species' universal experiences. Jung said that the collective unconscious explains why, for many people, spiritual concerns are deeply rooted and why people in different cultures share certain myths and images, such as mother as a symbol of nurturance. (Most of today's psychodynamic psychologists discount the idea of inherited experiences. But many psychodynamic and other psychological theorists do believe that our shared evolutionary history shaped some universal dispositions.)

Freud died in 1939. Since then, some of his ideas have been incorporated into the diversity of perspectives that make up psychodynamic theory. "Most contemporary [psychodynamic] theorists and therapists are not wedded to the idea that sex is the basis of personality," noted Drew Westen (1996). They "do not talk about ids and egos, and do not go around classifying their patients as oral, anal, or phallic characters." What they



Alfred Adler “The individual feels at home in life and feels his existence to be worthwhile just so far as he is useful to others and is overcoming feelings of inferiority” (*Problems of Neurosis*, 1964).

National Library of Medicine



Karen Horney “The view that women are infantile and emotional creatures, and as such, incapable of responsibility and independence is the work of the masculine tendency to lower women’s self-respect” (*Feminine Psychology*, 1932).

The Bettmann Archive/Corbis



Carl Jung “From the living fountain of instinct flows everything that is creative; hence the unconscious is the very source of the creative impulse” (*The Structure and Dynamics of the Psyche*, 1960).

Archive of the History of American Psychology/ University of Akron

do assume, with Freud and with much support from today’s psychological science, is that much of our mental life is unconscious. With Freud, they also assume that we often struggle with inner conflicts among our wishes, fears, and values, and that childhood shapes our personality and ways of becoming attached to others.

Assessing Unconscious Processes



12-6: What are projective tests, how are they used, and what are some criticisms of them?

Personality assessment tools are useful to those who study personality or provide therapy. Such tools differ because they are tailored to specific theories. How might psychodynamic clinicians attempt to assess personality characteristics?

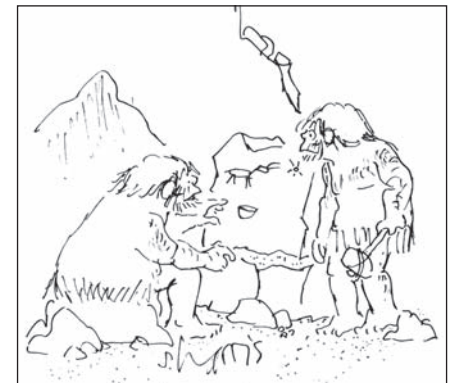
The first requirement would be some sort of a road into the unconscious, to unearth the residue of early childhood experiences, to move beneath surface pretensions and reveal hidden conflicts and impulses. Objective assessment tools, such as agree-disagree or true-false questionnaires, would be inadequate because they would merely tap the conscious surface.

Projective tests aim to provide this “psychological X-ray,” by asking test-takers to describe an ambiguous stimulus or tell a story about it. The clinician may presume that any hopes, desires, and fears that people see in the ambiguous image are projections of their own inner feelings or conflicts.

The most widely used projective test left some blots on the name of Swiss psychiatrist Hermann Rorschach [ROAR-shock; 1884–1922]. He based his famous **Rorschach inkblot test**, in which people describe what they see in a series of inkblots (**FIGURE 12.2**), on a childhood game. He and his friends would drip ink on a paper, fold it, and then say what they saw in the resulting blot (Sdorow, 2005). Do you see predatory animals or weapons? Perhaps you have aggressive tendencies. But is this a reasonable assumption? The answer varies.



Andy Warhol Foundation/Corbis



“The forward thrust of the antlers shows a determined personality, yet the small sun indicates a lack of self-confidence. . . .”

© 1983 by Sidney Harris, American Scientist Magazine.

FIGURE 12.2

The Rorschach test In this projective test, people tell what they see in a series of symmetrical inkblots. Some who use this test are confident that the interpretation of ambiguous stimuli will reveal unconscious aspects of the test-taker’s personality.

“We don’t see things as they are; we see things as we are.”

The Talmud

“The Rorschach Inkblot Test has been resoundingly discredited. I call it the Dracula of psychological tests, because no one has been able to drive a stake through the cursed thing’s heart.”

Carol Tavris, “Mind Games: Psychological Warfare Between Therapists and Scientists,” 2003

“Many aspects of Freudian theory are indeed out of date, and they should be: Freud died in 1939, and he has been slow to undertake further revisions.”

Psychologist Drew Westen (1998)

Some clinicians cherish the Rorschach, even offering Rorschach-based assessments of criminals’ violence potential to judges. Others view it as a helpful source of suggestive leads, or an icebreaker, or a revealing interview technique.

Critics of the Rorschach insist the test is no emotional MRI. They argue that only a few of the many Rorschach-derived scores, such as ones for hostility and anxiety, have demonstrated reliability and validity (Wood, 2006). Inkblot assessments diagnose many normal adults as pathological (Wood et al., 2003, 2006, 2010). Alternative projective assessment techniques fare little better. “Even seasoned professionals can be fooled by their intuitions and their faith in tools that lack strong evidence of effectiveness,” warned Scott Lilienfeld, James Wood, and Howard Garb (2001). “When a substantial body of research demonstrates that old intuitions are wrong, it is time to adopt new ways of thinking.”

The Society for Personality Assessment (2005) has commended the “responsible use” (which would *not* include inferring past childhood sexual abuse) of the Rorschach. And—in response to criticisms of test scoring and interpretation (Sechrest et al., 1998)—a research-based, computer-aided tool was designed to improve agreement among raters and enhance the test’s validity (Erdberg, 1990; Exner, 2003).

Evaluating Freud’s Psychoanalytic Perspective and Modern Views of the Unconscious



12-7: How do today’s psychologists view Freud’s psychoanalysis?

Modern Research Contradicts Many of Freud’s Ideas

We critique Freud from an early twenty-first-century perspective, a perspective that itself will be subject to revision. Freud did not have access to neurotransmitter or DNA studies, or to all that we have since learned about human development, thinking, and emotion. To criticize his theory by comparing it with today’s thinking, some say, is like criticizing Henry Ford’s Model T by comparing it with today’s hybrid cars. (How tempting it always is to judge people in the past from our perspective in the present.)

But both Freud’s admirers and his critics agree that recent research contradicts many of his specific ideas. Today’s developmental psychologists see our development as lifelong, not fixed in childhood. They doubt that infants’ neural networks are mature enough to sustain as much emotional trauma as Freud assumed. Some think Freud overestimated parental influence and underestimated peer influence. They also doubt that conscience and gender identity form as the child resolves the Oedipus complex at age 5 or 6. We gain our gender identity earlier and become strongly masculine or feminine even without a same-sex parent present. And they note that Freud’s ideas about childhood sexuality arose from his skepticism of stories of childhood sexual abuse told by his female patients—stories that some scholars believe he attributed to their own childhood sexual wishes and conflicts (Esterson, 2001; Powell & Boer, 1994). Today, we understand how Freud’s questioning might have created false memories of abuse, and we also know that childhood sexual abuse does happen.

As we saw in Chapter 3, new ideas about why we dream dispute Freud’s belief that dreams disguise and fulfill wishes. And slips of the tongue can be explained as competition between similar verbal choices in our memory network. Someone who says “I don’t want to do that—it’s a lot of brothel” may simply be blending *bother* and *trouble* (Foss & Hakes, 1978). Researchers find little support for Freud’s idea that defense mechanisms disguise sexual and aggressive impulses (though our cognitive gymnastics do indeed work to protect our self-esteem). History also has failed to support another of Freud’s ideas—that suppressed sexuality causes psychological disorders. From Freud’s time to ours, sexual inhibition has diminished; psychological disorders have not.

Psychologists also criticize Freud’s theory for its scientific shortcomings. Recall from Chapter 1 that good scientific theories explain observations and offer testable hypotheses. Freud’s theory rests on few objective observations, and parts of it offer few testable hypotheses. (For Freud, his own recollections and interpretations of patients’ free associations, dreams, and slips were evidence enough.)



What is the most serious problem with Freud's theory? It offers after-the-fact explanations of any characteristic (of one person's smoking, another's fear of horses, another's sexual orientation) yet fails to *predict* such behaviors and traits. If you feel angry at your mother's death, you illustrate his theory because "your unresolved childhood dependency needs are threatened." If you do not feel angry, you again illustrate his theory because "you are repressing your anger." That, said Calvin Hall and Gardner Lindzey (1978, p. 68), "is like betting on a horse after the race has been run." A good theory makes testable predictions.

So, should psychology post an "Allow Natural Death" order on this old theory? Freud's supporters object. To criticize Freudian theory for not making testable predictions is, they say, like criticizing baseball for not being an aerobic exercise, something it was never intended to be. Freud never claimed that psychoanalysis was predictive science. He merely claimed that, looking back, psychoanalysts could find meaning in our state of mind (Rieff, 1979).

Supporters also note that some of Freud's ideas *are* enduring. It was Freud who drew our attention to the unconscious and the irrational, to our self-protective defenses, to the importance of human sexuality, and to the tension between our biological impulses and our social well-being. It was Freud who challenged our self-righteousness, punctured our pretensions, and reminded us of our potential for evil.

Modern Research Challenges the Idea of Repression

Psychoanalytic theory rests on the assumption that the human mind often *represses* offending wishes, banishing them into the unconscious until they resurface, like long-lost books in a dusty attic. Recover and resolve childhood's conflicted wishes, and emotional healing should follow. Repression became a widely accepted concept, used to explain hypnotic phenomena and psychological disorders. Some of Freud's psychodynamic followers extended repression to explain apparently lost and recovered memories of childhood traumas (Boag, 2006; Cheit, 1998; Erdelyi, 2006). In one survey, 88 percent of university students believed that painful experiences commonly get pushed out of awareness and into the unconscious (Garry et al., 1994).

Today's researchers agree that we sometimes spare our egos by neglecting threatening information (Green et al., 2008). Yet, many contend that repression, if it ever occurs, is a rare mental response to terrible trauma. Even those who witnessed a parent's murder or survived Nazi death camps have retained their unrepressed memories of the horror (Helmreich, 1992, 1994; Malmquist, 1986; Pennebaker, 1990). "Dozens of formal studies have yielded not a single convincing case of repression in the entire literature on trauma," concluded personality researcher John Kihlstrom (2006).

Some researchers do believe that extreme, prolonged stress, such as the stress some severely abused children experience, might disrupt memory by damaging the hippocampus, which is important for processing conscious memories (Schacter, 1996). But the far more common reality is that high stress and associated stress hormones *enhance* memory (see Chapter 8). Indeed, rape, torture, and other traumatic events haunt survivors, who experience unwanted flashbacks. They are seared onto the soul. "You see the babies," said Holocaust survivor Sally H. (1979). "You see the screaming mothers. You see hanging people. You sit and you see that face there. It's something you don't forget."

The Modern Unconscious Mind



12-8: How has modern research developed our understanding of the unconscious?

Freud was right about a big idea that underlies today's psychodynamic thinking: We indeed have limited access to all that goes on in our minds (Erdelyi, 1985, 1988, 2006; Norman, 2010). Our two-track mind has a vast out-of-sight realm.

Nevertheless, many of today's research psychologists now think of the unconscious not as seething passions and repressive censoring but as cooler information

"We are arguing like a man who should say, 'If there were an invisible cat in that chair, the chair would look empty; but the chair does look empty; therefore there is an invisible cat in it.'"

C. S. Lewis, *Four Loves*, 1958

"During the Holocaust, many children . . . were forced to endure the unendurable. For those who continue to suffer [the] pain is still present, many years later, as real as it was on the day it occurred."

Eric Zillmer, Molly Harrower, Barry Ritzler, and Robert Archer, *The Quest for the Nazi Personality*, 1995

processing that occurs without our awareness. To these researchers, the unconscious also involves:

- the schemas that automatically control our perceptions and interpretations (Chapter 6).
- the priming by stimuli to which we have not consciously attended (Chapters 6 and 8).
- the right-hemisphere activity that enables the split-brain patient's left hand to carry out an instruction the patient cannot verbalize (Chapter 2).
- the implicit memories that operate without conscious recall, even among those with amnesia (Chapter 8).
- the emotions that activate instantly, before conscious analysis (Chapter 10).
- the stereotypes that automatically and unconsciously influence how we process information about others (Chapter 13).

More than we realize, we fly on autopilot. Our lives are guided by off-screen, out-of-sight, unconscious information processing. The unconscious mind is huge. This understanding of unconscious information processing is more like the pre-Freudian view of an underground, unattended stream of thought from which spontaneous behavior and creative ideas surface (Bargh & Morsella, 2008).

Recent research has also supported Freud's idea of our unconscious defense mechanisms. For example, Roy Baumeister and his colleagues (1998) found that people tend to see their foibles and attitudes in others, a phenomenon that Freud called *projection* and that today's researchers call the *false consensus effect*, the tendency to overestimate the extent to which others share our beliefs and behaviors. People who cheat on their taxes or break speed limits tend to think many others do likewise. People who see others as happy, kind, and trustworthy tend to be so themselves (Wood et al., 2010).

Evidence also confirms the unconscious mechanisms that defend self-esteem, such as reaction formation. Defense mechanisms, Baumeister concluded, are motivated less by the sexual and aggressive undercurrents that Freud presumed than by our need to protect our self-image.

RETRIEVE IT

- What are three values that Freud's work in psychoanalytic theory has contributed? What are three ways in which Freud's work has been criticized?

ANSWER: Freud first drew attention to (1) the importance of childhood experiences, (2) the existence of the unconscious mind, and (3) our self-protective defense mechanisms. Freud's work has been criticized as (1) not scientifically testable—drawing on after-the-fact explanations, (2) focusing too much on sexual conflicts in childhood, and (3) based upon the idea of repression, which has not been supported by modern research.

- Which elements of traditional psychoanalysis do modern-day *psychodynamic* theorists and therapists retain, and which elements have they mostly left behind?

ANSWER: Today's psychodynamic theories still rely on the interviewing techniques that Freud used, and they still tend to focus on childhood experiences and attachments, unresolved conflicts, and unconscious influences. However, they are not likely to dwell on fixation at any psychosexual stage, or the idea that resolution of sexual issues is the basis of our personality.

humanistic theories view personality with a focus on the potential for healthy personal growth.

self-actualization according to Maslow, one of the ultimate psychological needs that arises after basic physical and psychological needs are met and self-esteem is achieved; the motivation to fulfill one's potential.

unconditional positive regard according to Rogers, an attitude of total acceptance toward another person.

Humanistic Theories



12-9: How did humanistic psychologists view personality, and what was their goal in studying personality?

By the 1960s, some personality psychologists had become discontented with the sometimes bleak focus on drives and conflicts in psychodynamic theory and the mechanistic psychology of B. F. Skinner's behaviorism (see Chapter 7). In contrast to Freud's study of the base motives of "sick" people, these **humanistic theorists** focused

on the ways “healthy” people strive for self-determination and self-realization. In contrast to behaviorism’s scientific objectivity, they studied people through their own self-reported experiences and feelings.

Two pioneering theorists—Abraham Maslow (1908–1970) and Carl Rogers (1902–1987)—offered a *third-force perspective* that emphasized human potential.

Abraham Maslow’s Self-Actualizing Person

Maslow proposed that we are motivated by a *hierarchy of needs* (Chapter 10). If our physiological needs are met, we become concerned with personal safety; if we achieve a sense of security, we then seek to love, to be loved, and to love ourselves; with our love needs satisfied, we seek self-esteem. Having achieved self-esteem, we ultimately seek **self-actualization** (the process of fulfilling our potential) and *self-transcendence* (meaning, purpose, and communion beyond the self).

Maslow (1970) developed his ideas by studying healthy, creative people rather than troubled clinical cases. He based his description of self-actualization on a study of those, such as Abraham Lincoln, who seemed notable for their rich and productive lives. Maslow reported that such people shared certain characteristics: They were self-aware and self-accepting, open and spontaneous, loving and caring, and not paralyzed by others’ opinions. Secure in their sense of who they were, their interests were problem-centered rather than self-centered. They focused their energies on a particular task, one they often regarded as their mission in life. Most enjoyed a few deep relationships rather than many superficial ones. Many had been moved by spiritual or personal *peak experiences* that surpassed ordinary consciousness.

These, said Maslow, are mature adult qualities, ones found in those who have learned enough about life to be compassionate, to have outgrown their mixed feelings toward their parents, to have found their calling, to have “acquired enough courage to be unpopular, to be unashamed about being openly virtuous, etc.” Maslow’s work with college students led him to speculate that those likely to become self-actualizing adults were likeable, caring, “privately affectionate to those of their elders who deserve it,” and “secretly uneasy about the cruelty, meanness, and mob spirit so often found in young people.”

Carl Rogers’ Person-Centered Perspective

Fellow humanistic psychologist Carl Rogers agreed with much of Maslow’s thinking. Rogers believed that people are basically good and are, as Maslow said, endowed with self-actualizing tendencies. Unless thwarted by a growth-inhibiting environment, each of us is like an acorn, primed for growth and fulfillment. Rogers (1980) believed that a growth-promoting climate required three conditions:

- **Genuineness:** When people are *genuine*, they are open with their own feelings, drop their facades, and are transparent and self-disclosing.
- **Acceptance:** When people are *accepting*, they offer **unconditional positive regard**, an attitude of grace that values us even knowing our failings. It is a profound relief to drop our pretenses, confess our worst feelings, and discover that we are still accepted. In a good marriage, a close family, or an intimate friendship, we are free to be spontaneous without fearing the loss of others’ esteem.
- **Empathy:** When people are *empathic*, they share and mirror other’s feelings and reflect their meanings. “Rarely do we listen with real understanding, true empathy,” said Rogers. “Yet listening, of this very special kind, is one of the most potent forces for change that I know.”

Genuineness, acceptance, and empathy are, Rogers believed, the water, sun, and nutrients that enable people to grow like vigorous oak trees. For “as persons are accepted and prized, they tend to develop a more caring attitude toward themselves” (Rogers, 1980, p. 116). As persons are empathically heard, “it becomes possible for them to listen more accurately to the flow of inner experiencings.”



Abraham Maslow “Any theory of motivation that is worthy of attention must deal with the highest capacities of the healthy and strong person as well as with the defensive maneuvers of crippled spirits” (*Motivation and Personality*, 1970, p. 33).

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The picture of empathy Being open and sharing confidences is easier when the listener shows real understanding. Within such relationships people can relax and fully express their true selves.

Dylan Martinez/Reuters



A father *not* offering unconditional positive regard:



“Just remember, son, it doesn’t matter whether you win or lose—unless you want Daddy’s love.”

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Writer Calvin Trillin (2006) recalled an example of parental genuineness and acceptance at a camp for children with severe disorders, where his wife, Alice, worked. L., a “magical child,” had genetic diseases that meant she had to be tube-fed and could walk only with difficulty. Alice recalled,

One day, when we were playing duck-duck-goose, I was sitting behind her and she asked me to hold her mail for her while she took her turn to be chased around the circle. It took her a while to make the circuit, and I had time to see that on top of the pile [of mail] was a note from her mom. Then I did something truly awful. . . . I simply had to know what this child’s parents could have done to make her so spectacular, to make her the most optimistic, most enthusiastic, most hopeful human being I had ever encountered. I snuck a quick look at the note, and my eyes fell on this sentence: “If God had given us all of the children in the world to choose from, L., we would only have chosen you.” Before L. got back to her place in the circle, I showed the note to Bud, who was sitting next to me. “Quick. Read this,” I whispered. “It’s the secret of life.”

Maslow and Rogers would have smiled knowingly. For them a central feature of personality is one’s **self-concept**—all the thoughts and feelings we have in response to the question, “Who am I?” If our self-concept is positive, we tend to act and perceive the world positively. If it is negative—if in our own eyes we fall far short of our *ideal self*—said Rogers, we feel dissatisfied and unhappy. A worthwhile goal for therapists, parents, teachers, and friends is therefore, he said, to help others know, accept, and be true to themselves.

Assessing the Self



12-10: How did humanistic psychologists assess a person’s sense of self?

Humanistic psychologists sometimes assessed personality by asking people to fill out questionnaires that would evaluate their self-concept. One questionnaire, inspired by Carl Rogers, asked people to describe themselves both as they would *ideally* like to be and as they *actually* are. When the ideal and the actual self are nearly alike, said Rogers, the self-concept is positive. Assessing his clients’ personal growth during therapy, he looked for successively closer ratings of actual and ideal selves.

Some humanistic psychologists believed that any standardized assessment of personality, even a questionnaire, is depersonalizing. Rather than forcing the person to respond to narrow categories, these humanistic psychologists presumed that interviews and intimate conversation would provide a better understanding of each person’s unique experiences.

Evaluating Humanistic Theories



12-11: How have humanistic theories influenced psychology? What criticisms have they faced?

One thing said of Freud can also be said of the humanistic psychologists: Their impact has been pervasive. Maslow’s and Rogers’ ideas have influenced counseling, education, child rearing, and management. And they laid the groundwork for today’s scientific positive psychology (Chapter 11).

They have also influenced—sometimes in ways they did not intend—much of today’s popular psychology. Is a positive self-concept the key to happiness and success? Do acceptance and empathy nurture positive feelings about oneself? Are people basically good and capable of self-improvement? Many people answer *Yes, Yes, and Yes*. Responding to a 1992 *Newsweek* Gallup poll, 9 in 10 people rated self-esteem as very important for “motivating a person to work hard and succeed.” Given a choice, today’s North American collegians say they’d rather get a self-esteem boost, such as a compliment or good grade on a paper, than enjoy a favorite food or sexual activity (Bushman et al., 2011). Humanistic psychology’s message has been heard.

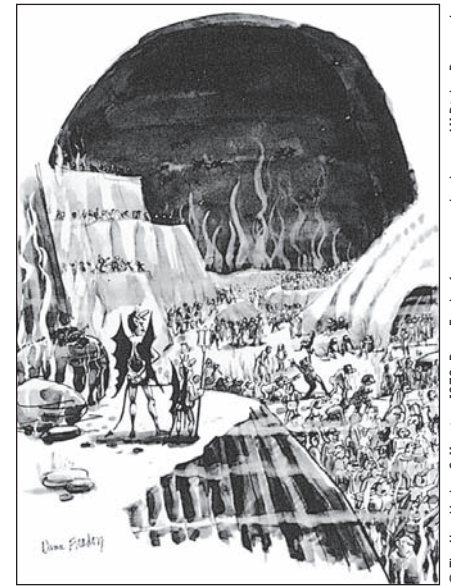
self-concept all our thoughts and feelings about ourselves, in answer to the question, “Who am I?”

The prominence of the humanistic perspective set off a backlash of criticism. First, said the critics, its concepts are vague and *subjective*. Consider Maslow’s description of self-actualizing people as open, spontaneous, loving, self-accepting, and productive. Is this a scientific description? Isn’t it merely a description of the theorist’s own values and ideals? Maslow, noted M. Brewster Smith (1978), offered impressions of his own personal heroes. Imagine another theorist who began with a different set of heroes—perhaps Napoleon, John D. Rockefeller, Sr., and Donald Trump. This theorist would likely describe self-actualizing people as “undeterred by others’ needs and opinions,” “motivated to achieve,” and “comfortable with power.”

Critics also objected to the idea that, as Rogers put it, “The only question which matters is, ‘Am I living in a way which is deeply satisfying to me, and which truly expresses me?’” (quoted by Wallach & Wallach, 1985). This emphasis on *individualism*—trusting and acting on one’s feelings, being true to oneself, fulfilling oneself—could lead to self-indulgence, selfishness, and an erosion of moral restraints (Campbell & Specht, 1985; Wallach & Wallach, 1983). Indeed, it is those who focus beyond themselves who are most likely to experience social support, to enjoy life, and to cope effectively with stress (Crandall, 1984).

Humanistic psychologists have countered by saying that a secure, nondefensive self-acceptance is actually the first step toward loving others. Indeed, people who feel intrinsically liked and accepted—for who they are, not just for their achievements—exhibit less-defensive attitudes (Schimmel et al., 2001).

A final critique has been that humanistic psychology is *naïve*, that it fails to appreciate the reality of our human capacity for evil (May, 1982). Faced with climate change, overpopulation, terrorism, and the spread of nuclear weapons, we may become apathetic from either of two rationalizations. One is a starry-eyed optimism that denies the threat (“People are basically good; everything will work out”). The other is a dark despair (“It’s hopeless; why try?”). Action requires enough realism to fuel concern and enough optimism to provide hope.



“We do pretty well when you stop to think that people are basically good.”

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RETRIEVE IT

- How did humanistic psychology provide a fresh perspective?

ANSWER: This movement sought to turn psychology's attention away from drives and conflicts and toward our growth potential, with a focus on the way healthy people strive for self-determination and self-actualization, which was in contrast to Freudian theory and strict behaviorism.

- What does it mean to be *empathic*? How about *self-actualized*? Which humanistic psychologists used these terms?

ANSWERS: To be *empathic* is to share and mirror another person's feelings. Carl Rogers believed that people nurture growth in others by being empathic. Abraham Maslow proposed that *self-actualization*, the motivation to fulfill one's potential, is one of the ultimate psychological needs (the other is self-transcendence).

Trait Theories



12-12: How do psychologists use traits to describe personality?

Rather than focusing on unconscious forces and thwarted growth opportunities, some researchers attempt to define personality in terms of stable and enduring behavior patterns, such as Sam Gamgee’s loyalty and optimism. This perspective can be traced in part to a remarkable meeting in 1919, when Gordon Allport, a curious 22-year-old psychology student, interviewed Sigmund Freud in Vienna. Allport soon discovered just how preoccupied the founder of psychoanalysis was with finding hidden motives, even in Allport’s own behavior during the interview. That experience ultimately led Allport to do what Freud did not do—to describe personality in terms of fundamental **traits**—people’s characteristic behaviors and conscious

trait a characteristic pattern of behavior or a disposition to feel and act, as assessed by self-report inventories and peer reports.



Ida Mae Astuter/ABC via Getty Images

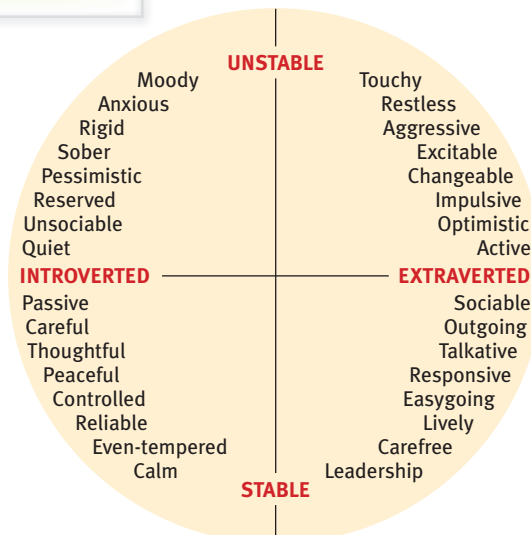
Stephen Colbert: The extravert Trait labels such as *extraversion* can describe our temperament and typical behaviors.

FIGURE 12.3

Two personality dimensions Map makers can tell us a lot by using two axes (north–south and east–west). Two primary personality factors (extraversion–introversion and stability–instability) are similarly useful as axes for describing personality variation. Varying combinations define other, more specific traits. (From Eysenck & Eysenck, 1963.) Those who are naturally introverted, such as primatologist Jane Goodall, may be particularly gifted in field studies. Successful politicians, including former U.S. President Bill Clinton, are often natural extraverts.



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REUTERS/Andrew Innerarity

motives (such as the curiosity that actually motivated Allport to see Freud). Meeting Freud, said Allport, “taught me that [psychoanalysis], for all its merits, may plunge too deep, and that psychologists would do well to give full recognition to manifest motives before probing the unconscious.” Allport came to define personality in terms of identifiable behavior patterns. He was concerned less with *explaining* individual traits than with *describing* them.

Exploring Traits

Classifying people as one or another distinct personality type fails to capture their full individuality. We are each a unique complex of multiple traits. So how else could we describe our personalities? We might describe an apple by placing it along several trait dimensions—relatively large or small, red or green, sweet or sour. By placing people on several trait dimensions simultaneously, psychologists can describe countless individual personality variations. (Remember from Chapter 6 that variations on just three color dimensions—hue, saturation, and brightness—create many thousands of colors.)

What trait dimensions describe personality? If you had an upcoming blind date, what personality traits might give you an accurate sense of the person? Allport and his associate H. S. Odbert (1936) counted all the words in an unabridged dictionary with which one could describe people. There were almost 18,000! How, then, could psychologists condense the list to a manageable number of basic traits?

Factor Analysis

One technique is *factor analysis*, the statistical procedure used to identify clusters (factors) of test items that tap basic components of a trait (such as, for intelligence, spatial ability or verbal skill). Imagine that people who describe themselves as outgoing also tend to say that they like excitement and practical jokes and dislike quiet reading. Such a statistically correlated cluster of behaviors reflects a basic factor, or trait—in this case, *extraversion*.

British psychologists Hans Eysenck and Sybil Eysenck [EYE-zink] believed that we can reduce many of our normal individual variations to two or three dimensions, including *extraversion–introversion* and *emotional stability–instability* (FIGURE 12.3). People in 35 countries around the world, from China to Uganda to Russia, have taken the *Eysenck Personality Questionnaire*. When their answers were analyzed, the extraversion and emotionality factors inevitably emerged as basic personality dimensions (Eysenck, 1990, 1992). The Eysencks believed that these factors are genetically influenced, and research supports this belief.

Biology and Personality

Brain-activity scans of extraverts add to the growing list of traits and mental states that have been explored with brain-imaging procedures. Such studies indicate that extraverts seek stimulation because their normal *brain arousal* is relatively low. For example, PET scans have shown that a frontal lobe area involved in behavior inhibition is less active in extraverts than in introverts (Johnson et al., 1999). Dopamine and dopamine-related neural activity tend to be higher in extraverts (Wacker et al., 2006).

Our biology influences our personality in other ways as well. As you may recall from the twin and adoption studies in Chapter 2, our genes have much to say about the temperament and behavioral style that help define our personality. Children's shyness and inhibition may differ as an aspect of autonomic nervous system reactivity: Those with a reactive autonomic nervous system respond to stress with greater anxiety and inhibition (Kagan, 2010). The fearless, curious child may become the rock-climbing or fast-driving adult.

Personality differences among dogs (in energy, affection, reactivity, and curious intelligence) are as evident, and as consistently judged, as personality differences among humans (Gosling et al., 2003; Jones & Gosling, 2005). Monkeys, chimpanzees, orangutans, and even birds also have stable personalities (Weiss et al., 2006). Among the Great Tit (a European relative of the American chickadee), bold birds more quickly inspect new objects and explore trees (Groothuis & Carere, 2005; Verbeek et al., 1994). By selective breeding, researchers can produce bold or shy birds. Both have their place in natural history. In lean years, bold birds are more likely to find food; in abundant years, shy birds feed with less risk.



Erik Lam/Shutterstock

RETRIEVE IT

- Which two primary dimensions did Hans and Sybil Eysenck propose for describing personality variation?

ANSWER: Introversi-on-extraversi-on and emoti-onal stability-ins-tability

Assessing Traits



12-13: What are personality inventories, and what are their strengths and weaknesses as trait-assessment tools?

If stable and enduring traits guide our actions, can we devise valid and reliable tests of them? Several trait assessment techniques exist—some more valid than others (see Thinking Critically About: How to Be a “Successful” Astrologer or Palm Reader on the next page). Some provide quick assessments of a single trait, such as extraversion, anxiety, or self-esteem. **Personality inventories**—longer questionnaires covering a wide range of feelings and behaviors—assess several traits at once.

The classic personality inventory is the **Minnesota Multiphasic Personality Inventory (MMPI)**. Although it assesses “abnormal” personality tendencies rather than normal personality traits, the MMPI illustrates a good way of developing a personality inventory. One of its creators, Starke Hathaway (1960), compared his effort to that of Alfred Binet. Binet, as you may recall from Chapter 9, developed the first intelligence test by selecting items that identified children who would probably have trouble progressing normally in French schools. Like Binet's items, the MMPI items were **empirically derived**: From a large pool of items, Hathaway and his colleagues selected those on which particular diagnostic groups differed. They then grouped the questions into 10 clinical scales, including scales that assess depressive tendencies, masculinity–femininity, and introversion–extraversion.

personality inventory a questionnaire (often with *true-false* or *agree-disagree* items) on which people respond to items designed to gauge a wide range of feelings and behaviors; used to assess selected personality traits.

Minnesota Multiphasic Personality Inventory (MMPI) the most widely researched and clinically used of all personality tests. Originally developed to identify emotional disorders (still considered its most appropriate use), this test is now used for many other screening purposes.

empirically derived test a test (such as the MMPI) developed by testing a pool of items and then selecting those that discriminate between groups.

THINKING CRITICALLY ABOUT:

How to Be a “Successful” Astrologer or Palm Reader

Can we discern people’s traits from the alignment of the stars and planets at the time of their birth? From their handwriting? From lines on their palms?

Astronomers scoff at the naiveté of astrology—the constellations have shifted in the millennia since astrologers formulated their predictions (Kelly, 1997, 1998). Humorists mock it: “No offense,” wrote Dave Barry, “but if you take the horoscope seriously your frontal lobes are the size of Raisinets.” Psychologists instead ask questions: Does it work? Can astrologers surpass chance when given someone’s birth date and asked to identify the person from a short lineup of different personality descriptions? Can people pick out their own horoscopes from a lineup of horoscopes? Do people’s astrological signs correlate with predicted traits?

The consistent answers have been *No, No, No, and No* (British Psychological Society, 1993; Carlson, 1985; Kelly, 1997, Reichardt, 2010). After examining census data from 20 million married people in England and Wales, one researcher found that “astrological sign has no impact on the probability of



Cihan Demirok, CIDEPIX/Shutterstock



liquidlibrary/Jupiterimages

People have had fun spoofing the MMPI with their own mock items: “Weeping brings tears to my eyes,” “Frantic screams make me nervous,” and “I stay in the bathtub until I look like a raisin” (Frankel et al., 1983).

marrying—and staying married to—someone of any other sign” (Voas, 2008).

Results have similarly been no better than chance when graphologists have tried to predict people’s occupations from examining several



© 2000 by Rob Pridem

pages of their handwriting (Beyerstein & Beyerstein, 1992; Dean et al., 1992). Nevertheless, graphologists—and introductory psychology students—will often *perceive* correlations between personality and handwriting even where there are none (King & Koehler, 2000).

If all these perceived correlations evaporate under close scrutiny, how do astrologers, palm readers, and crystal-ball gazers persuade millions of people worldwide to buy their services? Ray Hyman (1981), palm reader turned research psychologist, has revealed some of their suckering methods.

The first technique, the “stock spiel,” builds on the observation that each of us is in some

Hathaway and others initially gave hundreds of true-false statements (“No one seems to understand me”; “I get all the sympathy I should”; “I like poetry”) to groups of psychologically disordered patients and to “normal” people. They retained any statement—no matter how silly it sounded—on which the patient group’s answer differed from that of the normal group. “Nothing in the newspaper interests me except the comics” may seem senseless, but it just so happened that depressed people were more likely to answer *True*. Today’s MMPI-2 has additional scales, assessing work attitudes, family problems, and anger.

Unlike subjective projective tests, personality inventories are scored objectively—so objectively that a computer can administer and score them. (The computer can also provide descriptions of people who previously responded similarly.) Objectivity does not, however, guarantee validity. Individuals taking the MMPI for employment purposes can give socially desirable answers to create a good impression. But in so doing they may

ways like no one else and in other ways just like everyone else. That some things are true of us all enables the “seer” to offer statements that seem impressively accurate: “I sense that you worry about things more than you let on, even to your best friends.” A number of such generally true statements can be combined into a personality description. Imagine that you take a personality test and then receive the following character sketch:

You have a strong need for other people to like and to admire you. You have a tendency to be critical of yourself. . . . You pride yourself on being an independent thinker and do not accept other opinions without satisfactory proof. You have found it unwise to be too frank in revealing yourself to others. At times you are extraverted, affable, sociable; at other times you are introverted, wary, and reserved. Some of your aspirations tend to be pretty unrealistic (Davies, 1997; Forer, 1949).

In experiments, college students have received stock assessments like this one, drawn from statements in a newsstand astrology book. When they thought the bogus, generic feedback was prepared just for them and when it was favorable, they nearly always rated the description as either “good” or “excellent” (Davies, 1997). Even skeptics, given a flattering description attributed to an astrologer, have thought that “maybe there’s something to this astrology stuff after all” (Glick et al., 1989). This acceptance of stock, positive descriptions is called the *Barnum effect*, named in honor of master showman P. T. Barnum’s dictum, “We’ve got something for everyone.”



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“Perhaps you’d like a second opinion?”

An astrologer, it has been said, is someone “prepared to tell you what you think of yourself” (Jones, 2000). Another way of doing that is to “read” your clothing, physical features, gestures, and reactions. An expensive wedding ring and black dress might, for example, suggest a wealthy woman who was recently widowed.

You, too, could read such clues, says Hyman. If people seek you out for a reading, start with some safe sympathy: “I sense you’re having some problems lately. You seem unsure what to do. I get the feeling another person is involved.” Then tell them what they want to hear. Memorize some Barnum statements from astrology and fortune-telling manuals and use them liberally. Tell people it is their responsibility to cooperate by relating

your message to their specific experiences. Later they will recall that you predicted those specific details. Phrase statements as questions, and when you detect a positive response assert the statement strongly. Finally, be a good listener, and later, in different words, reveal to people what they earlier revealed to you. If you dupe them, they will come.

Better yet, beware of others who exploit people with these techniques. They are fortune takers rather than fortune tellers.

“A petite fortune teller who escapes from prison is a small medium at large.”

Anonymous

also score high on a *lie scale* that assesses faking (as when people respond *False* to a universally true statement, such as “I get angry sometimes”). The objectivity of the MMPI has contributed to its popularity and to its translation into more than 100 languages.

The Big Five Factors



12-14: Which traits seem to provide the most useful information about personality variation?

Today’s trait researchers believe that simple trait factors, such as the Eysencks’ introverted–extraverted and stability–instability dimensions, are important, but they do not tell the whole story. A slightly expanded set of factors—dubbed the *Big Five*—does a better job (Costa & McCrae, 2009). If a test specifies where you are on the five

Table 12.3
The “Big Five” Personality Factors

(Memory tip: Picturing a **CANOE** will help you recall these.)

Disorganized Careless Impulsive	← Conscientiousness →	Organized Careful Disciplined
Ruthless Suspicious Uncooperative	← Agreeableness →	Soft-hearted Trusting Helpful
Calm Secure Self-satisfied	← Neuroticism (emotional stability vs. instability) →	Anxious Insecure Self-pitying
Practical Prefers routine Conforming	← Openness →	Imaginative Prefers variety Independent
Retiring Sober Reserved	← Extraversion →	Sociable Fun-loving Affectionate

Steve Wisbauer/Getty Images

Source: Adapted from McCrae & Costa (1986, 2008).

dimensions (conscientiousness, agreeableness, neuroticism, openness, and extraversion; see **TABLE 12.3**), it has said much of what there is to say about your personality. Around the world—across 56 nations and 29 languages in one study (Schmitt et al., 2007)—people describe others in terms roughly consistent with this list. The Big Five may not be the last word: Some researchers (Block, 2010; De Raad et al., 2010) report that basic personality dimensions can be described by only two or three factors (such as conscientiousness, agreeableness, and extraversion). But for now at least, five is the winning number in the personality lottery (Heine & Buchtel, 2009; McCrae, 2009). The Big Five is currently our best approximation of the basic trait dimensions. This “common currency for personality psychology” (Funder, 2001) has been the most active personality research topic since the early 1990s, as researchers have explored these questions and more:

- **How stable are the Big Five traits?** In adulthood, these traits are quite stable, with some tendencies (emotional instability, extraversion, and openness) waning a bit during early and middle adulthood, and others (agreeableness and conscientiousness) rising (McCrae, 2011; Vaidya et al., 2002). Conscientiousness increases the most during our twenties, as we mature and learn to manage our jobs and relationships. Agreeableness increases the most during our thirties and continues to increase through our sixties (Srivastava et al., 2003).
- **How heritable are these traits?** Heritability (the extent to which individual differences are attributable to genes) varies with the diversity of people studied. It generally runs 50 percent or a tad more for each dimension, and genetic influences are similar in different nations (Loehlin et al., 1998; Yamagata et al., 2006). Many genes, each having small effects, combine to influence our traits (McCrae et al., 2010). Researchers have also identified brain areas associated with the various Big Five traits, such as a frontal lobe area that is sensitive to reward and is larger in extraverts (DeYoung et al., 2010).
- **Do the Big Five traits predict our actual behaviors?** Yes. If people report being outgoing, conscientious, and agreeable, “they probably are telling the truth,” reports Big Five researcher Robert McCrae (2011). For example, our traits appear in our language patterns. In text messaging, extraversion predicts use of personal pronouns. Agreeableness predicts positive-emotion words. Neuroticism (emotional instability) predicts negative-emotion words (Holtgraves, 2011).

By exploring such questions, Big Five research has sustained trait psychology and renewed appreciation for the importance of personality. Traits matter.



Hemera Technologies/Jupiterimages

RETRIEVE IT

- What are the Big Five personality factors, and why are they scientifically useful?

ANSWER: The Big Five personality factors are conscientiousness, agreeableness, neuroticism (emotional stability vs. instability), openness, and extraversion (CANOE). These factors may be objectively measured, and research suggests that these factors are relatively stable across the life span and apply to all cultures in which they have been studied.

Evaluating Trait Theories



12-15: Does research support the consistency of personality traits over time and across situations?

Are our personality traits stable and enduring? Or does our behavior depend on where and with whom we find ourselves? J.R.R. Tolkien created characters, like the loyal Sam Gamgee, whose personality traits were consistent across various times and places. The Italian playwright Luigi Pirandello had a different view. For him, personality was ever-changing, tailored to the particular role or situation. In one of Pirandello’s plays, Lamberto Laudisi describes himself: “I am really what you take me to be; though, my dear madam, that does not prevent me from also being really what your husband, my sister, my niece, and Signora Cini take me to be—because they also are absolutely right!” To which Signora Sirelli responds, “In other words you are a different person for each of us.”

The Person-Situation Controversy

Who, then, typifies human personality, Tolkien’s consistent Sam Gamgee or Pirandello’s inconsistent Laudisi? Both. Our behavior is influenced by the interaction of our inner disposition with our environment. Still, the question lingers: Which is more important? Are we *more* as Tolkien or as Pirandello imagined us to be?

When we explore this *person-situation controversy*, we look for genuine personality traits that persist over time *and* across situations. Are some people dependably conscientious and others unreliable? Some cheerful and others dour? Some friendly and outgoing and others shy? If we are to consider friendliness a trait, friendly people must act friendly at different times and places. Do they?

In considering research that has followed lives through time, some scholars (especially those who study infants) are impressed with personality change; others are struck by personality stability during adulthood. As **FIGURE 12.4** illustrates, data from 152 long-term studies reveal that personality trait scores are positively correlated with scores obtained seven years later, and that as people grow older their personality stabilizes. Interests may change—the avid tropical-fish collector may become an avid gardener. Careers may change—the determined salesperson may become a determined social worker. Relationships may change—the hostile spouse may start over with a new partner. But most people recognize their traits as their own, as Robert McCrae and Paul Costa noted (1994), “and it is well that they do. A person’s recognition of the inevitability of his or her one and only personality is . . . the culminating wisdom of a lifetime.”

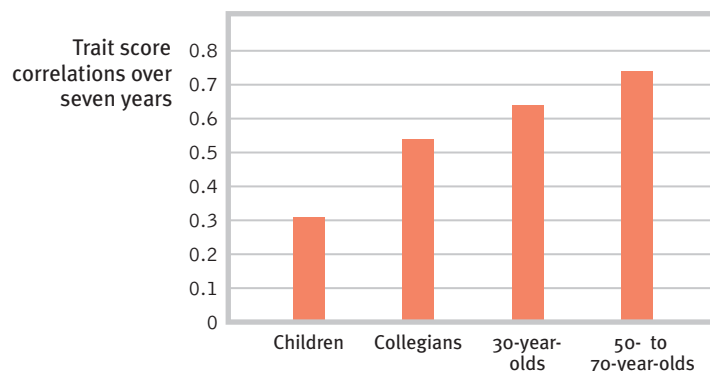


FIGURE 12.4

Personality stability With age, personality traits become more stable, as reflected in the stronger correlation of trait scores with follow-up scores seven years later. (Data from Roberts & DelVecchio, 2000.)

“There is as much difference between us and ourselves, as between us and others.”

Michel de Montaigne, Essays, 1588



“I’m going to France—I’m a different person in France.”

© The New Yorker Collection, 2006, Victoria Roberts from cartoonbank.com. All Rights Reserved.

Change and consistency can co-exist. If all people were to become somewhat less shy with age, there would be personality change, but there would also be relative stability and predictability.



“Mr. Coughlin over there was the founder of one of the first motorcycle gangs.”

So most people—including most psychologists—would probably side with Tolkien’s assumption of stability of personality traits. Moreover, our traits are socially significant. They influence our health, our thinking, and our job performance (Deary & Matthews, 1993; Hogan, 1998). Studies that follow lives through time show that personality traits rival socioeconomic status and cognitive ability as predictors of mortality, divorce, and occupational attainment (Roberts et al., 2007).

Although our personality *traits* may be both stable and potent, the consistency of our specific *behaviors* from one situation to the next is another matter. As Walter Mischel (1968, 2009) has pointed out, people do not act with predictable consistency. Mischel’s studies of college students’ conscientiousness revealed but a modest relationship between a student’s being conscientious on one occasion (say, showing up for class on time) and being similarly conscientious on another occasion (say, turning in assignments on time). Pirandello would not have been surprised. If you’ve noticed how outgoing you are in some situations and how reserved you are in others, perhaps you’re not surprised either (though for certain traits, Mischel reports, you may accurately assess yourself as more consistent).

This inconsistency in behaviors also makes personality test scores weak predictors of behaviors. People’s scores on an extraversion test, for example, do not neatly predict how sociable they actually will be on any given occasion. If we remember such results, says Mischel, we will be more cautious about labeling and pigeonholing individuals. Years in advance, science can tell us the phase of the Moon for any given date. A day in advance, meteorologists can often predict the weather. But we are much further from being able to predict how *you* will feel and act tomorrow.

However, people’s *average* outgoingness, happiness, or carelessness over many situations is predictable (Epstein, 1983a,b). People who know a person well do generally agree when rating that individual’s shyness or agreeableness (Kenrick & Funder, 1988). The predictability of average behavior across many situations was again confirmed when researchers collected snippets of people’s daily experience via body-worn recording devices: Extraverts really do talk more (Mehl et al., 2006). (I have repeatedly vowed to cut back on my jabbering and joking during my noontime pickup basketball games with friends. Alas, moments later, the irrepressible chatterbox inevitably reoccupies my body.) As our best friends can verify, we do have genetically influenced personality traits. And those traits even lurk, report Samuel Gosling and his colleagues in a series of studies, in our

- **music preferences.** Classical, jazz, blues, and folk music lovers tend to be open to experience and verbally intelligent; country, pop, and religious music lovers tend to be cheerful, outgoing, and conscientious (Rentfrow & Gosling, 2003, 2006). On first meeting, students often disclose their music preferences to each other; in doing so, they are swapping information about their personalities.
- **dorm rooms and offices.** Our personal spaces display our identity and leave a behavioral residue (in our scattered laundry or neat desktop). That helps explain why just a few minutes’ inspection of our living and working spaces can enable someone to assess with reasonable accuracy our conscientiousness, our openness to new experiences, and even our emotional stability (Gosling et al., 2002, 2008).
- **personal websites.** Is a personal website or a Facebook profile also a canvas for self-expression? Or is it an opportunity for people to present themselves in false or misleading ways? It’s more the former (Back et al., 2010; Gosling et al., 2007; Marcus et al., 2006). Visitors quickly gain important clues to the creator’s extraversion, conscientiousness, and openness to experience.
- **electronic communications.** If you have ever felt you could detect others’ personality from their writing voice, you are right!! (What a cool, exciting finding!!!) People’s ratings of others’



personality based solely on their e-mails or blogs correlate with actual personality scores on measures such as extraversion and neuroticism (Gill et al., 2006; Oberlander & Gill, 2006; Yarkoni, 2010). Extraverts, for example, use more adjectives.

In unfamiliar, formal situations—perhaps as a guest in the home of a person from another culture—our traits remain hidden as we carefully attend to social cues. In familiar, informal situations—just hanging out with friends—we feel less constrained, allowing our traits to emerge (Buss, 1989). In these informal situations, our expressive styles—our animation, manner of speaking, and gestures—are impressively consistent. That’s why those very thin slices of someone’s behavior—even just three 2-second clips of a teacher—have been so revealing (Ambady & Rosenthal, 1992, 1993).

To sum up, we can say that at any moment the immediate situation powerfully influences a person’s behavior. Social psychologists have assumed, albeit without much evidence, that this is especially so when a “strong situation” makes clear demands (Cooper & Withey, 2009). We can better predict drivers’ behavior at traffic lights from knowing the color of the lights than from knowing the drivers’ personalities. Averaging our behavior across many occasions does, however, reveal distinct personality traits. Traits exist. We differ. And our differences matter.



John Langford Photography

Room with a cue Even at “zero acquaintance,” people can discern something of others’ personality from glimpsing their website, dorm room, or office. So, what is your read on University of Texas researcher Samuel Gosling?

RETRIEVE IT

- How well do personality test scores predict our behavior? Explain.

ANSWER: Our scores on personality tests predict our *average* behavior across many situations much better than they predict our specific behavior in any given situation.

Social-Cognitive Theories



12-16: How do social-cognitive theorists view personality development, and how do they explore behavior?

Today’s psychological science views individuals as biopsychosocial organisms. The **social-cognitive perspective** on personality proposed by Albert Bandura (1986, 2006, 2008) emphasizes the interaction of our traits with our situations. Much as nature and nurture always work together, so do individuals and their situations.

Social-cognitive theorists believe we learn many of our behaviors either through conditioning or by observing and imitating others. (That’s the “social” part.) They also emphasize the importance of mental processes: What we *think* about a situation affects our behavior in that situation. (That’s the “cognitive” part.) Instead of focusing solely on how our environment *controls* us (behaviorism), social-cognitive theorists focus on how we and our environment *interact*: How do we interpret and respond to external events? How do our schemas, our memories, and our expectations influence our behavior patterns?

Reciprocal Influences

Bandura (1986, 2006) views the person-environment interaction as **reciprocal determinism**. “Behavior, internal personal factors, and environmental influences,” he said, “all operate as interlocking determinants of each other” (**FIGURE 12.5** on the next page). For example, children’s TV-viewing habits (past behavior) influence their viewing preferences (internal factor), which influence how television (environmental factor) affects their current behavior. The influences are mutual.

social-cognitive perspective views behavior as influenced by the interaction between people’s traits (including their thinking) and their social context.

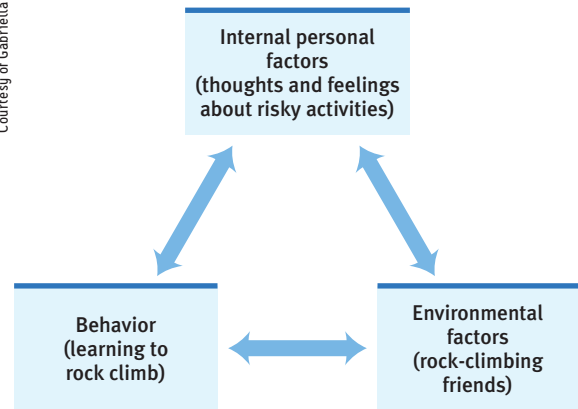
reciprocal determinism the interacting influences of behavior, internal cognition, and environment.

FIGURE 12.5

Reciprocal determinism The social-cognitive perspective proposes that our personalities are shaped by the interaction of our personal traits (including our thoughts and feelings), our environment, and our behaviors.



Courtesy of Gabriella Brune



Consider three specific ways in which individuals and environments interact:

1. **Different people choose different environments.** The school you attend, the reading you do, the TV programs you watch, the music you listen to, the friends you associate with—all are part of an environment you have chosen, based partly on your dispositions (Funder, 2009; Ickes et al., 1997). You choose your environment and it then shapes you.
2. **Our personalities shape how we interpret and react to events.** Anxious people, for example, are attuned to potentially threatening events (Eysenck et al., 1987). Thus, they perceive the world as threatening, and they react accordingly.
3. **Our personalities help create situations to which we react.** How we view and treat people influences how they in turn treat us. If we expect someone to be angry with us, we may give the person a cold shoulder, touching off the very anger we expect. If we have an easygoing, positive disposition, we will likely enjoy close, supportive friendships (Donnellan et al., 2005; Kendler, 1997).

In such ways, we are both the products and the architects of our environments.

If all this has a familiar ring, it may be because it parallels and reinforces a pervasive theme in psychology and in this book: *Behavior emerges from the interplay of external and internal influences.* Boiling water turns an egg hard and a potato soft. A threatening environment turns one person into a hero, another into a scoundrel. Extraverts enjoy greater well-being in an extraverted culture than in an introverted one (Fulmer et al., 2010). *At every moment*, our behavior is influenced by our biology, our social and cultural experiences, and our cognition and dispositions (**FIGURE 12.6**).

FIGURE 12.6

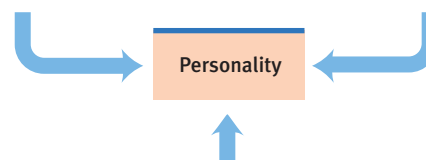
The biopsychosocial approach to the study of personality As with other psychological phenomena, personality is fruitfully studied at multiple levels.

Biological influences:

- genetically determined temperament
- autonomic nervous system reactivity
- brain activity

Psychological influences:

- learned responses
- unconscious thought processes
- expectations and interpretations



Social-cultural influences:

- childhood experiences
- influence of the situation
- cultural expectations
- social support

RETRIEVE IT

- Albert Bandura proposed the _____ - _____ perspective on personality, which emphasizes the interaction of people with their environment. To describe the interacting influences of behavior, thoughts, and environment, he used the term _____.

ANSWERS: social-cognitive; reciprocal determinism

Assessing Behavior in Situations

Social-cognitive psychologists explore how people interact with situations. To predict behavior, they often observe behavior in realistic situations.

One ambitious example was the U.S. Army's World War II strategy for assessing candidates for spy missions. Rather than using paper-and-pencil tests, Army psychologists subjected the candidates to simulated undercover conditions. They tested their ability to handle stress, solve problems, maintain leadership, and withstand intense interrogation without blowing their cover. Although time-consuming and expensive, this assessment of behavior in a realistic situation helped predict later success on actual spy missions (OSS Assessment Staff, 1948).

Military and educational organizations and many Fortune 500 companies are adopting assessment center strategies (Bray & Byham, 1991, 1997; Eurich et al., 2009). AT&T has observed prospective managers doing simulated managerial work. Many colleges assess students' potential via internships and student teaching and assess potential faculty members' teaching abilities by observing them teach. Armies assess their soldiers by observing them during military exercises. Most American cities with populations of 50,000 or more have used assessment centers in evaluating police and fire officers (Lowry, 1997).

Assessment center exercises have some limitations. They are more revealing of visible dimensions, such as communication ability, than of others, such as inner achievement drive (Bowler & Woehr, 2006). Nevertheless, these procedures exploit a valid principle: The best means of predicting future behavior is neither a personality test nor an interviewer's intuition; rather, it is *the person's past behavior patterns in similar situations* (Mischel, 1981; Ouellette & Wood, 1998; Schmidt & Hunter, 1998). As long as the situation and the person remain much the same, the best predictor of future job performance is past job performance; the best predictor of future grades is past grades; the best predictor of future aggressiveness is past aggressiveness; the best predictor of young-adult drug use is high-school drug use. If you can't check the person's past behavior, the next-best thing is to create an assessment situation that simulates the task so you can see how the person handles it (Lievens et al., 2009; Meriac et al., 2008).



AP Photo/Jennifer Szjmaszek

Assessing behavior in situations

Reality TV shows, such as Donald Trump's *The Apprentice*, may take "show me" job interviews to the extreme, but they do illustrate a valid point. Seeing how a potential employee behaves in a job-relevant situation helps predict job performance.

A *New York Times* analysis of 100 rampage murders over the last half-century revealed that 55 of the killers had regularly exploded in anger and 63 had threatened violence (Goodstein & Glaberson, 2000). Most didn't, out of the blue, "just snap."

Evaluating Social-Cognitive Theories



12-17: What criticisms have social-cognitive theorists faced?

Social-cognitive theories of personality sensitize researchers to how situations affect, and are affected by, individuals. More than other personality theories (see **TABLE 12.4** on the next page), they build from psychological research on learning and cognition.

Critics charge that social-cognitive theories focus so much on the situation that they fail to appreciate the person's inner traits. Where is the person in this view of personality, ask the dissenters, and where are human emotions? True, the situation does guide our behavior. But, say the critics, in many instances our unconscious motives, our emotions, and our pervasive traits shine through. Personality traits have been shown to predict behavior at work, love, and play. Our biologically influenced traits really do matter. Consider Percy Ray Pridgen and Charles Gill. Each faced the same situation: They had jointly won a \$90 million lottery jackpot (Harriston, 1993). When Pridgen learned of

Table 12.4
Comparing the Major Personality Theories

Personality Theory	Key Proponents	Assumptions	View of Personality	Personality Assessment Methods
<i>Psychoanalytic</i>	Freud	Emotional disorders spring from unconscious dynamics, such as unresolved sexual and other childhood conflicts, and fixation at various developmental stages. Defense mechanisms fend off anxiety.	Personality consists of pleasure-seeking impulses (the id), a reality-oriented executive (the ego), and an internalized set of ideals (the superego).	Free association, projective tests, dream analysis
<i>Psychodynamic</i>	Jung, Adler, Horney	The unconscious and conscious minds interact. Childhood experiences and defense mechanisms are important.	The dynamic interplay of conscious and unconscious motives and conflicts shape our personality.	Projective tests, therapy sessions
<i>Humanistic</i>	Rogers, Maslow	Rather than examining the struggles of sick people, it's better to focus on the ways healthy people strive for self-realization.	If our basic human needs are met, we will strive toward self-actualization. In a climate of unconditional positive regard, we can develop self-awareness and a more realistic and positive self-concept.	Questionnaires, therapy sessions
<i>Trait</i>	Allport, Eysenck, McCrae, Costa	We have certain stable and enduring characteristics, influenced by genetic predispositions.	Scientific study of traits has isolated important dimensions of personality, such as the Big Five traits (stability, extraversion, openness, agreeableness, and conscientiousness).	Personality inventories
<i>Social-Cognitive</i>	Bandura	Our traits and the social context interact to produce our behaviors.	Conditioning and observational learning interact with cognition to create behavior patterns.	Our behavior in one situation is best predicted by considering our past behavior in similar situations.

the winning numbers, he began trembling uncontrollably, huddled with a friend behind a bathroom door while confirming the win, then sobbed. When Gill heard the news, he told his wife and then went to sleep.

RETRIEVE IT

- According to the social-cognitive perspective, what is the best way to predict a person's future behavior?

ANSWER: Examine the person's past behavior patterns in similar situations.

Exploring the Self



12-18: Why has psychology generated so much research on the self? How important is self-esteem to psychology and to our well-being?

self in contemporary psychology, assumed to be the center of personality, the organizer of our thoughts, feelings, and actions.

spotlight effect overestimating others' noticing and evaluating our appearance, performance, and blunders (as if we presume a spotlight shines on us).

self-esteem one's feelings of high or low self-worth.

self-efficacy one's sense of competence and effectiveness.

Psychology's concern with people's sense of self dates back at least to William James, who devoted more than 100 pages of his 1890 *Principles of Psychology* to the topic. By 1943, Gordon Allport lamented that the self had become "lost to view." Although humanistic psychology's later emphasis on the self did not instigate much scientific research, it did help renew the concept of self and keep it alive. Now, more than a century after James, the self is one of Western psychology's most vigorously researched topics. Every year, new studies galore appear on self-esteem, self-disclosure, self-awareness, self-schemas, self-monitoring, and so forth. Even neuroscientists have searched for self, by identifying a central frontal

lobe region that activates when people respond to self-reflective questions about their traits and dispositions (Damasio, 2010; Mitchell, 2009). Underlying all this research is an assumption that the **self**, as organizer of our thoughts, feelings, and actions, is the center of personality.

One example of thinking about self is the concept of *possible selves* put forth by Hazel Markus and her colleagues (Cross & Markus, 1991; Markus & Nurius, 1986). Your possible selves include your visions of the self you dream of becoming—the rich self, the successful self, the loved and admired self. They also include the self you fear becoming—the unemployed self, the lonely self, the academically failed self. Such possible selves motivate us by laying out specific goals and calling forth the energy to work toward them. University of Michigan students in a combined undergraduate/medical school program earn higher grades if they undergo the program with a clear vision of themselves as successful doctors. Dreams do often give birth to achievements.

Our self-focused perspective may motivate us, but it can also lead us to presume too readily that others are noticing and evaluating us. Thomas Gilovich (1996) demonstrated this **spotlight effect** by having individual Cornell University students don Barry Manilow T-shirts before entering a room with other students. Feeling self-conscious, the T-shirt wearers guessed that nearly half their peers would take note of the shirt as they walked in. In reality, only 23 percent did. This absence of attention applies not only to our dorky clothes and bad hair but also to our nervousness, irritation, or attraction: Fewer people notice than we presume (Gilovich & Savitsky, 1999). Others are also less aware than we suppose of the variability—the ups and downs—of our appearance and performance (Gilovich et al., 2002). Even after a blunder (setting off a library alarm, showing up in the wrong clothes), we stick out like a sore thumb less than we imagine (Savitsky et al., 2001). Knowing about the spotlight effect can be empowering. Help public speakers to understand that their natural nervousness is not so apparent to their audience and their speaking performance improves (Savitsky & Gilovich, 2003).



Trinity Mirror/Mirrorpix/Alamy/Timothy Large/Shutterstock

“The first step to better times is to imagine them.”

Chinese fortune cookie

The Benefits of Self-Esteem

Our **self-esteem**—our feelings of high or low self-worth—is also important. So also is **self-efficacy**, our sense of competence on a task. A person with high self-esteem will strongly agree with self-affirming questionnaire statements such as, “I am fun to be with,” or “I have good ideas.” A low-self-esteem person responds to these statements with qualifying adjectives, such as *somewhat* or *sometimes*.

High self-esteem pays dividends. People who feel good about themselves have fewer sleepless nights. They are less likely to give in to pressures to conform. They are more persistent at difficult tasks; they are less shy, anxious, and lonely. They try harder to shake their bad moods because they think they deserve better (Wood et al., 2009). And they are just plain happier (Greenberg, 2008; Orth et al., 2008, 2009).

But is high self-esteem the horse or the cart? Is it really “the armor that protects kids” from life’s problems (McKay, 2000)? Some psychologists have had their doubts (Baumeister, 2006; Dawes, 1994; Leary, 1999; Seligman, 1994, 2002). Children’s academic self-efficacy—their confidence that they can do well in a subject—predicts school achievement, but their general self-image does not (Marsh & Craven, 2006; Swann et al., 2007; Trautwein et al., 2006). Maybe self-esteem simply reflects reality. Maybe feeling good *follows* doing well. Maybe it’s a side effect of meeting challenges and surmounting difficulties. Maybe self-esteem is a gauge that reads out the state of our relationships with others. If so, isn’t pushing the gauge artificially higher (“You are special”) akin to forcing a car’s low fuel gauge to display “full”? And if problems and failures cause low self-esteem, won’t the best boost therefore come not from our repeatedly telling children how wonderful they are but from their own effective coping and hard-won achievements?

“When kids increase in self-control, their grades go up later. But when kids increase their self-esteem, there is no effect on their grades.”

Angela Duckworth, In Character interview, 2009



However, experiments have revealed an *effect* of low self-esteem. When researchers temporarily deflated people's self-image (by telling them they did poorly on an aptitude test or by disparaging their personality), they were more likely to disparage others or to express heightened racial prejudice (Ybarra, 1999). In other studies, people who were negative about themselves also tended to be oversensitive and judgmental (Baumgardner et al., 1989; Pelham, 1993). And people made to feel insecure often became excessively critical, as if to impress others with their own brilliance (Amabile, 1983). Such findings are consistent with Maslow's and Rogers' presumptions that a healthy self-image pays dividends. Accept yourself and you'll find it easier to accept others. Disparage yourself and you will be prone to the floccinaucinihilipilification¹ of others. Said more simply, people who are down on themselves tend to be down on others. Some people "love their neighbors as themselves"; others loathe their neighbors as themselves.

Self-Serving Bias



12-19: What evidence reveals self-serving bias, and how do defensive and secure self-esteem differ?

Carl Rogers (1958) once objected to the religious doctrine that humanity's problems arise from excessive self-love, or pride. He noted that most people he had known "despise themselves, regard themselves as worthless and unlovable." Mark Twain had a similar idea: "No man, deep down in the privacy of his heart, has any considerable respect for himself."

Actually, most of us have a good reputation with ourselves. In studies of self-esteem, even those who score low respond in the midrange of possible scores. Moreover, one of psychology's most provocative and firmly established recent conclusions concerns our potent **self-serving bias**—our readiness to perceive ourselves favorably (Mezulis et al., 2004; Myers, 2013). Consider:

People accept more responsibility for good deeds than for bad, and for successes than for failures. Athletes often privately credit their victories to their own prowess, and their losses to bad breaks, lousy officiating, or the other team's exceptional performance. Most students who receive poor grades on an exam criticize the test, not themselves. Drivers filling out insurance forms explain their accidents in such words as: "An invisible car came out of nowhere, struck my car, and vanished." "As I reached an intersection, a hedge sprang up, obscuring my vision, and I did not see the other car." "A pedestrian hit me and went under my car." The question "What have I done to deserve this?" is one we usually ask of our troubles, not our successes—those, we assume we deserve.

Most people see themselves as better than average. This is true for nearly any commonplace behavior that is subjectively assessed and socially desirable (Myers, 2013):

- In national surveys, most business executives say they are more ethical than their average counterpart.
- In several studies, 90 percent of business managers and more than 90 percent of college professors rated their performance as superior to that of their average peer.
- In the National Survey of Families and Households, 49 percent of men said they provided half or more of the child care, though only 31 percent of their wives or partners saw things that way (Galinsky et al., 2008).
- In Australia, 86 percent of people rate their job performance as above average, and only 1 percent as below average.

self-serving bias a readiness to perceive oneself favorably.

¹ I couldn't resist throwing that in. But don't worry, you won't be tested on floccinaucinihilipilification, which is the act of estimating something as worthless (and was the longest nontechnical word in the first edition of the *Oxford English Dictionary*).

The self-serving bias reflects our overestimation of ourselves rather than an underestimation of others (Epley & Dunning, 2000). This phenomenon is less striking in Asia, where people value modesty (Falk et al., 2009; Heine & Hamamura, 2007). Yet self-serving biases have been observed worldwide: among Dutch, Australian, and Chinese students; Japanese drivers; Indian Hindus; and French people of most walks of life. In every one of 53 countries surveyed, people expressed self-esteem above the midpoint of the most widely used scale (Schmitt & Allik, 2005).

Ironically, people even see themselves as more immune than others to self-serving bias (Pronin, 2007). The world, it seems, is Garrison Keillor's Lake Wobegon writ large—a place where “all the women are strong, all the men are good-looking, and all the children are above average.” And so are the pets. Three in four owners believe their pet is smarter than average (Nier, 2004).

Threatened egotism, more than low self-esteem, it seems, predisposes aggression. This is true even in childhood, when the recipe for frequent fighting mixes high self-esteem with social rejection. The most aggressive children tend to have high self-regard that gets punctured by other kids' dislike (van Boxtel et al., 2004).

An adolescent or adult whose swelled head is deflated by insults is potentially dangerous. Finding their self-esteem threatened, people with large egos may react violently. “Aryan pride” fueled Nazi atrocities. “These biases have the effect of making wars more likely to begin and more difficult to end,” noted Daniel Kahneman and Jonathan Renshon (2007).

Brad Bushman and Roy Baumeister (1998; Bushman et al., 2009) experimented with what they call the “dark side of high self-esteem.” They had 540 undergraduate volunteers write a paragraph, in response to which another supposed student gave them either praise (“Great essay!”) or stinging criticism (“One of the worst essays I have read!”). Then the essay writers played a reaction-time game against the other student. After wins, they could assault their opponent with noise of any intensity for any duration.

Can you anticipate the result? After criticism, those with inflated high self-esteem were “exceptionally aggressive.” They delivered three times the auditory torture of those with normal self-esteem. “Encouraging people to feel good about themselves when they haven't earned it” poses problems, Baumeister (2001) concluded. “Conceited, self-important individuals turn nasty toward those who puncture their bubbles of self-love.”

Are self-serving perceptions on the rise in North America? Some researchers believe they are. From 1980 to 2007, popular song lyrics became more self-focused (DeWall et al., 2011). From 1988 to 2008, self-esteem scores increased among American collegians, high schoolers, and especially middle school students (Gentile et al., 2010). On one prominent self-esteem inventory on which 40 is the highest possible self-esteem score, 51 percent of 2008 collegians scored 35 or more.

Narcissism—excessive self-love and self-absorption—is also rising, reports psychologist Jean Twenge (2006; Twenge & Foster, 2010). After tracking self-importance across the last several decades, Twenge found that what she calls *Generation Me* (born in the 80s and 90s) is expressing more narcissism by agreeing more often with statements such as, “If I ruled the world, it would be a better place,” or “I think I am a special person.” Agreement with such narcissistic statements correlates with materialism, the desire to be famous, inflated expectations, more hookups with fewer committed relationships, more gambling, and more cheating, all of which have been increasing as narcissism has increased.

Some critics of the concept of self-serving bias claim that it overlooks those who feel worthless and unlovable: If self-serving bias prevails, why do so many people disparage themselves? For four reasons:

PEANUTS



“If you are like most people, then like most people, you don't know you're like most people. Science has given us a lot of facts about the average person, and one of the most reliable of these facts is the average person doesn't see herself as average.”

Daniel Gilbert, *Stumbling on Happiness*, 2006

“The enthusiastic claims of the self-esteem movement mostly range from fantasy to hogwash. The effects of self-esteem are small, limited, and not all good.”

Roy Baumeister (1996)

narcissism excessive self-love and self-absorption.

"If you compare yourself with others, you may become vain and bitter; for always there will be greater and lesser persons than yourself."

Max Ehrmann, "Desiderata," 1927

- Self-directed put-downs can be *subtly strategic*: They elicit reassuring strokes. Saying "No one likes me" may at least elicit "But not everyone has met you!"
- Before an important event, such as a game or an exam, self-disparaging comments *prepare us for possible failure*. The coach who extols the superior strength of the upcoming opponent makes a loss understandable, a victory noteworthy.
- A self-disparaging "How could I have been so stupid!" can help us *learn from our mistakes*.
- Self-disparagement frequently *pertains to one's old self*. Asked to remember their really bad behaviors, people recall things from long ago; good behaviors more easily come to mind from their recent past (Escobedo & Adolphs, 2010). People are much more critical of their distant past selves than of their current selves—even when they have not changed (Wilson & Ross, 2001). "At 18, I was a jerk; today I'm more sensitive." In their own eyes, chumps yesterday, champs today.

Even so, it's true: All of us some of the time, and some of us much of the time, do feel inferior—especially when we compare ourselves with those who are a step or two higher on the ladder of status, looks, income, or ability. The deeper and more frequently we have such feelings, the more unhappy, even depressed, we are. But for most people, thinking has a naturally positive bias.

While recognizing the dark side of self-serving bias and self-esteem, some researchers prefer isolating the effects of two types of self-esteem—defensive and secure (Kernis, 2003; Lambird & Mann, 2006; Ryan & Deci, 2004). *Defensive self-esteem* is fragile. It focuses on sustaining itself, which makes failures and criticism feel threatening. Such egotism exposes one to perceived threats, which feed anger and disorder (Crocker & Park, 2004).

Secure self-esteem is less fragile, because it is less contingent on external evaluations. Feeling accepted for who we are, and not for our looks, wealth, or acclaim, relieves pressures to succeed and enables us to focus beyond ourselves. By losing ourselves in relationships and purposes larger than self, we may achieve a more secure self-esteem and greater quality of life (Crocker & Park, 2004). Authentic pride, rooted in actual achievement, supports self-confidence and leadership (Tracy et al., 2009; Williams & DeSteno, 2009).

RETRIEVE IT

- The tendency to accept responsibility for success and blame circumstances or bad luck for failures is called _____. The tendency to overestimate others' attention to and evaluation of our appearance, performance, and blunders is called the _____.
- _____ (Secure/Defensive) self-esteem correlates with aggressive and antisocial behavior. _____ (Secure/Defensive) self-esteem is a healthier self-image that allows us to focus beyond ourselves and enjoy a higher quality of life.

ANSWERS: self-serving bias; spotlight effect

ANSWERS: Defensive; Secure

individualism giving priority to one's own goals over group goals and defining one's identity in terms of personal attributes rather than group identifications.

collectivism giving priority to the goals of one's group (often one's extended family or work group) and defining one's identity accordingly.



12-20: How do individualist and collectivist cultures influence people?

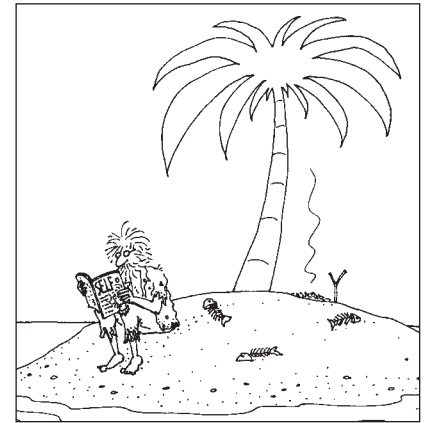
Our consideration of personality—of people's characteristic ways of thinking, feeling, and acting—concludes with a look at cultural variations in how people think, feel, and act. Imagine that someone were to rip away your social connections, making you a solitary refugee in a foreign land. How much of your identity would remain intact?

If as our solitary traveler you pride yourself on your **individualism**, a great deal of your identity would remain intact—the very core of your being, the sense of “me,” the awareness of your personal convictions and values. Individualists (often people from North America, Western Europe, Australia, or New Zealand) give relatively greater priority to personal goals and define their identity mostly in terms of personal attributes (Schimmack et al., 2005). They strive for personal control and individual achievement. In American culture, with its relatively big *I* and small *we*, 85 percent of people have agreed that it is possible “to pretty much be who you want to be” (Sampson, 2000).

Individualists share the human need to belong. They join groups. But they are less focused on group harmony and doing their duty to the group (Brewer & Chen, 2007). And being more self-contained, they more easily move in and out of social groups. They feel relatively free to switch places of worship, switch jobs, or even leave their extended families and migrate to a new place. Marriage is often for as long as they both shall love.

If set adrift in a foreign land as a **collectivist**, you might experience a greater loss of identity. Cut off from family, groups, and loyal friends, you would lose the connections that have defined who you are. In a collectivist culture, group identifications provide a sense of belonging, a set of values, a network of caring individuals, an assurance of security. In return, collectivists have deeper, more stable attachments to their groups—their family, clan, or company. In South Korea, for example, people place less value on expressing a consistent, unique self-concept, and more on tradition and shared practices (Choi & Choi, 2002).

Valuing communal solidarity means placing a premium on preserving group spirit and ensuring that others never lose face. What people say reflects not only what they feel (their inner attitudes) but what they presume others feel (Kashima et al., 1992). Avoiding direct confrontation, blunt honesty, and uncomfortable topics, collectivists often defer to others’ wishes and display a polite, self-effacing humility (Markus & Kitayama, 1991). Elders and superiors receive respect, and duty to family may trump personal career and mate preferences (Zhang & Kline, 2009). In new groups, people may be shy and more easily embarrassed than their individualist counterparts (Singelis et al., 1995, 1999). Compared with Westerners, people in Japanese and Chinese cultures, for example, exhibit greater shyness toward strangers and greater concern for social harmony and loyalty (Bond, 1988; Cheek & Melchior, 1990; Triandis, 1994). When the priority is “we,” not “me,” that individualized latte—“decaf, single shot, skinny, extra hot”—that feels so good to a North American might sound more like a selfish demand in Seoul (Kim & Markus, 1999).



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f59/ ZUMA Press/ Newscom

A collectivist culture Although the United States is largely individualist, many cultural subgroups remain collectivist. This is true for Alaska Natives, who demonstrate respect for tribal elders, and whose identity springs largely from their group affiliations.



REUTERS/Kyodo

Considerate collectivists Japan’s collectivist values, including duty to others and social harmony, were on display after the devastating 2011 earthquake and tsunami. Virtually no looting was reported, and residents remained calm and orderly, as shown here while waiting for drinking water.

Table 12.5
Value Contrasts Between Individualism and Collectivism

Concept	Individualism	Collectivism
<i>Self</i>	Independent (identity from individual traits)	Interdependent (identity from belonging)
<i>Life task</i>	Discover and express one's uniqueness	Maintain connections, fit in, perform role
<i>What matters</i>	Me—personal achievement and fulfillment; rights and liberties; self-esteem	Us—group goals and solidarity; social responsibilities and relationships; family duty
<i>Coping method</i>	Change reality	Accommodate to reality
<i>Morality</i>	Defined by individuals (self-based)	Defined by social networks (duty-based)
<i>Relationships</i>	Many, often temporary or casual; confrontation acceptable	Few, close and enduring; harmony valued
<i>Attributing behavior</i>	Behavior reflects one's personality and attitudes	Behavior reflects social norms and roles

Sources: Adapted from Thomas Schoeneman (1994) and Harry Triandis (1994).

"One needs to cultivate the spirit of sacrificing the *little me* to achieve the benefits of the *big me*."

Chinese saying

To be sure, there is diversity within cultures. Even in the most individualistic countries, some people manifest collectivist values. Within many countries, there are also distinct cultures related to one's religion, economic status, and region (Cohen, 2009). And in collectivist Japan, a spirit of individualism marks the "northern frontier" island of Hokkaido (Kitayama et al., 2006). But in general, people (especially men) in competitive, individualist cultures have more personal freedom, are less geographically bound to their families, enjoy more privacy, and take more pride in personal achievements (TABLE 12.5).

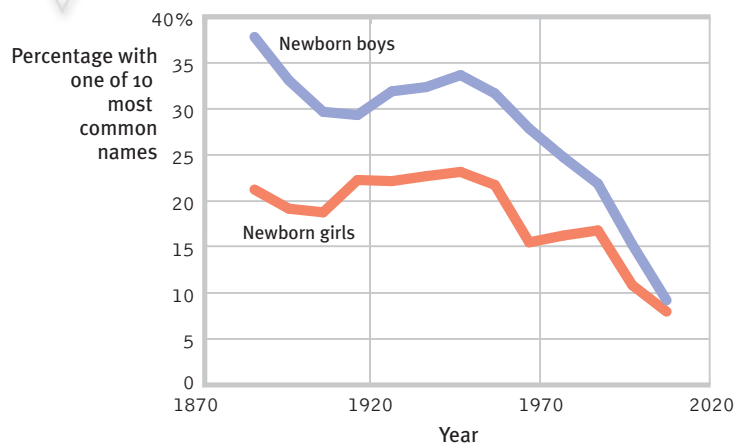
They even prefer unusual names, as psychologist Jean Twenge noticed while seeking a name for her first child. Over time, the most common American names listed by year on the U.S. Social Security baby names website were becoming less desirable. An analysis of the first names of 325 million American babies born between 1880 and 2007 confirmed this trend (Twenge et al., 2010). As FIGURE 12.7 illustrates, the percentage of boys and girls given one of the 10 most common names for their birth year has plunged, especially in recent years. (No wonder my parents, who bore me in a less individualistic age, gave me such a common first name.)

The individualist–collectivist divide appeared in reactions to medals received during the 2000 and 2002 Olympic games. U.S. gold medal winners and the U.S. media covering them attributed the achievements mostly to the athletes themselves (Markus et al., 2006). "I think I just stayed focused," explained swimming gold medalist Misty Hyman. "It was time to show the world what I could do. I am just glad I was able to do it." Japan's gold medalist in the women's marathon, Naoko Takahashi, had a different explanation: "Here is the best coach in the world, the best manager in the world, and all of the people who support me—all of these things were getting together and became a gold medal." Even when describing friends, Westerners tend to use trait-describing adjectives ("*she is helpful*"), whereas East Asians more often use verbs that describe behaviors in context ("*she helps her friends*") (Maass et al., 2006).

Individualism's benefits can come at the cost of more loneliness, higher divorce and homicide rates, and more stress-related disease (Popenoe, 1993; Triandis et al., 1988). Demands for more romance and personal fulfillment in marriage can subject relationships to more pressure (Dion & Dion, 1993). In one survey, "keeping romance alive" was rated as important to a good marriage by 78 percent of U.S. women but only 29 percent of Japanese women (*American Enterprise*, 1992). In China, love songs often express enduring commitment and friendship (Rothbaum & Tsang, 1998): "We will be together from now on . . . I will never change from now to forever."

FIGURE 12.7

A child like no other Americans' individualist tendencies are reflected in their choice of names for their babies. In recent years, the percentage of American babies receiving one of that year's 10 most common names has plunged. (Adapted from Twenge et al., 2010.)



Roughly speaking, enduring, inner influences on behavior are the focus of personality psychology, and the temporary, external influences on behavior are the focus of social psychology—the area we turn to next. In actuality, behavior always depends on the interaction of persons with situations.

RETRIEVE IT

- How do individualist and collectivist cultures differ?

ANSWER: Individualists give priority to personal goals and tend to define their identity in terms of their own personal attributes. Collectivists give priority to group goals and tend to define their identity in terms of group identifications.

CHAPTER REVIEW

Personality

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Psychodynamic Theories

- 12-1:** How did Sigmund Freud's treatment of psychological disorders lead to his view of the unconscious mind?
- 12-2:** What was Freud's view of personality?
- 12-3:** What developmental stages did Freud propose?
- 12-4:** How did Freud think people defended themselves against anxiety?
- 12-5:** Which of Freud's ideas did his followers accept or reject?
- 12-6:** What are projective tests, how are they used, and what are some criticisms of them?
- 12-7:** How do today's psychologists view Freud's psychoanalysis?
- 12-8:** How has modern research developed our understanding of the unconscious?

Humanistic Theories

- 12-9:** How did humanistic psychologists view personality, and what was their goal in studying personality?
- 12-10:** How did humanistic psychologists assess a person's sense of self?

- 12-11:** How have humanistic theories influenced psychology? What criticisms have they faced?

Trait Theories

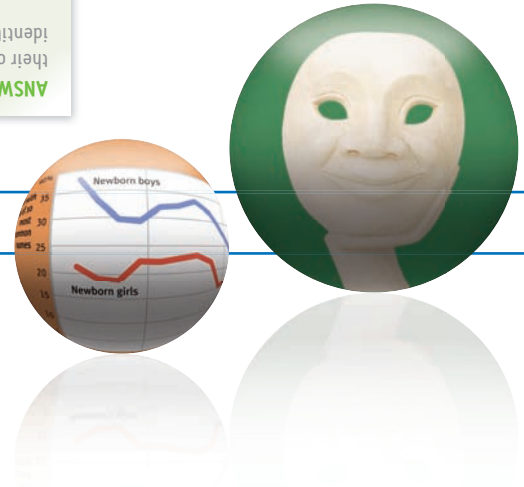
- 12-12:** How do psychologists use traits to describe personality?
- 12-13:** What are personality inventories, and what are their strengths and weaknesses as trait-assessment tools?
- 12-14:** Which traits seem to provide the most useful information about personality variation?
- 12-15:** Does research support the consistency of personality traits over time and across situations?

Social-Cognitive Theories

- 12-16:** How do social-cognitive theorists view personality development, and how do they explore behavior?
- 12-17:** What criticisms have social-cognitive theorists faced?

Exploring the Self

- 12-18:** Why has psychology generated so much research on the self? How important is self-esteem to psychology and to our well-being?
- 12-19:** What evidence reveals self-serving bias, and how do defensive and secure self-esteem differ?
- 12-20:** How do individualist and collectivist cultures influence people?



TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

personality, p. 423

psychodynamic theories, p. 424

psychoanalysis, p. 424

unconscious, p. 424

free association, p. 424

id, p. 425

ego, p. 425

superego, p. 425

psychosexual stages, p. 426

Oedipus [ED-uh-puss] complex, p. 426

identification, p. 426

fixation, p. 426

defense mechanisms, p. 427

repression, p. 427

collective unconscious, p. 428

projective test, p. 429

Rorschach inkblot test, p. 429

humanistic theories, p. 432

self-actualization, p. 433

unconditional positive regard, p. 433

self-concept, p. 434

trait, p. 435

personality inventory, p. 437

Minnesota Multiphasic Personality Inventory (MMPI), p. 437

empirically derived test, p. 437

social-cognitive perspective, p. 443

reciprocal determinism, p. 443

self, p. 447

spotlight effect, p. 447

self-esteem, p. 447

self-efficacy, p. 447

self-serving bias, p. 448

narcissism, p. 449

individualism, p. 451

collectivism, p. 451

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Freud believed that we may block painful or unacceptable thoughts, wishes, feelings, or memories from consciousness through an unconscious process called _____.
- According to Freud's view of personality structure, the "executive" system, the _____, seeks to gratify the impulses of the _____ in more acceptable ways.
 - id; ego
 - ego; superego
 - ego; id
 - id; superego
- Freud proposed that the development of the "voice of conscience" is related to the _____, which internalizes ideals and provides standards for judgments.
- According to the psychoanalytic view of development, we all pass through a series of psychosexual stages, including the oral, anal, and phallic stages. Conflicts unresolved at any of these stages may lead to
 - dormant sexual feelings.
 - fixation at that stage.
 - preconscious blocking of impulses.
 - a distorted gender identity.
- Freud believed that defense mechanisms are unconscious attempts to distort or disguise reality, all in an effort to reduce our _____.
- _____ tests ask test-takers to respond to an ambiguous stimulus, for example, by describing it or telling a story about it.
- In general, neo-Freudians such as Adler and Horney accepted many of Freud's views but placed more emphasis than he did on
 - development throughout the life span.
 - the collective unconscious.
 - the role of the id.
 - social interactions.
- Modern day psychodynamic theorists and therapists agree with Freud about
 - the existence of unconscious mental processes.
 - the Oedipus complex.
 - the predictive value of Freudian theory.
 - the superego's role as the executive part of personality.
- Which of the following is NOT part of the contemporary view of the unconscious?
 - Repressed memories of anxiety-provoking events
 - Schemas that influence our perceptions and interpretations
 - Parallel processing that occurs without our conscious knowledge
 - Instantly activated emotions and implicit memories of learned skills

10. Maslow's hierarchy of needs proposes that we must satisfy basic physiological and safety needs before we seek ultimate psychological needs, such as self-actualization. Maslow based his ideas on
- Freudian theory.
 - his experiences with patients.
 - a series of laboratory experiments.
 - his study of healthy, creative people.
11. How might Freud and Rogers differ in their explanations of how the environment influences the development of a criminal?
12. The total acceptance Rogers advocated as part of a growth-promoting environment is called _____.
13. The _____ theory of personality focuses on describing characteristic behavior patterns, such as agreeableness or extraversion.
14. One famous personality inventory is the
- Extraversion–Introversion Scale.
 - Person–Situation Inventory.
 - MMPI.
 - Rorschach.
15. Which of the following is NOT one of the Big Five personality factors?
- Conscientiousness
 - Anxiety
 - Extraversion
 - Agreeableness
16. Our scores on personality tests best predict
- our behavior on a specific occasion.
 - our average behavior across many situations.
 - behavior involving a single trait, such as conscientiousness.
 - behavior that depends on the situation or context.
17. The social-cognitive perspective proposes our personality is shaped by a process called reciprocal determinism, as personal factors, environmental factors, and behaviors interact. An example of an environmental factor is
- the presence of books in a home.
 - a preference for outdoor play.
 - the ability to read at a fourth-grade level.
 - the fear of violent action on television.
18. Critics say that _____ - _____ personality theory is very sensitive to an individual's interactions with particular situations, but that it gives too little attention to the person's enduring traits.
19. Researchers have found that low self-esteem tends to be linked with life problems. How should this link be interpreted?
- Life problems cause low self-esteem.
 - The answer isn't clear because the link is correlational and does not indicate cause and effect.
 - Low self-esteem leads to life problems.
 - Because of the self-serving bias, we must assume that external factors cause low self-esteem.
20. A fortune cookie advises, "Love yourself and happiness will follow." Is this good advice?
21. Individualist cultures tend to value _____; collectivist cultures tend to value _____.
- interdependence; independence
 - independence; interdependence
 - group solidarity; uniqueness
 - duty to family; personal fulfillment

Find answers to these questions in Appendix E, in the back of the book.



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TESTING
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SOCIAL THINKING

The Fundamental Attribution Error

Attitudes and Actions

SOCIAL INFLUENCE

Cultural Influences

Conformity: Complying With Social Pressures

Obedience: Following Orders

Group Behavior

SOCIAL RELATIONS

Prejudice

CLOSE-UP: Automatic Prejudice

Aggression

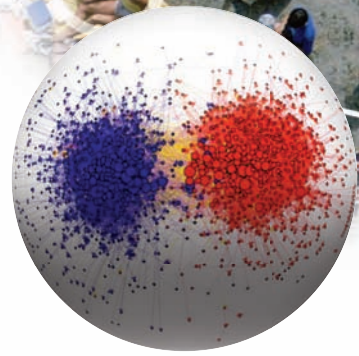
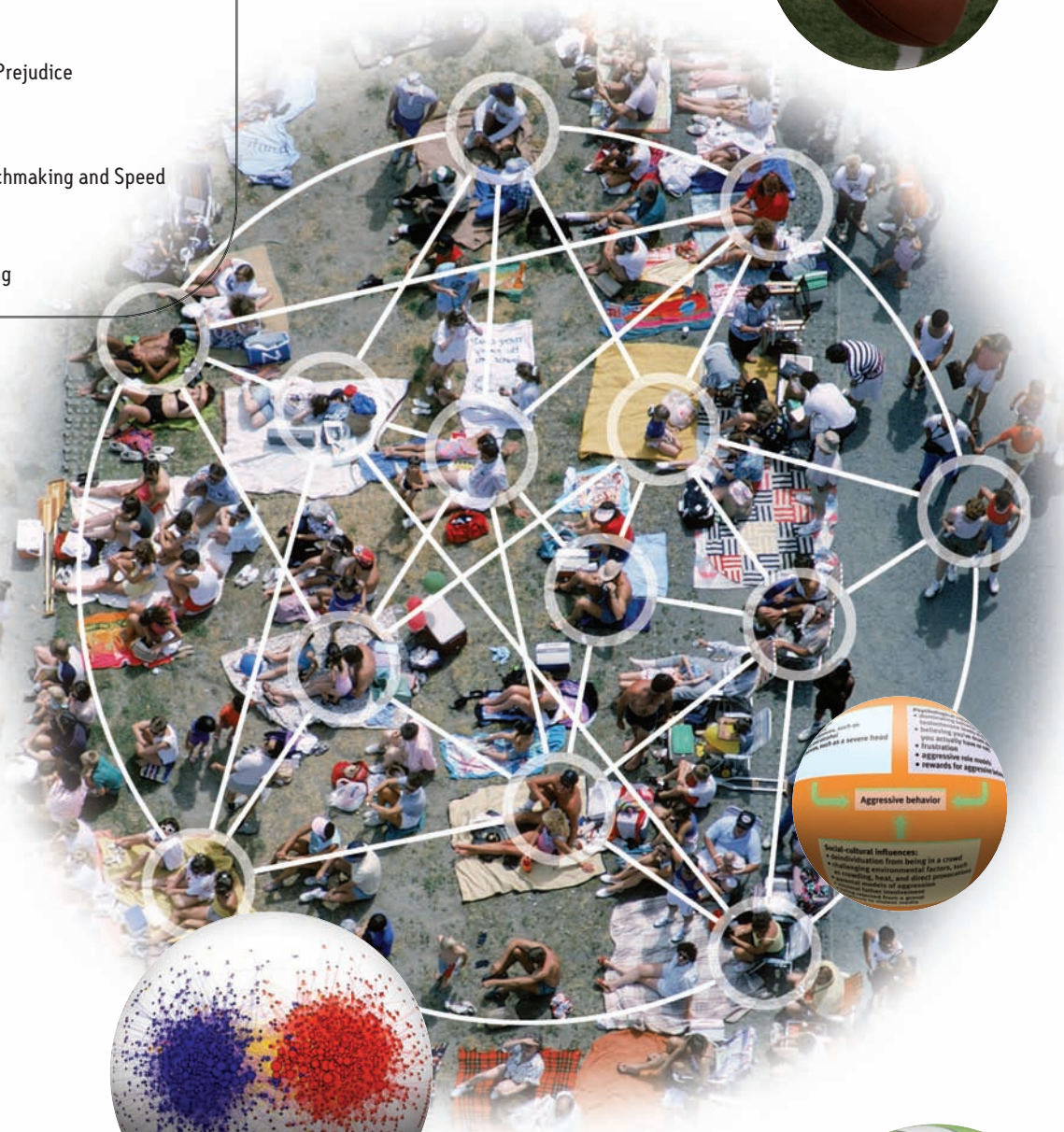
Attraction

CLOSE-UP: Online Matchmaking and Speed

Dating

Altruism

Conflict and Peacemaking





CHAPTER 13

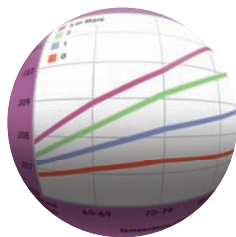
Social Psychology

Dirk Willems faced a moment of decision in 1569. Threatened with torture and death as a member of a persecuted religious minority, he escaped from his Asperen, Holland, prison and fled across an ice-covered pond. His stronger and heavier jailer pursued him but fell through the ice and, unable to climb out, pled for help.

With his freedom in front of him, Willems acted with ultimate selflessness. He turned back and rescued his pursuer, who, under orders, took him back to captivity. A few weeks later Willems was condemned to be “executed with fire, until death ensues.” For his martyrdom, present-day Asperen has named a street in honor of its folk hero (Toews, 2004).

What drives people to feel contempt for minority-group members, such as Dirk Willems, and to act so spitefully? And what motivated the selflessness of Willems’ response, and of so many who have died trying to save others? Indeed, what motivates any of us when we volunteer kindness and generosity toward others?

As such examples demonstrate, we are social animals. We may assume the best or the worst in others. We may approach them with closed fists or open arms. Yet as the novelist Herman Melville remarked, “We cannot live for ourselves alone. Our lives are connected by a thousand invisible threads.” *Social psychologists* explore these connections by scientifically studying how we *think about, influence, and relate to* one another.



Unlike sociology, which studies societies and social groupings, social psychologists focus more on how *individuals* view and affect one another.

Social Thinking



13-1: What do social psychologists study? How do we tend to explain others' behavior and our own?

Personality psychologists (Chapter 12) focus on the person. They study the personal traits and dynamics that explain why *different people* may act differently in a *given situation*, such as the one Willems faced. (Would you have helped the jailer out of the icy water?) **Social psychologists** focus on the situation. They study the social influences that explain why *the same person* will act differently in *different situations*. Might the jailer have acted differently—opting not to march Willems back to jail—under differing circumstances?

The Fundamental Attribution Error

Our social behavior arises from our social thinking. Especially when the unexpected occurs, we want to understand and explain why people act as they do. After studying how people explain others' behavior, Fritz Heider (1958) proposed an **attribution theory**: We can attribute the behavior to the person's stable, enduring traits (a *dispositional attribution*). Or we can attribute it to the situation (a *situational attribution*).

For example, in class, we notice that Juliette seldom talks. Over coffee, Jack talks nonstop. That must be the sort of people they are, we decide. Juliette must be shy and Jack outgoing. Such attributions—to their dispositions—can be valid, because people do have enduring personality traits.

But sometimes we fall prey to the **fundamental attribution error**

(Ross, 1977): We overestimate the influence of personality and underestimate the influence of situations. In class, Jack may be as quiet as Juliette. Catch Juliette at a party and you may hardly recognize your quiet classmate.

David Napolitan and George Goethals (1979) demonstrated the fundamental attribution error in an experiment with Williams College students. They had students talk, one at a time, with a young woman who acted either cold and critical or warm and friendly. Before the talks, the researchers told half the students that the woman's behavior would be spontaneous. They told the other half the truth—that they had instructed her to *act* friendly (or unfriendly).

Did hearing the truth affect students' impressions of the woman? Not at all! If the woman acted friendly, both groups decided she really was a warm person. If she acted unfriendly, both decided she really was a cold person. They attributed her behavior to her personal disposition *even when told that her behavior was situational*—that she was merely acting that way for the purposes of the experiment.

What Factors Affect Our Attributions?

The fundamental attribution error appears more often in some cultures than in others. Individualist Westerners more often attribute behavior to people's personal traits. People in East Asian cultures are somewhat more sensitive to the power of the situation (Heine & Ruby, 2010; Kitayama et al., 2009). This difference has appeared in experiments that asked people to view scenes, such as a big fish swimming. Americans focused more on the individual fish, and Japanese people more on the whole scene (Chua et al., 2005; Nisbett, 2003).

We all commit the fundamental attribution error. Consider: Is your psychology instructor shy or outgoing?

If you answer “outgoing,” remember that you know your instructor from one situation—the classroom, which demands outgoing behavior. Your instructor (who observes his or her own behavior not only in the classroom, but also with family, in meetings, when traveling)



Dirk Willems, 1569.

An etching of Dirk Willems by Dutch artist Jan Luyken (from *The Martyrs Mirror*, 1685)

social psychology the scientific study of how we think about, influence, and relate to one another.

attribution theory the theory that we explain someone's behavior by crediting either the situation or the person's disposition.

fundamental attribution error the tendency for observers, when analyzing another's behavior, to underestimate the impact of the situation and to overestimate the impact of personal disposition.

might say, “Me, outgoing? It all depends on the situation. In class or with good friends, yes, I’m outgoing. But at professional meetings I’m really rather shy.” Outside their assigned roles, professors seem less professorial, presidents less presidential, lawyers less legalistic.

When we explain *our own* behavior, we are sensitive to how behavior changes with the situation (Idson & Mischel, 2001). (Chapter 12 discussed an important exception: We more often attribute our intentional and admirable actions not to situations but to our own good reasons [Malle, 2006; Malle et al., 2007].) We also are sensitive to the power of the situation when we explain the behavior of people we know well and have seen in different contexts. We more often commit the fundamental attribution error when a stranger acts badly. Having only seen that red-faced fan screaming at the referee in the heat of competition, we may assume he is a bad person. But outside the stadium, he may be a good neighbor and a great parent.

Could we broaden our thinking by taking the other’s view? To test this idea, researchers have reversed the perspectives of *actor* and *observer*. They filmed some interactions and then had participants view a replay—filmed from the other person’s perspective. This reversed their attributions of the behaviors (Lassiter & Irvine, 1986; Storms, 1973). Seeing the world from the actor’s perspective, the observers better appreciated the situation. (As we interact, our eyes look outward; we see others’ faces, not our own.) Taking the observer’s point of view, the actors became more aware of their own personal style.

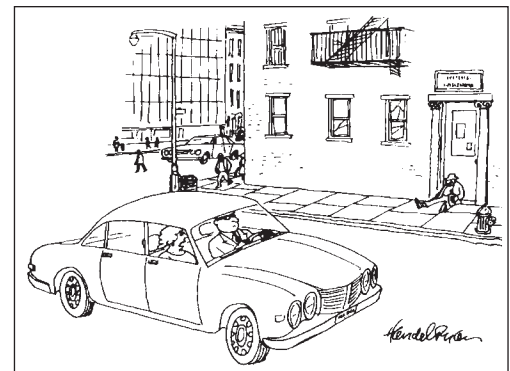
What Are the Consequences of Our Attributions?

The way we explain others’ actions, attributing them to the person or the situation, can have important real-life effects (Fincham & Bradbury, 1993; Fletcher et al., 1990). A person must decide whether to attribute another’s friendliness to romantic or sexual interest. A jury must decide whether a shooting was malicious or in self-defense. A voter must decide whether a candidate’s promises will be kept or forgotten. A partner must decide whether a loved one’s tart-tongued remark reflects a bad day or a mean disposition.

Finally, consider the social and economic effects of attribution. How do we explain poverty or unemployment? In Britain, India, Australia, and the United States (Furnham, 1982; Pandey et al., 1982; Wagstaff, 1982; Zucker & Weiner, 1993), political conservatives tend to place the blame on the personal dispositions of the poor and unemployed: “People generally get what they deserve. Those who don’t work are freeloaders. Those who take initiative can still get ahead.” Political liberals (and social scientists) are more likely to blame past and present situations: “If you or I had to live with the same poor education, lack of opportunity, and discrimination, would we be any better off? Or might a medical condition make normal day-to-day life a challenge?” To understand and prevent terrorism, they say, consider the situations that breed terrorists. Better to drain the swamps than swat the mosquitoes.

The point to remember: Our attributions—to a person’s disposition or to the situation—have real consequences.

Some 7 in 10 college women report having experienced a man misattributing her friendliness as a sexual come-on (Jacques-Tiura et al., 2007).



“Otis, shout at that man to pull himself together.”

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Lee Snider/The Image Works

An attribution question

Whether we attribute poverty and homelessness to social circumstances or to personal dispositions affects and reflects our political views.

attitude feelings, often influenced by our beliefs, that predispose us to respond in a particular way to objects, people, and events.

peripheral route persuasion occurs when people are influenced by incidental cues, such as a speaker's attractiveness.

central route persuasion occurs when interested people focus on the arguments and respond with favorable thoughts.

Attitudes and Actions



13-2: How do attitudes and actions interact?

Attitudes are feelings, often influenced by our beliefs, that predispose our reactions to objects, people, and events. If we *believe* someone is threatening us, we may *feel* fear and anger toward the person and *act* defensively. The traffic between our attitudes and our actions is two-way. Our attitudes affect our actions. And our actions affect our attitudes.

Attitudes Affect Actions

Consider the climate-change debate. On one side are climate-change activists: “Almost all climate scientists are of one mind about the threat of global warming,” reports *Science* magazine (Kerr, 2009). “It’s real, it’s dangerous, and the world needs to take action immediately.” On the other side are climate-change skeptics: The number of Americans who told Gallup pollsters that global warming is “generally exaggerated” increased from 30 percent in 2006 to 48 percent in 2010 (Newport, 2010).

Knowing that public attitudes affect public policies, activists on both sides are aiming to persuade. Persuasion efforts generally take two forms:

- **Peripheral route persuasion** doesn’t engage systematic thinking, but does produce fast results as people respond to uninformative cues (such as celebrity endorsements), and make snap judgments. A perfume ad may lure us with images of beautiful people in love.
- **Central route persuasion** offers evidence and arguments that aim to trigger favorable thoughts. It occurs mostly when people are naturally analytical or involved in the issue. Environmental advocates may show us evidence of rising temperatures, melting glaciers, rising seas, and northward shifts in vegetation and animal life. Because it is more thoughtful and less superficial, it is more durable.

Those who attempt to persuade us by any means are trying to influence our behavior by changing our attitudes. But other factors, including the situation, also influence behavior. Strong social pressures, for example, can weaken the attitude-behavior connection (Wallace et al., 2005). In roll-call votes, politicians will sometimes vote what their supporters demand, despite privately disagreeing with those demands (Nagourney, 2002). In such cases, external pressure overrides the attitude-behavior link.

Attitudes are especially likely to affect behavior when external influences are minimal, and when the attitude is stable, specific to the behavior, and easily recalled (Glasman & Albarracín, 2006). One experiment used vivid, easily recalled information to persuade people that sustained tanning put them at risk for future skin cancer. One month later, 72 percent of the participants, and only 16 percent of those in a waitlist control group, had lighter skin (McClendon & Prentice-Dunn, 2001). Persuasion changed attitudes (concerning skin cancer risk) which changed behavior (less tanning).

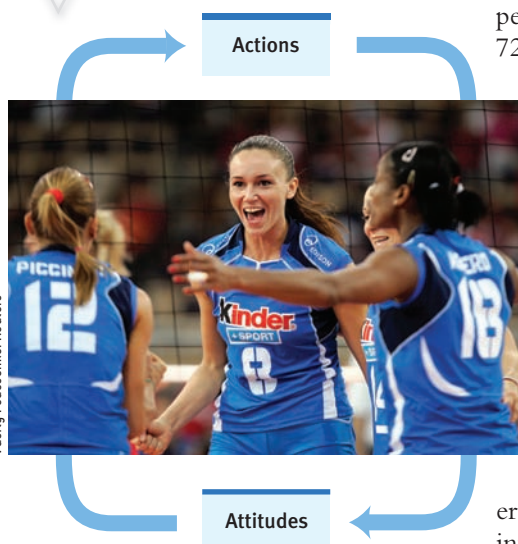
Actions Affect Attitudes

Now consider a more surprising principle: Not only will people stand up for what they believe, they also will believe more strongly in what they have stood up for. Many streams of evidence confirm that *attitudes follow behavior* (FIGURE 13.1).

The Foot-in-the-Door Phenomenon How do you think you would react if someone induced you to act against your beliefs? In many cases, people adjust their attitudes. During the Korean war, many U.S. prisoners of war were held in war camps run by Chinese communists. Without using brutality, the captors secured the prisoners’ collaboration in various activities. Some prisoners merely ran errands or accepted favors. Others made radio appeals and false confessions. Still others informed on fellow prisoners and divulged military information. When the war ended,

FIGURE 13.1

Attitudes follow behavior Cooperative actions, such as those performed by people on sports teams, feed mutual liking. Such attitudes, in turn, promote positive behavior.



21 prisoners chose to stay with the communists. Some of the others returned home “brainwashed”—convinced that communism was a good thing for Asia.

How did the Chinese captors achieve these amazing results? A key ingredient was their effective use of the **foot-in-the-door phenomenon**: They knew that people who agreed to a small request would find it easier to comply later with a larger one. The Chinese began with harmless requests, such as copying a trivial statement, but gradually escalated their demands (Schein, 1956). The next statement to be copied might list flaws of capitalism. Then, to gain privileges, the prisoners participated in group discussions, wrote self-criticisms, or uttered public confessions. After doing so, they often adjusted their beliefs to be more consistent with their public acts. The point is simple: To get people to agree to something big, start small and build (Cialdini, 1993). A trivial act makes the next act easier. Succumb to a temptation and you will find the next temptation harder to resist.

In dozens of experiments, researchers have coaxed people into acting against their attitudes or violating their moral standards, with the same result: Doing becomes believing. After giving in to a request to harm an innocent victim—by making nasty comments or delivering electric shocks—people begin to disparage their victim. After speaking or writing on behalf of a position they have qualms about, they begin to believe their own words.

Fortunately, the attitudes-follow-behavior principle works with good deeds as well. The foot-in-the-door tactic has helped boost charitable contributions and blood donations, as well as product sales. In one classic experiment, researchers posing as safe-driving volunteers asked Californians to permit the installation of a large, poorly lettered “Drive Carefully” sign in their front yards. Only 17 percent consented. They approached other home owners with a small request first: Would they display a 3-inch-high “Be a Safe Driver” sign? Nearly all readily agreed. When reapproached two weeks later to allow the large, ugly sign in their front yards, 76 percent consented (Freedman & Fraser, 1966). To secure a big commitment, it often pays to put your foot in the door: Start small and build.

Racial attitudes likewise follow behavior. In the years immediately following the introduction of school desegregation in the United States and the passage of the Civil Rights Act of 1964, White Americans expressed diminishing racial prejudice. And as Americans in different regions came to act more alike—thanks to more uniform national standards against discrimination—they began to think more alike. Experiments confirm the observation. Moral action strengthens moral convictions.

Role Playing Affects Attitudes When you adopt a new **role**—when you become a college student, marry, or begin a new job—you are mindful of the social prescriptions. At first, your behaviors in the new role may feel phony, because you are *acting* a role. Soldiers may at first feel they are playing war games. Newlyweds may feel they are “playing house.” Before long, however, what began as play acting in the theater of life becomes *you*. Researchers have confirmed this effect by assessing people’s attitudes before and after they adopt a new role, sometimes in laboratory situations, sometimes in everyday situations, such as before and after taking a job.

Role playing morphed into real life in one famous study in which male college students volunteered to spend time in a simulated prison (Zimbardo, 1972). Psychologist Philip Zimbardo randomly assigned some volunteers to be guards. He gave them uniforms, clubs, and whistles and instructed them to enforce certain rules. Others became prisoners, locked in barren cells and forced to wear humiliating outfits. For a day or two, the volunteers self-consciously “played” their roles. Then the simulation became real—too real. Most guards developed disparaging attitudes, and some devised cruel and degrading routines. One by one, the prisoners broke down, rebelled, or became passively resigned. After only six days, Zimbardo called off the study.

Role playing can train torturers (Staub, 1989). In the early 1970s, the Greek military government eased men into their roles. First, a trainee stood guard outside an interrogation cell. After this “foot in the door” step, he stood guard inside. Only then was he ready to become actively involved in the questioning and torture. What we do, we gradually become.

“If the King destroys a man, that’s proof to the King it must have been a bad man.”

Thomas Cromwell, in Robert Bolt’s A Man for All Seasons, 1960

“Fake it until you make it.”

Alcoholics Anonymous saying

foot-in-the-door phenomenon the tendency for people who have first agreed to a small request to comply later with a larger request.

role a set of expectations (norms) about a social position, defining how those in the position ought to behave.

The power of the situation In his 1972 Stanford Prison simulation, Philip Zimbardo created a toxic situation (left). Those assigned to the guard role soon degraded the prisoners. In real life in 2004, some U.S. military guards tormented Iraqi prisoners at the U.S.-run Abu Ghraib prison (right). To Zimbardo (2004, 2007), it was a bad barrel rather than a few bad apples that led to the Abu Ghraib atrocities: “When ordinary people are put in a novel, evil place, such as most prisons, Situations Win, People Lose.”



Philip G. Zimbardo, Inc.



Associated Press

Yet people differ. In Zimbardo’s Stanford Prison simulation and in other atrocity-producing situations, some people have succumbed to the situation and others have not (Carnahan & McFarland, 2007; Haslam & Reicher, 2007; Mastroianni & Reed, 2006; Zimbardo, 2007). Person and situation interact. Much as water dissolves salt but not sand, so rotten situations turn some people into bad apples while others resist (Johnson, 2007).

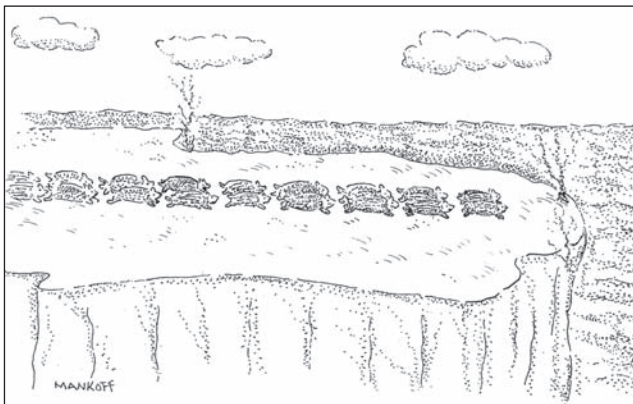
Cognitive Dissonance: Relief From Tension So far we have seen that actions can affect attitudes, sometimes turning prisoners into collaborators, doubters into believers, and compliant guards into abusers. But why? One explanation is that when we become aware that our attitudes and actions don’t coincide, we experience tension, or *cognitive dissonance*. To relieve such tension, according to Leon Festinger’s (1957) **cognitive dissonance theory**, we often bring our attitudes into line with our actions.

Dozens of experiments have explored this cognitive dissonance phenomenon. Many have made people feel responsible for behavior that clashed with their attitudes and had foreseeable consequences. In one of these experiments, you might agree for a measly \$2 to help a researcher by writing an essay that supports something you don’t believe in (perhaps a tuition increase). Feeling responsible for the statements (which are inconsistent with your attitudes), you would probably feel dissonance, especially if you thought an administrator would be reading your essay. To reduce the uncomfortable tension you might start believing your phony words. At such times, it’s as if we rationalize, “If I chose to do it (or say it), I must believe in it.” The less coerced and more responsible we feel for a troubling act, the more dissonance we feel. The more dissonance we feel, the more motivated we are to find consistency, such as changing our attitudes to help justify the act.

The pressure to reduce dissonance helped explain the evolution of American attitudes toward the U.S. invasion of Iraq. When the war began, the stated reason for the invasion was the presumed threat of Saddam Hussein’s weapons of mass destruction (WMD). Would the war be justified if Iraq did not have WMD? Only 38 percent of Americans surveyed said it would be (Gallup, 2003). Nearly 80 percent believed such weapons would be found (Duffy, 2003; Newport et al., 2003). When no WMD were found, many Americans felt dissonance, which was heightened by their awareness of the war’s financial and human costs, by scenes of chaos in Iraq, and by inflamed anti-American and pro-terrorist sentiments in some parts of the world.

To reduce dissonance, some people revised their memories of the war’s rationale. The invasion then became a movement to liberate an oppressed people and promote democracy in the Middle East. Before long, 58 percent of Americans—a majority—said they supported the war even if no WMD were found (Gallup, 2003).

The attitudes-follow-behavior principle has a heartening implication: We cannot directly control all our feelings, but we can



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“Look, I have my misgivings, too, but what choice do we have except stay the course?”

influence them by altering our behavior. (Recall from Chapter 10 the emotional effects of facial expressions and of body postures.) If we are down in the dumps, we can do as cognitive-behavioral therapists advise and talk in more positive, self-accepting ways with fewer self-put-downs. If we are unloving, we can become more loving by behaving as if we were so—by doing thoughtful things, expressing affection, giving affirmation. That helps explain why teens' doing volunteer work promotes a compassionate identity. "Assume a virtue, if you have it not," says Hamlet to his mother. "For use can almost change the stamp of nature." Pretense can become reality. Conduct sculpts character. What we do we become.

The point to remember: Cruel acts shape the self. But so do acts of good will. Act as though you like someone, and you soon may. Changing our behavior can change how we think about others and how we feel about ourselves.

RETRIEVE IT

- Driving to school one snowy day, Marco narrowly misses a car that slides through a red light. "Slow down! What a terrible driver," he thinks to himself. Moments later, Marco himself slips through an intersection and yelps, "Wow! These roads are awful. The city plows need to get out here." What social psychology principle has Marco just demonstrated? Explain.

ANSWER: By attributing the other person's behavior to the person ("what a terrible driver") and his own to the situation ("these roads are awful"), Marco has exhibited the *fundamental attribution error*.

- How do our attitudes and our actions affect each other?

ANSWER: Our attitudes often influence our actions as we behave in ways consistent with our beliefs. However, our attitudes also follow our actions; we come to believe in what we have done.

- When people act in a way that is not in keeping with their attitudes, and then change their attitudes to match those actions, _____ theory attempts to explain why.

ANSWER: cognitive dissonance

"Sit all day in a moping posture, sigh, and reply to everything with a dismal voice, and your melancholy lingers. . . . If we wish to conquer undesirable emotional tendencies in ourselves, we must . . . go through the outward movements of those contrary dispositions which we prefer to cultivate."

William James, *Principles of Psychology*, 1890

Social Influence

Social psychology's great lesson is the enormous power of social influence. This influence can be seen in our conformity, our obedience to authority, and our group behavior. Suicides, bomb threats, airplane hijackings, and UFO sightings all have a curious tendency to come in clusters. On campus, jeans are the dress code; on New York's Wall Street or London's Bond Street, dress suits are the norm. When we know how to act, how to groom, how to talk, life functions smoothly. Armed with social influence principles, advertisers, fundraisers, and campaign workers aim to sway our decisions to buy, to donate, to vote. Isolated with others who share their grievances, dissenters may gradually become rebels, and rebels may become terrorists. We'll start by considering the nature of our cultural influences. Then we will examine the pull of our social strings. How strong are they? How do they operate? When do we break them?

"Have you ever noticed how one example—good or bad—can prompt others to follow? How one illegally parked car can give permission for others to do likewise? How one racial joke can fuel another?"

Marian Wright Edelman, *The Measure of Our Success*, 1992

Cultural Influences



13-3: How do cultural norms affect our behavior?

Compared with the narrow path taken by flies, fish, and foxes, the road along which environment drives us is wider. The mark of our species—nature's great gift to us—is our ability to learn and adapt. We come equipped with a huge cerebral hard drive ready to receive cultural software.

Culture is the behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next (Brislin, 1988; Cohen, 2009). Human nature, notes Roy Baumeister (2005), seems designed for culture. We are social animals, but more. Wolves are social animals; they live and hunt in packs. Ants

cognitive dissonance theory the theory that we act to reduce the discomfort (dissonance) we feel when two of our thoughts (cognitions) are inconsistent. For example, when we become aware that our attitudes and our actions clash, we can reduce the resulting dissonance by changing our attitudes.

culture the enduring behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next.

are incessantly social, never alone. But “culture is a better way of being social,” notes Baumeister. Wolves function pretty much as they did 10,000 years ago. You and I enjoy things unknown to most of our century-ago ancestors, including electricity, indoor plumbing, antibiotics, and the Internet.

We can thank our mastery of language for this *preservation of innovation*. Moreover, culture enables an efficient *division of labor*. Although one lucky person gets his name on this book’s cover, the product actually results from the coordination and commitment of a team of people, no one of whom could produce it alone.

Across cultures, we differ in our language, our monetary systems, our sports, which fork—if any—we eat with, even which side of the road we drive on. But beneath these differences is our great similarity—our capacity for culture. Culture transmits the customs and beliefs that enable us to communicate, to exchange money for things, to play, to eat, and to drive with agreed-upon rules and without crashing into one another.

Variation Across Cultures

We see our adaptability in cultural variations among our beliefs and our values, in how we raise our children and bury our dead, and in what we wear (or whether we wear anything at all). I am ever mindful that the readers of this book are culturally diverse. You and your ancestors reach from Australia to Africa and from Singapore to Sweden.

Riding along with a unified culture is like biking with the wind: As it carries us along, we hardly notice it is there. When we try riding *against* the wind we feel its force. Face to face with a different culture, we become aware of the cultural winds. Stationed in Iraq, Afghanistan, and Kuwait, American and European soldiers were reminded how liberal their home cultures were. Each cultural group evolves its own **norms**—rules for accepted and expected behavior. The British have a norm for orderly waiting in line. Many South Asians use only the right hand’s fingers for eating. Sometimes social expectations seem oppressive: “Why should it matter what I wear?” Yet, norms grease the social machinery and can free us from self-preoccupation.

When cultures collide, their differing norms often befuddle. Should we greet people by shaking hands or kissing each cheek? The answer depends on the surrounding culture. Learning when to clap or bow, how to order at a new restaurant, and what sorts of gestures and compliments are appropriate helps us avoid accidental insults and embarrassment.

Variation Over Time

Like biological creatures, cultures vary and compete for resources, and thus evolve over time (Mesoudi, 2009). Consider how rapidly cultures may change. English poet Geoffrey Chaucer (1342–1400) is separated from a modern Briton by only 20 generations, but the two would converse with great difficulty. In the thin slice of history since 1960, most Western cultures have changed with remarkable speed. Middle-class people today fly to places they once only read about. They enjoy the convenience of air-conditioned housing, online shopping, anywhere-anytime electronic communication, and—enriched by doubled per-person real income—eating out more than twice as often as did their grandparents back in the culture of 1960. Most minority groups are enjoying expanded human rights. And, with greater economic independence, today’s women more often marry for love and less often endure abusive relationships (Circle of Prevention, 2002).

But some changes seem not so wonderfully positive. Had you fallen asleep in the United States in 1960 and awakened today, you would open your eyes to a culture with more divorce and depression. You would also find North Americans—like their counterparts in Britain, Australia, and New Zealand—spending more hours at work, fewer hours with friends and family, and fewer hours asleep (BLS, 2011; Putnam, 2000).

Whether we love or loathe these changes, we cannot fail to be impressed by their breathtaking speed. And we cannot explain them by changes in the human gene pool, which evolves far too slowly to account for high-speed cultural transformations. Cultures vary. Cultures change. And cultures shape our lives.



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norm an understood rule for accepted and expected behavior. Norms prescribe “proper” behavior.

RETRIEVE IT

- What is *culture*, and how does its transmission distinguish us from other social animals?

ANSWER: Culture represents our shared behaviors, ideas, attitudes, values, and traditions, which we transmit across generations by way of our language ability. This allows us to preserve innovation and enjoy an efficient division of labor.

Conformity: Complying With Social Pressures



13-4: What is automatic mimicry, and how do conformity experiments reveal the power of social influence?

Automatic Mimicry

Fish swim in schools. Birds fly in flocks. And humans, too, tend to go with their group, to think what it thinks and do what it does. Behavior is contagious. Chimpanzees are more likely to yawn after observing another chimpanzee yawn (Anderson et al., 2004). Ditto for humans. If one of us yawns, laughs, coughs, stares at the sky, or checks a cell phone, others in our group will soon do the same. Like the chameleon lizards that take on the color of their surroundings, we humans take on the emotional tones of those around us. Just hearing someone reading a neutral text in either a happy- or sad-sounding voice creates “mood contagion” in listeners (Neumann & Strack, 2000). We are natural mimics, unconsciously imitating others’ expressions, postures, and voice tones.

Tanya Chartrand and John Bargh captured this mimicry, which they call the *chameleon effect* (Chartrand & Bargh, 1999). They had students work in a room alongside another person, who was actually a confederate working for the experimenters. Sometimes the confederates rubbed their own face. Sometimes they shook their foot. Sure enough, the students tended to rub their face when with the face-rubbing person and shake their foot when with the foot-shaking person.

Automatic mimicry helps us to *empathize*—to feel what others are feeling. This helps explain why we feel happier around happy people than around depressed people. It also helps explain why studies of groups of British nurses and accountants have revealed *mood linkage*—sharing up and down moods (Totterdell et al., 1998). Empathic people yawn more after seeing others yawn (Morrison, 2007). And empathic mimicking fosters fondness (van Baaren et al., 2003, 2004). Perhaps you’ve noticed that when someone nods their head as you do and echoes your words, you feel a certain rapport and liking?

Suggestibility and mimicry sometimes lead to tragedy. In the eight days following the 1999 shooting rampage at Colorado’s Columbine High School, every U.S. state except Vermont experienced threats of copycat violence. Pennsylvania alone recorded 60 such threats (Cooper, 1999). Sociologist David Phillips and his colleagues (1985, 1989) found

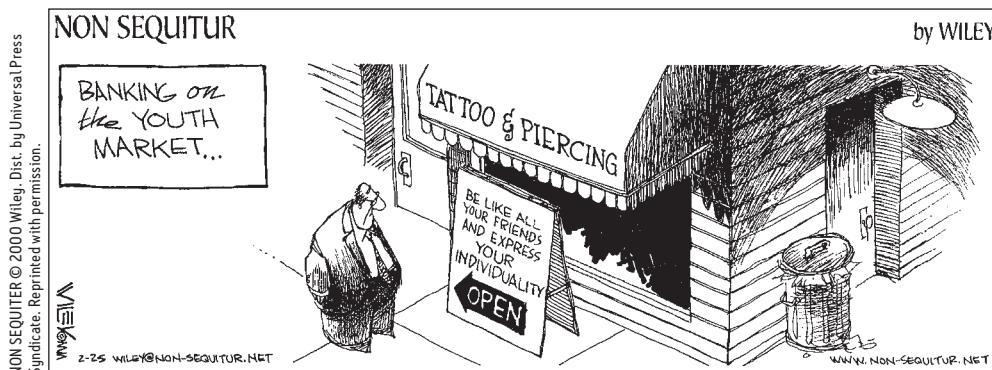


Arctic-Images/Getty Images

Conforming to nonconformity Are these students asserting their individuality or identifying themselves with others of the same microculture?

When I see synchrony and mimicry—whether it concerns yawning, laughing, dancing, or aping—I see social connection and bonding.”

Primatologist Frans de Waal “The Empathy Instinct,” 2009



conformity adjusting our behavior or thinking to coincide with a group standard.

normative social influence influence resulting from a person's desire to gain approval or avoid disapproval.

informational social influence influence resulting from one's willingness to accept others' opinions about reality.

that suicides, too, sometimes increase following a highly publicized suicide. In the wake of screen idol Marilyn Monroe's suicide on August 6, 1962, for example, the number of suicides in the United States exceeded the usual August count by 200.

What causes behavior clusters? Do people act similarly because of their influence on one another? Or because they are simultaneously exposed to the same events and conditions? Seeking answers to such questions, social psychologists have conducted experiments on group pressure and conformity.

Conformity and Social Norms

Suggestibility and mimicry are subtle types of **conformity**—adjusting our behavior or thinking toward some group standard. To study conformity, Solomon Asch (1955) devised a simple test. As a participant in what you believe is a study of visual perception, you arrive in time to take a seat at a table with five other people. The experimenter asks the group to state, one by one, which of three comparison lines is identical to a standard line. You see clearly that the answer is Line 2, and you await your turn to say so. Your boredom begins to show when the next set of lines proves equally easy.

Now comes the third trial, and the correct answer seems just as clear-cut (**FIGURE 13.2**). But the first person gives what strikes you as a wrong answer: "Line 3." When the second person and then the third and fourth give the same wrong answer, you sit up straight and squint. When the fifth person agrees with the first four, you feel your heart begin to pound. The experimenter then looks to you for your answer. Torn between the unanimity voiced by the five others and the evidence of your own eyes, you feel tense and suddenly unsure. You hesitate before answering, wondering whether you should suffer the discomfort of being the oddball. What answer do you give?

In Asch's experiments, college students, answering questions alone, erred less than 1 percent of the time. But what about when several others—confederates working for the experimenter—answered incorrectly? Although most people told the truth even when others did not, Asch was disturbed by his result: More than one-third of the time, these "intelligent and well-meaning" college students were then "willing to call white black" by going along with the group.

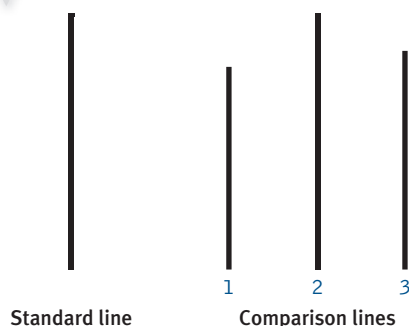
Later investigations have not always found as much conformity as Asch found, but they have revealed that we are more likely to conform when we

- are made to feel incompetent or insecure.
- are in a group with at least three people.
- are in a group in which everyone else agrees. (If just one other person disagrees, the odds of our disagreeing greatly increase.)
- admire the group's status and attractiveness.
- have not made a prior commitment to any response.
- know that others in the group will observe our behavior.
- are from a culture that strongly encourages respect for social standards.

FIGURE 13.2

Asch's conformity experiments

Which of the three comparison lines is equal to the standard line? What do you suppose most people would say after hearing five others say, "Line 3"? In this photo from one of Asch's experiments, the student in the center shows the severe discomfort that comes from disagreeing with the responses of other group members (in this case, accomplices of the experimenter).



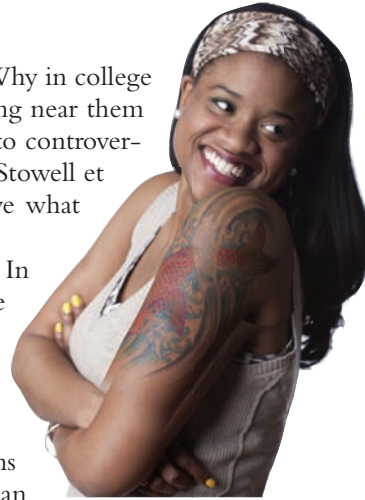
William Vandivert/Scientific American

Why do we so often think what others think and do what they do? Why in college residence halls do students' attitudes become more similar to those living near them (Cullum & Harton, 2007)? Why in classrooms are hand-raised answers to controversial questions less diverse than anonymous electronic clicker responses (Stowell et al., 2010)? Why do we clap when others clap, eat as others eat, believe what others believe, say what others say, even see what others see?

Frequently, we conform to avoid rejection or to gain social approval. In such cases, we are responding to **normative social influence**. We are sensitive to social norms because the price we pay for being different can be severe. We need to belong.

At other times, we conform because we want to be accurate. Groups provide information, and only an uncommonly stubborn person will never listen to others. “Those who never retract their opinions love themselves more than they love truth,” observed Joseph Joubert, an eighteenth-century French essayist. When we accept others' opinions about reality, we are responding to **informational social influence**. As Rebecca Denton demonstrated in 2004, sometimes it pays to assume others are right and to follow their lead. Denton set a record for the furthest distance driven on the wrong side of a British divided highway—30 miles, with only one minor sideswipe, before the motorway ran out and police were able to puncture her tires. Denton later explained that she thought the hundreds of other drivers coming at her were all on the wrong side of the road (Woolcock, 2004).

Is conformity good or bad? The answer depends partly on our culturally influenced values. Western Europeans and people in most English-speaking countries tend to prize *individualism* (cultural focus on an independent self). People in many Asian, African, and Latin American countries place a higher value on honoring group standards. In social influence experiments across 17 countries, conformity rates have been lower in individualist cultures (Bond & Smith, 1996).



David Katzenstein/Photolibary

Tattoos: Yesterday's nonconformity, today's conformity? As tattoos become perceived as fashion conformity, their popularity may wane.



“I love the little ways you're identical to everyone else.”

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RETRIEVE IT

- Which of the following strengthens conformity to a group?
 - a. Finding the group attractive
 - b. Feeling secure
 - c. Coming from an individualist culture
 - d. Having made a prior commitment

ANSWER: a

Obedience: Following Orders



13-5: What did Milgram's obedience experiments teach us about the power of social influence?

Social psychologist Stanley Milgram (1963, 1974), a student of Solomon Asch, knew that people often give in to social pressures. But how would they respond to outright commands? To find out, he undertook what became social psychology's most famous and controversial experiments (Benjamin & Simpson, 2009).

Imagine yourself as one of the nearly 1000 people who took part in Milgram's 20 experiments. You respond to an advertisement for participants in a Yale University psychology study of the effect of punishment on learning. Professor Milgram's assistant asks you and another person to draw slips from a hat to see who will be the “teacher” and who will be the “learner.” Because both slips say “teacher,” you draw a “teacher” slip and are asked to sit down in front of a machine, which has a series of labeled switches. The supposed learner, a mild and submissive-seeming man, is led to an adjoining room and



Stanley Milgram (1933–1984) This social psychologist's obedience experiments “belong to the self-understanding of literate people in our age” (Sabini, 1986).

Courtesy of CUNY Graduate School and University Center

strapped into a chair. From the chair, wires run through the wall to “your” machine. You are given your task: Teach and then test the learner on a list of word pairs. If the learner gives a wrong answer, you are to flip a switch to deliver a brief electric shock. For the first wrong answer, you will flip the switch labeled “15 Volts—Slight Shock.” With each succeeding error, you will move to the next higher voltage. With each flip of a switch, lights flash and relay switches buzz.

The experiment begins, and you deliver the shocks after the first and second wrong answers. If you continue, you hear the learner grunt when you flick the third, fourth, and fifth switches. After you activate the eighth switch (“120 Volts—Moderate Shock”), the learner cries out that the shocks are painful. After the tenth switch (“150 Volts—Strong Shock”), he begins shouting. “Get me out of here! I won’t be in the experiment anymore! I refuse to go on!” You draw back, but the stern experimenter prods you: “Please continue—the experiment requires that you continue.” You resist, but the experimenter insists, “It is absolutely essential that you continue,” or “You have no other choice, you *must* go on.”

If you obey, you hear the learner shriek in apparent agony as you continue to raise the shock level after each new error. After the 330-volt level, the learner refuses to answer and falls silent. Still, the experimenter pushes you toward the final, 450-volt switch. Ask the question, he says, and if no correct answer is given, administer the next shock level.

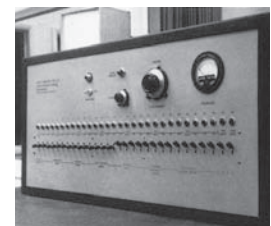
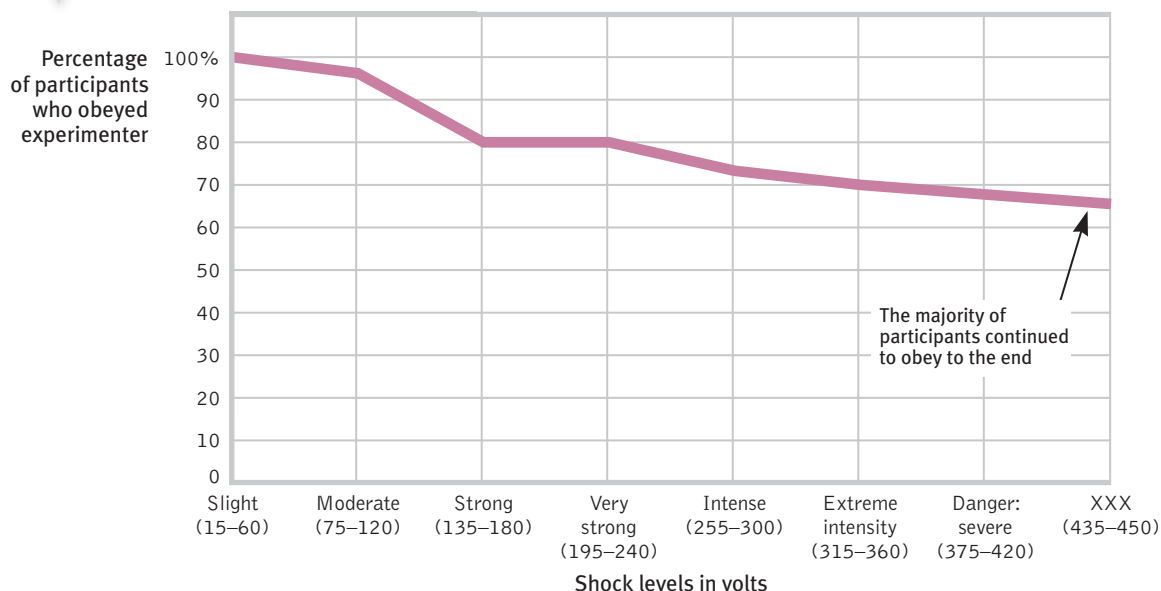
Would you follow the experimenter’s commands to shock someone? At what level would you refuse to obey? Milgram asked that question in a survey before he started his experiments. Most people were sure they would stop playing such a sadistic-seeming role soon after the learner first indicated pain, certainly before he shrieked in agony. Forty psychiatrists agreed with that prediction when Milgram asked them. Were the predictions accurate? Not even close. When Milgram conducted the experiment with men aged 20 to 50, he was astonished. More than 60 percent complied fully—right up to the last switch. Even when Milgram ran a new study, with 40 new “teachers,” and the learner complained of a “slight heart condition,” the results were similar. A full 65 percent of the new teachers obeyed every one of the experimenter’s commands, right up to 450 volts (**FIGURE 13.3**). In 10 later studies, women obeyed at rates similar to men’s (Blass, 1999).

Cultures change over time. Are people today less likely to obey an order to hurt someone? To find out, Jerry Burger (2009) replicated Milgram’s basic experiment. Seventy percent of the participants obeyed up to the 150-volt point, a slight reduction from Milgram’s result. And in a French reality TV show replication, 80 percent of people, egged on by a cheering audience, obeyed and tortured a screaming victim (de Moraes, 2010).

FIGURE 13.3

Milgram’s follow-up obedience experiment

In a repeat of the earlier experiment, 65 percent of the adult male “teachers” fully obeyed the experimenter’s commands to continue. They did so despite the “learner’s” earlier mention of a heart condition and despite hearing cries of protest after they administered what they thought were 150 volts and agonized protests after 330 volts. (Data from Milgram, 1974.)



© 1965 By Stanley Milgram, from the film *Obedience*, dist. by Penn State, Media Sales

Did the teachers figure out the hoax—that no real shock was being delivered and the learner was in fact a confederate who was pretending to feel pain? Did they realize the experiment was really testing their willingness to comply with commands to inflict punishment? *No*. The teachers typically displayed genuine distress: They perspired, trembled, laughed nervously, and bit their lips.

Milgram's use of deception and stress triggered a debate over his research ethics. In his own defense, Milgram pointed out that, after the participants learned of the deception and actual research purposes, virtually none regretted taking part (though perhaps by then the participants had reduced their cognitive dissonance). When 40 of the teachers who had agonized most were later interviewed by a psychiatrist, none appeared to be suffering emotional aftereffects. All in all, said Milgram, the experiments provoked less enduring stress than university students experience when facing and failing big exams (Blass, 1996).

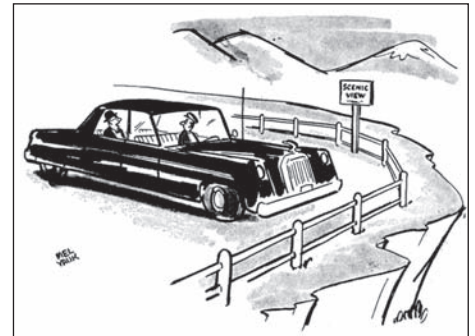
In later experiments, Milgram discovered some things that influence people's behavior. When he varied the situation, full obedience ranged from 0 to 93 percent. Obedience was highest when

- *the person giving the orders was close at hand and was perceived to be a legitimate authority figure.* (Such was the case in 2005 when Temple University's basketball coach sent a 250-pound bench player, Nehemiah Ingram, into a game with instructions to commit "hard fouls." Following orders, Ingram fouled out in four minutes after breaking an opposing player's right arm.)
- *the authority figure was supported by a prestigious institution.* Compliance was somewhat lower when Milgram dissociated his experiments from Yale University.
- *the victim was depersonalized or at a distance, even in another room.* (Similarly, many soldiers in combat either have not fired their rifles at an enemy they can see, or have not aimed them properly. Such refusals to kill have been rare among soldiers who were operating long-distance artillery or aircraft weapons [Padgett, 1989]. In modern warfare, those who kill from a distance—by operating remotely piloted aircraft ["drones"]—have suffered much less post-traumatic stress disorder than have Afghanistan and Iraq war veterans [Miller, 2012].)
- *there were no role models for defiance.* (Teachers did not see any other participant disobey the experimenter.)

The power of legitimate, close-at-hand authorities was apparent among those who followed orders to carry out the Holocaust atrocities. Obedience alone does not explain the Holocaust. Anti-Semitic ideology also contributed (Mastroianni, 2002). But obedience was a factor. In the summer of 1942, nearly 500 middle-aged German reserve police officers were dispatched to German-occupied Jozefow, Poland. On July 13, the group's visibly upset commander informed his recruits, mostly family men, of their orders. They were to round up the village's Jews, who were said to be aiding the enemy. Able-bodied men would be sent to work camps, and all the rest would be shot on the spot.

The commander gave the recruits a chance to refuse to participate in the executions. Only about a dozen immediately refused. Within 17 hours, the remaining 485 officers killed 1500 helpless women, children, and elderly, shooting them in the back of the head as they lay face down. Hearing the victims' pleas, and seeing the gruesome results, some 20 percent of the officers did eventually dissent, managing either to miss their victims or to wander away and hide until the slaughter was over (Browning, 1992). In real life, as in Milgram's experiments, those who resisted were the minority.

Another story played out in the French village of Le Chambon. There, French Jews destined for deportation to Germany were sheltered by villagers who openly defied orders to cooperate with



"Drive off the cliff, James, I want to commit suicide."

Drawing by Mel Yauk.

Standing up for democracy Some individuals—roughly one in three in Milgram's experiments—resist social coercion, as did this unarmed man in Beijing, by single-handedly challenging an advancing line of tanks the day after the 1989 Tiananmen Square student uprising was suppressed.



AP/Wide World Photos

the “New Order.” The villagers’ ancestors had themselves been persecuted, and their pastors taught them to “resist whenever our adversaries will demand of us obedience contrary to the orders of the Gospel” (Rochat, 1993). Ordered by police to give a list of sheltered Jews, the head pastor modeled defiance: “I don’t know of Jews, I only know of human beings.” Without realizing how long and terrible the war would be, or how much punishment and poverty they would suffer, the resisters made an initial commitment to resist. Supported by their beliefs, their role models, their interactions with one another, and their own initial acts, they remained defiant to the war’s end.

Lessons From the Conformity and Obedience Studies

What do the Asch and Milgram experiments teach us about ourselves? How does judging the length of a line or flicking a shock switch relate to everyday social behavior? Recall from Chapter 1 that psychological experiments aim not to re-create the literal behaviors of everyday life but to capture and explore the underlying processes that shape those behaviors. Participants in the Asch and Milgram experiments confronted a dilemma we all face frequently: Do I adhere to my own standards, or do I respond to others?

In Milgram’s experiments and their modern replications, participants were torn. Should they respond to the pleas of the victim or the orders of the experimenter? Their moral sense warned them not to harm another, yet it also prompted them to obey the experimenter and to be a good research participant. With kindness and obedience on a collision course, obedience usually won.

These experiments demonstrated that strong social influences can make people conform to falsehoods or capitulate to cruelty. Milgram saw this as the fundamental lesson of this work: “Ordinary people, simply doing their jobs, and without any particular hostility on their part, can become agents in a terrible destructive process” (1974, p. 6).

Focusing on the end point—450 volts, or someone’s real life reprehensible deceit or violence—we can hardly comprehend the inhumanity. But we ignore how they get there, in tiny increments. Milgram did not entrap his teachers by asking them first to zap learners with enough electricity to make their hair stand on end. Rather, he exploited the foot-in-the-door effect, beginning with a little tickle of electricity and escalating step by step. In the minds of those throwing the switches, the small action became justified, making the next act tolerable. In Le Chambon, as in Milgram’s experiments, those who resisted usually did so early. After the first acts of compliance or resistance, attitudes began to follow and justify behavior.

So it happens when people succumb, gradually, to evil. In any society, great evils sometimes grow out of people’s compliance with lesser evils. The Nazi leaders suspected that most German civil servants would resist shooting or gassing Jews directly, but they found them surprisingly willing to handle the paperwork of the Holocaust (Silver & Geller, 1978). Milgram found a similar reaction in his experiments. When he asked 40 men to administer the learning test while someone else did the shocking, 93 percent complied. Cruelty does not require devilish villains. All it takes is ordinary people corrupted by an evil situation. Ordinary students may follow orders to haze initiates into their group. Ordinary employees may follow orders to produce and market harmful products. Ordinary soldiers may follow orders to punish and then torture prisoners (Lankford, 2009).

“I was only following orders.”

*Adolf Eichmann, Director of Nazi
deportation of Jews to concentration
camps*

“The normal reaction to an abnormal situation is abnormal behavior.”

*James Waller, Becoming Evil: How
Ordinary People Commit Genocide
and Mass Killing, 2007*

RETRIEVE IT

- Psychology’s most famous obedience experiments, in which most participants obeyed an authority figure’s demands to inflict presumed life-threatening shocks on an innocent other, were conducted by social psychologist _____.

ANSWER: Stanley Milgram

- What situations have researchers found to be most likely to encourage obedience in participants?

ANSWER: The Milgram studies showed that people were most likely to follow orders when the experimenter was nearby and was a legitimate authority figure, the victim was not nearby, and there were no models for defiance.

Group Behavior



13-6: How is our behavior affected by the presence of others?

Imagine yourself standing in a room, holding a fishing pole. Your task is to wind the reel as fast as you can. On some occasions you wind in the presence of another participant who is also winding as fast as possible. Will the other's presence affect your own performance?

In one of the social psychology's first experiments, Norman Triplett (1898) reported that adolescents would wind a fishing reel faster in the presence of someone doing the same thing. Although a modern reanalysis revealed that the difference was modest (Stroebe, 2012), he helped inspire later social psychologists to study how others' presence affects our behavior. Group influences operate in such simple groups—one person in the presence of another—and in more complex groups.

Social Facilitation

Triplett's claim—of strengthened performance in others' presence—is called **social facilitation**. But on tougher tasks (learning nonsense syllables or solving complex multiplication problems), people perform worse when observers or others working on the same task are present. Further studies revealed that the presence of others sometimes helps and sometimes hinders performance (Guerin, 1986; Zajonc, 1965). Why? Because when others observe us, we become aroused, and this arousal amplifies our other reactions. It strengthens our most *likely* response—the correct one on an easy task, an incorrect one on a difficult task. Thus, expert pool players who made 71 percent of their shots when alone made 80 percent when four people came to watch them (Michaels et al., 1982). Poor shooters, who made 36 percent of their shots when alone, made only 25 percent when watched.

The energizing effect of an enthusiastic audience probably contributes to the home advantage that has shown up in studies of more than a quarter million college and professional athletic events in various countries (Jamieson, 2010). Home teams win about 6 in 10 games (somewhat fewer for baseball, cricket, and football, somewhat more for basketball, rugby, and soccer—see **TABLE 13.1**).

Social facilitation also helps explain a funny effect of crowding. Comedians and actors know that a “good house” is a full one. Crowding triggers arousal, which, as we have seen, strengthens other reactions, too. Comedy routines that are mildly amusing to people in an uncrowded room seem funnier in a densely packed room (Aiello et al., 1983; Freedman & Perlick, 1979). And in experiments, when participants have been seated close to one another, they liked a friendly person even more, an unfriendly person even less (Schiffenbauer & Schiavo, 1976; Storms & Thomas, 1977). So, for an energetic class or event, choose a room or set up seating that will just barely accommodate everyone.

The point to remember: What you do well, you are likely to do even better in front of an audience, especially a friendly audience. What you normally find difficult may seem all but impossible when you are being watched.

Social Loafing

Social facilitation experiments test the effect of others' presence on performance on an individual task, such as shooting pool. But what happens to performance when people perform the task as a group? In a team tug-of-war, for example, do you suppose your

social facilitation improved performance on simple or well-learned tasks in the presence of others.

Social facilitation Skilled athletes often find they are “on” before an audience. What they do well, they do even better when people are watching.



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Table 13.1
Home Advantage in Team Sports

Sport	Games Studied	Home Team Winning Percentage
Baseball	120,576	55.6%
Cricket	513	57.0
American football	11,708	57.3
Ice hockey	50,739	59.5
Basketball	30,174	62.9
Rugby	2,653	63.7
Soccer	40,380	67.4

Source: From Jeremy Jamieson (2010).



Todd Taulman/Shutterstock

john t. fowler/Alamy



Working hard, or hardly working? In group projects, social loafing often occurs, as individuals free-ride on the efforts of others.

effort would be more than, less than, or the same as the effort you would exert in a one-on-one tug-of-war? To find out, a University of Massachusetts research team asked blindfolded students “to pull as hard as you can” on a rope. When they fooled the students into believing three others were also pulling behind them, they exerted only 82 percent as much effort as when they knew they were pulling alone (Ingham et al., 1974). And consider what happened when blindfolded people seated in a group clapped or shouted as loud as they could while hearing (through headphones) other people clapping or shouting loudly (Latané, 1981). When they thought they were part of a group effort, the participants produced about one-third less noise than when clapping or shouting “alone.”

Bibb Latané and his colleagues (1981; Jackson & Williams, 1988) described this diminished effort as **social loafing**. Experiments in the United States, India, Thailand, Japan, China, and Taiwan have recorded social loafing on various tasks, though it was especially common among men in individualist cultures (Karau & Williams, 1993). What causes social loafing? Three things:

- People acting as part of a group feel less accountable, and therefore worry less about what others think.
- Group members may view their individual contributions as dispensable (Harkins & Szymanski, 1989; Kerr & Bruun, 1983).
- When group members share equally in the benefits, regardless of how much they contribute, some may slack off (as you perhaps have observed on group assignments). Unless highly motivated and strongly identified with the group, people may *free-ride* on others’ efforts.

Deindividuation

Deindividuation During England’s 2011 riots and looting, rioters were disinhibited by social arousal and by the anonymity provided by darkness and their hoods and masks. Later, some of those arrested expressed bewilderment over their own behavior.

We’ve seen that the presence of others can arouse people (social facilitation), or it can diminish their feelings of responsibility (social loafing). But sometimes the presence of others does both. The uninhibited behavior that results can range from a food fight to vandalism or rioting. This process of losing self-awareness and self-restraint, called **deindividuation**, often occurs when group participation makes people both *aroused* and *anonymous*. In one experiment, New York University women dressed in depersonalizing Ku Klux Klan-style hoods. Compared with identifiable women in a control group, the hooded women delivered twice as much electric shock to a victim (Zimbardo, 1970). (As in all such experiments, the “victim” did not actually receive the shocks.)

Deindividuation thrives, for better or for worse, in many different settings. Tribal warriors who depersonalize themselves with face paints or masks are more likely than those with exposed faces to kill, torture, or mutilate captured enemies (Watson, 1973). Online, Internet trolls and bullies, who would never say “You’re a fraud” to someone’s face, will hide behind anonymity. When we shed self-awareness and self-restraint—whether in a mob, at a rock concert, at a ballgame, or at worship—we become more responsive to the group experience—bad or good.

We have examined the conditions under which being in the *presence* of others can motivate people to exert themselves or tempt them to free-ride on the efforts of others, make easy tasks easier and difficult tasks harder, and enhance humor or fuel mob violence. Research also shows that *interacting* with others can similarly have both bad and good effects.



Lewis Whig/Press Association Images

Group Polarization



13-7: What are group polarization and groupthink, and how much power do we have as individuals?

Over time, initial differences between groups of college students tend to grow. If the first-year students at College X tend to be artistic, and those at College Y tend to be business-savvy, those differences will probably be even greater by the time they graduate. Similarly, gender differences tend to widen over time, as Eleanor Maccoby (2002) noted from her decades of observing gender development. Girls talk more intimately than boys do and play and fantasize less aggressively; these differences will be amplified as boys and girls interact mostly with their own gender.

In each case, the beliefs and attitudes we bring to a group grow stronger as we discuss them with like-minded others. This process, called **group polarization**, can have beneficial results, as when it amplifies a sought-after spiritual awareness or reinforces the resolve of those in a self-help group. But it can also have dire consequences. George Bishop and I discovered that when high-prejudice students discussed racial issues, they became *more* prejudiced (**FIGURE 13.4**). (Low-prejudice students became even more accepting.) Thus ideological separation + deliberation = polarization between groups.

This polarizing effect can also feed suicide terrorism. Analyses of terrorist organizations around the world reveals that the terrorist mentality does not erupt suddenly, on a whim (McCauley, 2002; McCauley & Segal, 1987; Merari, 2002). It usually begins slowly, among people who share a grievance. As they interact in isolation (sometimes with other “brothers” and “sisters” in camps) their views grow more and more extreme. Increasingly, they categorize the world as “us” against “them” (Moghaddam, 2005; Qirko, 2004). The like-minded echo chamber will continue to polarize people, speculated a 2006 U.S. National Intelligence estimate: “We assess that the operational threat from self-radicalized cells will grow.”

Although I cut my eye teeth in social psychology with experiments on group polarization, I never imagined the potential dangers, or the creative possibilities, of polarization in *virtual* groups. Electronic communication and social networking have created virtual town halls where people can isolate themselves from those whose perspective differs. People read blogs that reinforce their views, and those blogs link to kindred blogs (**FIGURE 13.5** on the next page). As the Internet connects the like-minded and pools their ideas, climate-change skeptics, UFO abductees, and conspiracy theorists find support for their shared ideas and suspicions. White supremacists may become more racist. And militia members may become more terror prone.

But the Internet-as-social-amplifier can also work for good. Social networking sites, such as Facebook, connect friends and family members sharing common interests or coping with similar challenges. Peacemakers, cancer survivors, and bereaved parents can find strength and solace from kindred spirits. By amplifying shared concerns and ideas, Internet-enhanced communication can also foster social ventures. (I know this personally from social networking with others with hearing loss in an effort to transform American assistive listening technology.)

The point to remember: By linking and magnifying the inclinations of like-minded people, the Internet can be very, very bad, but also very, very good.

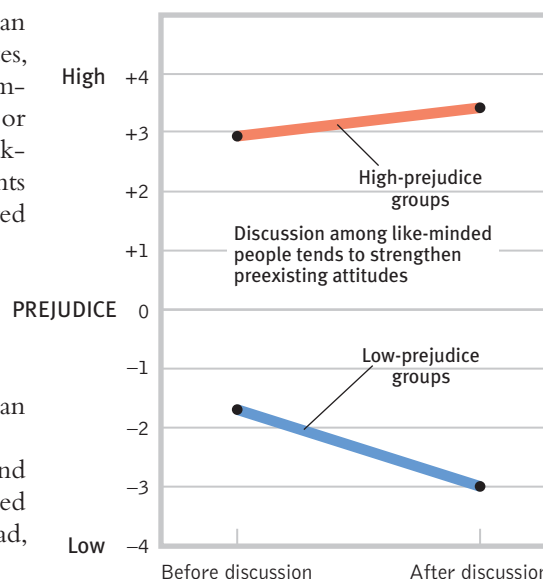


FIGURE 13.4

Group polarization If a group is like-minded, discussion strengthens its prevailing opinions. Talking over racial issues increased prejudice in a high-prejudice group of high school students and decreased it in a low-prejudice group (Myers & Bishop, 1970).

social loafing the tendency for people in a group to exert less effort when pooling their efforts toward attaining a common goal than when individually accountable.

deindividuation the loss of self-awareness and self-restraint occurring in group situations that foster arousal and anonymity.

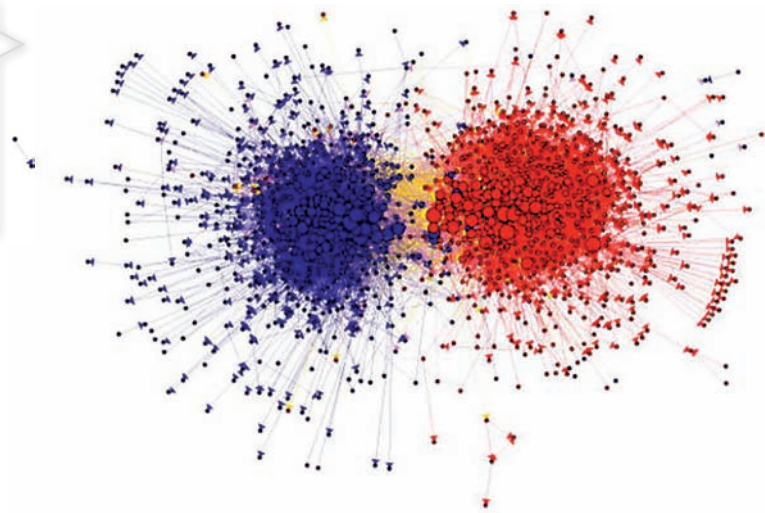
group polarization the enhancement of a group's prevailing inclinations through discussion within the group.

“What explains the rise of fascism in the 1930s? The emergence of student radicalism in the 1960s? The growth of Islamic terrorism in the 1990s? . . . The unifying theme is simple: *When people find themselves in groups of like-minded types, they are especially likely to move to extremes.* [This] is the phenomenon of *group polarization*.”

Cass Sunstein, *Going to Extremes*, 2009

FIGURE 13.5

Like minds network in the blogosphere Blue liberal blogs link mostly to one another, as do red conservative blogs. Each blog's size reflects the number of other blogs linking to it. (From Lazer et al., 2009).



Groupthink

So, group interaction can influence our personal decisions. Does it ever distort important national decisions? Consider the “Bay of Pigs fiasco.” In 1961, President John F. Kennedy and his advisers decided to invade Cuba with 1400 CIA-trained Cuban exiles. When the invaders were easily captured and soon linked to the U.S. government, Kennedy wondered in hindsight, “How could we have been so stupid?”

Social psychologist Irving Janis (1982) studied the decision-making procedures leading to the ill-fated invasion. He discovered that the soaring morale of the recently elected president and his advisers fostered undue confidence. To preserve the good feeling, group members suppressed or self-censored their dissenting views, especially after President Kennedy voiced his enthusiasm for the scheme. Since no one spoke strongly against the idea, everyone assumed the support was unanimous. To describe this harmonious but unrealistic group thinking, Janis coined the term **groupthink**.

Later studies showed that groupthink—fed by overconfidence, conformity, self-justification, and group polarization—contributed to other fiascos as well. Among them were the failure to anticipate the 1941 Japanese attack on Pearl Harbor; the escalation of the Vietnam war; the U.S. Watergate cover-up; the Chernobyl nuclear reactor accident (Reason, 1987); the U.S. space shuttle *Challenger* explosion (Esser & Lindoerfer, 1989); and the Iraq war, launched on the false idea that Iraq had weapons of mass destruction (U.S. Senate Intelligence Committee, 2004).

Despite the dangers of groupthink, two heads are better than one in solving many problems. Knowing this, Janis also studied instances in which U.S. presidents and their advisers collectively made good decisions, such as when the Truman administration formulated the Marshall Plan, which offered assistance to Europe after World War II, and when the Kennedy administration successfully prevented the Soviets from installing missiles in Cuba. In such instances—and in the business world, too, Janis believed—groupthink is prevented when a leader welcomes various opinions, invites experts’ critiques of developing plans, and assigns people to identify possible problems. Just as the suppression of dissent bends a group toward bad decisions, so open debate often shapes good ones. This is especially so with diverse groups, whose varied perspectives often enable creative or superior outcomes (Nemeth & Ormiston, 2007; Page, 2007). None of us is as smart as all of us.

The Power of Individuals

In affirming the power of social influence, we must not overlook the power of individuals. *Social control* (the power of the situation) and *personal control* (the power of the individual) interact. People aren’t billiard balls. When feeling coerced, we may react by doing the opposite of what is expected, thereby reasserting our sense of freedom (Brehm & Brehm, 1981).

“One of the dangers in the White House, based on my reading of history, is that you get wrapped up in groupthink and everybody agrees with everything, and there’s no discussion and there are no dissenting views.”

Barack Obama, December 1, 2008, press conference

“Truth springs from argument among friends.”

Philosopher David Hume, 1711–1776

“If you have an apple and I have an apple and we exchange apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas.”

Attributed to dramatist George Bernard Shaw, 1856–1950

Committed individuals can sway the majority and make social history. Were this not so, communism would have remained an obscure theory, Christianity would be a small Middle Eastern sect, and Rosa Parks' refusal to sit at the back of the bus would not have ignited the U.S. civil rights movement. Technological history, too, is often made by innovative minorities who overcome the majority's resistance to change. To many, the railroad was a nonsensical idea; some farmers even feared that train noise would prevent hens from laying eggs. People derided Robert Fulton's steamboat as "Fulton's Folly." As Fulton later said, "Never did a single encouraging remark, a bright hope, a warm wish, cross my path." Much the same reaction greeted the printing press, the telegraph, the incandescent lamp, and the typewriter (Cantril & Bumstead, 1960).

The power of one or two individuals to sway majorities is *minority influence* (Moscovici, 1985). In studies of groups in which one or two individuals consistently express a controversial attitude or an unusual perceptual judgment, one finding repeatedly stands out: When you are the minority, you are far more likely to sway the majority if you hold firmly to your position and don't waffle. This tactic won't make you popular, but it may make you influential, especially if your self-confidence stimulates others to consider *why* you react as you do. Even when a minority's influence is not yet visible, people may privately develop sympathy for the minority position and rethink their views (Wood et al., 1994). The powers of social influence are enormous, but so are the powers of the committed individual.



Gandhi As the life of Hindu nationalist and spiritual leader Mahatma Gandhi powerfully testifies, a consistent and persistent minority voice can sometimes sway the majority. Gandhi's nonviolent appeals and fasts were instrumental in winning India's independence from Britain in 1947.

RETRIEVE IT

- What is social facilitation, and under what circumstances is it most likely to occur?
ANSWER: This improved performance in the presence of others is most likely to occur with a well-learned task, because the added arousal caused by an audience tends to strengthen the most likely response.
- People tend to exert less effort when working with a group than they would alone, which is called _____.
ANSWER: social loafing
- You are organizing a meeting of fiercely competitive political candidates. To add to the fun, friends have suggested handing out masks of the candidates' faces for supporters to wear. What phenomenon might these masks engage?
ANSWER: The anonymity provided by the masks, combined with the arousal of the contentious setting, might create *deindividuation* (lessened self-awareness and self-restraint).
- When like-minded groups discuss a topic, and the result is the strengthening of the prevailing opinion, this is called _____.
ANSWER: group polarization
- When a group's desire for harmony overrides its realistic analysis of other options, _____ has occurred.
ANSWER: groupthink

Social Relations

We have sampled how we *think* about and *influence* one another. Now we come to social psychology's third focus—how we *relate* to one another. What causes us to harm or to help or to fall in love? How can we move a destructive conflict toward a just peace? We will ponder the bad and the good: from prejudice and aggression to attraction, altruism, and peacemaking.

groupthink the mode of thinking that occurs when the desire for harmony in a decision-making group overrides a realistic appraisal of alternatives.

prejudice an unjustifiable and usually negative attitude toward a group and its members. Prejudice generally involves stereotyped beliefs, negative feelings, and a predisposition to discriminatory action.

stereotype a generalized (sometimes accurate but often overgeneralized) belief about a group of people.

discrimination unjustifiable negative behavior toward a group and its members.

Prejudice



13-8: What is prejudice? What are its social and emotional roots?

Prejudice means “prejudgment.” It is an unjustifiable and usually negative attitude toward a group—often a different cultural, ethnic, or gender group. Like all attitudes, prejudice is a three-part mixture of

- *beliefs* (in this case, called **stereotypes**).
- *emotions* (for example, hostility or fear).
- predispositions to *action* (to discriminate).

To *believe* that obese people are gluttonous, to feel *dislike* for an obese person, and to be hesitant to hire or date an obese person is to be prejudiced. Prejudice is a negative *attitude*. **Discrimination** is a negative *behavior*.

How Prejudiced Are People?

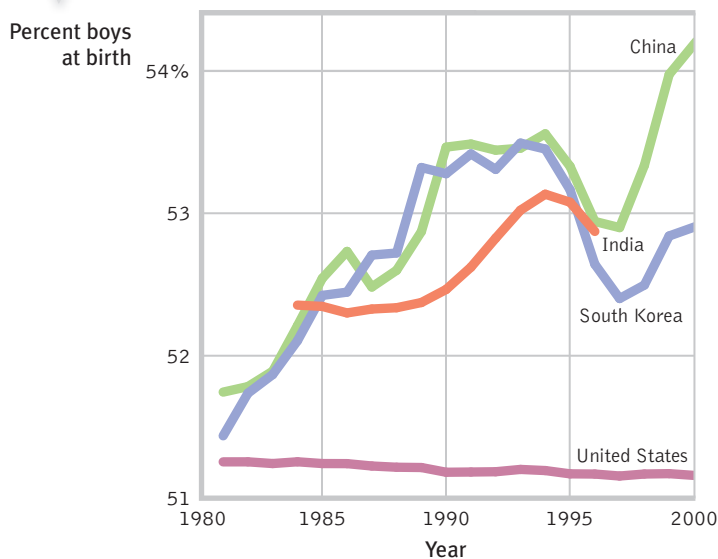
To assess prejudice, we can observe what people say and what they do. Americans’ expressed gender and racial attitudes have changed dramatically in the last 70 years. The one-third of Americans who in 1937 told Gallup pollsters that they would vote for a qualified woman whom their party nominated for president soared to 89 percent in 2007 (Gallup Brain, 2008; Jones & Moore, 2003). Nearly everyone now agrees that women and men should receive the same pay for the same job, and that children of all races should attend the same schools.

Support for all forms of racial contact, including interracial dating, has also dramatically increased. Among 18- to 29-year-old Americans, 9 in 10 now say they would be fine with a family member marrying someone of a different race (Pew, 2010).

Yet as *overt* prejudice wanes, *subtle* prejudice lingers. Despite increased verbal support for interracial marriage, many people admit that in socially intimate settings (dating, dancing, marrying) they would feel uncomfortable with someone of another race. And many people who *say* they would feel upset with someone making racist slurs actually, when hearing such racism, respond indifferently (Kawakami et al., 2009). In Western Europe, where many “guest workers” and refugees settled at the end of the twentieth century, “modern prejudice”—rejecting immigrant minorities as job applicants for supposedly nonracial reasons—has been replacing blatant prejudice (Jackson et al., 2001; Lester, 2004; Pettigrew, 1998, 2006). A slew of recent experiments illustrates that prejudice can be not only subtle but also automatic and unconscious (see Close-Up: Automatic Prejudice).

FIGURE 13.6

Missing girls In several Asian countries, especially in China, which has mandated one-child families, boy babies have been overrepresented (Abrevaya, 2009). China had this overrepresentation still occurring in 2009, with 54.5 percent of babies being boys, and only 45.5 percent being girls (Hvistendahl, 2010).



In most places in the world, gays and lesbians cannot comfortably acknowledge who they are and whom they love. Gender prejudice and discrimination persist, too. Despite gender equality in intelligence scores, people have tended to perceive their fathers as more intelligent than their mothers (Furnham & Wu, 2008). In Saudi Arabia, women are still not allowed to drive. In Western countries, we still pay more to those (usually men) who care for our streets than to those (usually women) who care for our children. Worldwide, women have been more likely to live in poverty (Lipps, 1999), and they represent two-thirds of illiterate adults (CIA, 2010).

Female infants are no longer left out on a hillside to die of exposure, as was the practice in ancient Greece. Yet natural female mortality and the normal male-to-female newborn ratio (105-to-100) hardly explain the world’s estimated 163 million (say that number slowly) “missing women” (Hvistendahl, 2011). In many places, sons are valued more than daughters. With testing that enables sex-selective abortions, several South Asian countries have experienced a shortfall in female births (**FIGURE 13.6**). Although

CLOSE UP:

Automatic Prejudice

As we have seen throughout this book, the human mind processes thoughts, memories, and attitudes on two different tracks. Sometimes that processing is explicit—on the radar screen of our awareness. To an even greater extent, it is implicit—below the radar, leaving us unaware of how our attitudes are influencing our behavior. Modern studies indicate that prejudice is often implicit, an automatic attitude that is an unthinking knee-jerk response. Consider these findings:

Implicit racial associations Using Implicit Association Tests, researchers have demonstrated that even people who deny harboring racial prejudice may carry negative associations (Greenwald et al., 1998, 2009). (By 2011, nearly 5 million people had taken the Implicit Association Test, as you can at implicit.harvard.edu.) For example, 9 in 10 White respondents took longer to identify pleasant words (such as peace and paradise) as “good” when presented with Black-sounding names (such as Latisha and Darnell) rather than with White-sounding names (such as Katie and Ian). Moreover, people who more quickly associate good things with White names or faces also are the quickest to perceive anger and apparent threat in Black faces (Hugenberg & Bodenhausen, 2003).

Although the test is useful for studying automatic prejudice, critics caution against using it to assess or label individuals (Blanton et al., 2006, 2007, 2009). Defenders counter that implicit biases predict behaviors that range from simple acts of friendliness to the evaluation of work quality (Greenwald et al., 2009). In the 2008 U.S. presidential election, implicit as well as explicit prejudice predicted voters’ response to candidate Barack Obama, whose election in turn served to reduce implicit prejudice (Bernstein et al., 2010; Payne et al., 2010).

Unconscious patronization When White university women evaluated a flawed essay said to be written by a Black fellow student, they gave markedly higher ratings and never expressed the harsh criticisms they assigned

to flawed essays supposedly written by White students (Harber, 1998). Did the evaluators calibrate their evaluations to their racial stereotypes, leading to less exacting standards and a patronizing attitude? In real-world evaluations, such low expectations and the resulting “inflated praise and insufficient criticism” could hinder minority student achievement, the researcher noted. (To preclude such bias, many teachers read essays while “blind” to their authors.)

Race-influenced perceptions Our expectations influence our perceptions. In 1999, Amadou Diallo was accosted as he approached his apartment house doorway by police officers looking for a rapist. When he pulled out his wallet, the officers, perceiving a gun, riddled his body with 19 bullets from 41 shots. Curious about this tragic killing of an unarmed, innocent man, two research teams reenacted the situation (Correll et al., 2002, 2007; Greenwald et al., 2003). They asked viewers to press buttons quickly to “shoot” or not shoot men who suddenly appeared on screen. Some of the on-screen men held a gun. Others held a harmless

object, such as a flashlight or bottle. People (both Blacks and Whites, in one study) more often shot Black men than White men who were holding the harmless objects. Priming people with a flashed Black rather than White face also makes them more likely then to misperceive a flashed tool as a gun (FIGURE 13.7).

Reflexive bodily responses Even people who consciously express little prejudice may give off telltale signals as their body responds selectively to another’s race. Neuroscientists can detect these signals when people look at White and Black faces. The viewers’ implicit prejudice may show up in facial-muscle responses and in the activation of their emotion-processing amygdala (Cunningham et al., 2004; Eberhardt, 2005; Stanley et al., 2008).

If your own gut check reveals you sometimes have feelings you would rather not have about other people, remember this: It is what we do with our feelings that matters. By monitoring our feelings and actions, and by replacing old habits with new ones based on new friendships, we can work to free ourselves from prejudice.



Paul Burnst/Blend/Getty Images

FIGURE 13.7

Race primes perceptions In experiments by Keith Payne (2006), people viewed a White or Black face, immediately followed by a gun or hand tool, which was then followed by a visual mask. Participants were more likely to misperceive a tool as a gun when it was preceded by a Black rather than White face.



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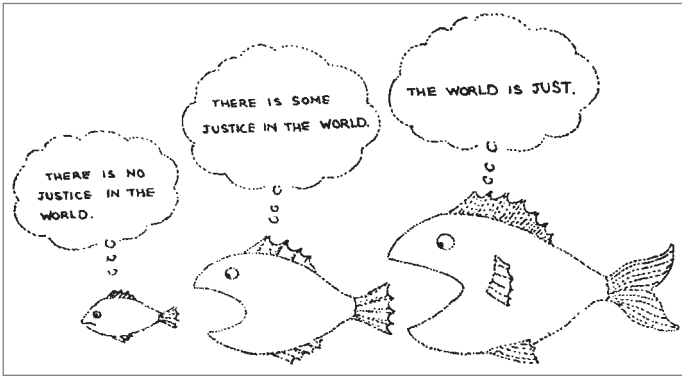
Visual Mask



B. K. Payne (2006)

China has declared that sex-selective abortions—gender genocide—are now a criminal offense, the country’s newborn sex ratio is still 118 boys for every 100 girls (Hvistendahl, 2009, 2010, 2011), and 95 percent of the children in Chinese orphanages are girls (Webb, 2009). With under-age-20 males exceeding females by 32 million, many Chinese bachelors will be unable to find mates (Zhu et al., 2009).

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Social Roots of Prejudice

Why does prejudice arise? Social inequalities and divisions are partly responsible.

Social Inequalities When some people have money, power, and prestige and others do not, the “haves” usually develop attitudes that justify things as they are. The **just-world phenomenon** reflects an idea we commonly teach our children—that good is rewarded and evil is punished. From this it is but a short leap to assume that those who succeed must be good and those who suffer must be bad. Such reasoning enables the rich to see both their own wealth and the poor’s misfortune as justly deserved.

Are women naturally unassertive but sensitive? This common perception suggests that women are well-suited for the caretaking tasks they have traditionally performed (Hoffman & Hurst, 1990). In an extreme case, slave “owners” perceived slaves as innately lazy, ignorant, and irresponsible—as having the very traits that justified enslaving them. Stereotypes rationalize inequalities.

Victims of discrimination may react with either self-blame or anger (Allport, 1954). Either reaction can feed prejudice through the classic *blame-the-victim* dynamic. Do the circumstances of poverty breed a higher crime rate? If so, that higher crime rate can be used to justify discrimination against those who live in poverty.

Us and Them: Ingroup and Outgroup We have inherited our Stone Age ancestors’ need to belong, to live and love in groups. There was safety in solidarity (those who didn’t band together left fewer descendants). Whether hunting, defending, or attacking, 10 hands were better than 2. Dividing the world into “us” and “them” entails prejudice and war, but it also provides the benefits of communal solidarity. Thus, we cheer for our groups, kill for them, die for them. Indeed, we define who we are partly in terms of our groups. Through our *social identities* we associate ourselves with certain groups and contrast ourselves with others (Hogg, 1996, 2006; Turner, 1987, 2007). When Ian identifies himself as a man, an Aussie, a Labourite, a University of Sydney student, a Catholic, and a MacGregor, he knows who he is, and so do we.

Evolution prepared us, when encountering strangers, to make instant judgments: friend or foe? Those from our group, those who look like us, and also those who *sound* like us—with accents like our own—we instantly tend to like, from childhood onward (Gluszek & Dovidio, 2010; Kinzler et al., 2009). Mentally drawing a circle defines “us,” the **ingroup**. But the social definition of who you are also states who you are not. People outside that circle are “them,” the **outgroup**. An **ingroup bias**—a favoring of our own group—soon follows. Even arbitrarily creating us-them groups by tossing a coin creates this bias. In experiments, people have favored their own group when dividing any rewards (Tajfel, 1982; Wilder, 1981).

The ingroup Scotland’s famed “Tartan Army” soccer fans, shown here during a match against archrival England, share a social identity that defines “us” (the Scottish ingroup) and “them” (the English outgroup).



Mike Hewitt/Getty Images

The urge to distinguish enemies from friends predisposes prejudice against strangers (Whitley, 1999). To Greeks of the classical era, all non-Greeks were “barbarians.” In our own era, most children believe their school is better than all other schools in town. Many high school students form cliques—goths/emos, theater people, athletes (sorted by sport), gangsters, preps, nerds—and disparage those outside their own group. Even chimpanzees have been seen to wipe clean the spot where they were touched by a chimpanzee from another group (Goodall, 1986). They also display ingroup empathy, by yawning more after seeing ingroup (rather than outgroup) members yawn (Campbell & de Waal, 2011).

Ingroup bias explains the cognitive power of political partisanship (Cooper, 2010; Douthat, 2010). In the United States in the late 1980s, most Democrats believed inflation had risen under Republican president Ronald Reagan (it had dropped). In 2010, most Republicans believed that taxes had increased under Democrat president Barack Obama (for most, they had decreased).

Emotional Roots of Prejudice

Prejudice springs not only from the divisions of society but also from the passions of the heart. **Scapegoat theory** notes that when things go wrong, finding someone to blame can provide a target for anger. Following the 9/11 attacks, some outraged people lashed out at innocent Arab-Americans. Others called for eliminating Saddam Hussein, the Iraqi leader whom Americans had been grudgingly tolerating. “Fear and anger create aggression, and aggression against citizens of different ethnicity or race creates racism and, in turn, new forms of terrorism,” noted Philip Zimbardo (2001). A decade after 9/11, anti-Muslim animosities still flared in the United States, with mosque burnings and efforts to block construction of an Islamic community center near Ground Zero in New York City.

Evidence for the scapegoat theory of prejudice comes from high prejudice among economically frustrated people, and from experiments in which a temporary frustration intensifies prejudice. Students who experienced failure or were made to feel insecure often restored their self-esteem by disparaging a rival school or another person (Cialdini & Richardson, 1980; Crocker et al., 1987). To boost our own sense of status when we’re down, it helps to have others to denigrate. That is why a rival’s misfortune sometimes provides a twinge of pleasure. By contrast, those made to feel loved and supported have become more open to and accepting of others who differ (Mikulincer & Shaver, 2001).

Negative emotions nourish prejudice. When facing death, fearing threats, or experiencing frustration, people cling more tightly to their ingroup and their friends. As the terror of death heightens patriotism, it also produces loathing and aggression toward “them”—those who threaten our world (Pyszczynski et al., 2002, 2008). The few individuals who lack fear and its associated amygdala activity—such as children with the genetic disorder, Williams syndrome—also display a notable lack of racial stereotypes and prejudice (Santos et al., 2010).

Cognitive Roots of Prejudice



13-9: What are the cognitive roots of prejudice?

Prejudice springs from a culture’s divisions, the heart’s passions, and also from the mind’s natural workings. Stereotyped beliefs are a by-product of how we cognitively simplify the world.

Forming Categories One way we simplify our world is to categorize. A chemist categorizes molecules as organic and inorganic. Therapists categorize psychological disorders. All of us categorize people by race, with mixed-race people often assigned to their minority identity. Despite his mixed-race background and his rearing by a White mother and White grandparents, President Obama is perceived by White Americans as Black. Researchers believe this happens because, after learning the features of a familiar

“For if [people were] to choose out of all the customs in the world [they would] end by preferring their own.”

Greek historian Herodotus, 440 B.C.E.

“The misfortunes of others are the taste of honey.”

Japanese saying

“If the Tiber reaches the walls, if the Nile does not rise to the fields, if the sky doesn’t move or the Earth does, if there is famine, if there is plague, the cry is at once: ‘The Christians to the lion!’”

Tertullian, Apologeticus, c.E. 197

just-world phenomenon the tendency for people to believe the world is just and that people therefore get what they deserve and deserve what they get.

ingroup “Us”—people with whom we share a common identity.

outgroup “Them”—those perceived as different or apart from our ingroup.

ingroup bias the tendency to favor our own group.

scapegoat theory the theory that prejudice offers an outlet for anger by providing someone to blame.

**FIGURE 13.8**

Categorizing mixed race people When New Zealanders quickly classified 104 photos by race, those of European descent more often than those of Chinese descent classified the ambiguous middle two as Chinese (Halberstadt et al., 2011).

racial group, the observer's selective attention is drawn to the distinctive features of the less-familiar minority. Jamin Halberstadt and his colleagues (2011) illustrated this learned-association effect by showing New Zealanders blended Chinese-Caucasian faces. Compared with Chinese participants, the Caucasian New Zealanders more readily classified ambiguous faces as Chinese (see **FIGURE 13.8**).

In categorizing people into groups, we often stereotype them. We recognize how greatly *we* differ from other individuals in *our* groups. But we overestimate the homogeneity of other groups. “They”—the members of some other group—seem to look and act alike, while “we” are more diverse (Bothwell et al., 1989). To those in one ethnic group, members of another often seem more alike than they really are in attitudes, personality, and appearance. Our greater recognition for individual own-race faces—called the **other-race effect** (also called the *cross-race effect* or *own-race bias*)—emerges during infancy, between 3 and 9 months of age (Gross, 2009; Kelly et al., 2007).

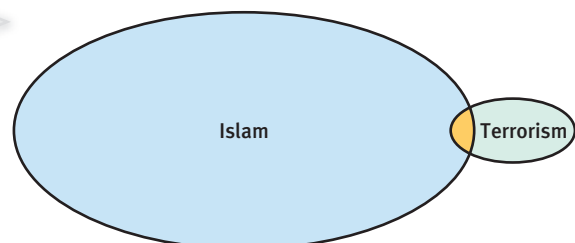
With effort and with experience, people get better at recognizing individual faces from another group (Hugenberg et al., 2010). People of European descent, for example, more accurately identify individual African faces if they have watched a great deal of basketball on television, exposing them to many African-heritage faces (Li et al., 1996). And the longer Chinese people have resided in a Western country, the less they exhibit the other-race effect (Hancock & Rhodes, 2008).

Remembering Vivid Cases As we saw in Chapter 9, we often judge the frequency of events by instances that readily come to mind. In a classic experiment, researchers showed two groups of University of Oregon students lists containing information about 50 men (Rothbart et al., 1978). The first group's list included 10 men arrested for *nonviolent* crimes, such as forgery. The second group's list included 10 men arrested for *violent* crimes, such as assault. Later, both groups were asked how many men on their list had committed *any* sort of crime. The second group overestimated the number. Vivid (violent) cases are more readily available to our memory and feed our stereotypes (**FIGURE 13.9**).

Believing the World Is Just As we noted earlier, people often justify their prejudices by blaming victims. If the world is just, “people must get what they deserve.” As one German civilian is said to have remarked when visiting the Bergen-Belsen concentration camp shortly after World War II, “What terrible criminals these prisoners must have been to receive such treatment.”

**FIGURE 13.9**

Vivid cases feed stereotypes The 9/11 Muslim terrorists created, in many minds, an exaggerated stereotype of Muslims as terror prone. Actually, reported a U.S. National Research Council panel on terrorism, when offering this inexact illustration, most terrorists are not Muslim and “the vast majority of Islamic people have no connection with and do not sympathize with terrorism” (Smelser & Mitchell, 2002).



Hindsight bias is also at work here (Carli & Leonard, 1989). Have you ever heard people say that rape victims, abused spouses, or people with AIDS got what they deserved? In some countries, such as Pakistan, women who have been raped have sometimes been sentenced to severe punishment for having violated a law against adultery (Mydans, 2002). In one experiment illustrating the blame-the-victim phenomenon, people were given a detailed account of a date that ended with the woman being raped (Janoff-Bulman et al., 1985). They perceived the woman's behavior as at least partly to blame, and in hindsight, they thought, "She should have known better." (Blaming the victim also serves to reassure people that it couldn't happen to them.) Others, given the same account with the rape ending deleted, did not perceive the woman's behavior as inviting rape.

People also have a basic tendency to justify their culture's social systems (Jost et al., 2009; Kay et al., 2009). We're inclined to see the way things are as the way they ought to be. This natural conservatism makes it difficult to legislate major social changes, such as health care or climate-change policies. Once such policies are in place, our "system justification" tends to preserve them.

RETRIEVE IT

- When prejudiced judgment causes us to find an undeserving person to blame for a problem, that person is called a _____.

ANSWER: scapegoat

Aggression



13-10: How does psychology's definition of *aggression* differ from everyday usage? What biological factors make us more prone to hurt one another?

Prejudice hurts, but aggression often hurts more. In psychology, **aggression** is any behavior intended to harm someone, whether done out of hostility or as a calculated means to an end. The assertive, persistent salesperson is not aggressive. Nor is the dentist who makes you wince with pain. But the person who passes along a vicious rumor about you, someone who bullies you in person or online, and the attacker who mugs you for your money are aggressive. People behave aggressively toward both strangers and close relationship partners. Indeed, one out of every six married or cohabiting American couples has acknowledged experiencing at least one physically aggressive act in their relationship over the past year (Schafer et al., 1998).

Aggressive behavior emerges from the interaction of biology and experience. For a gun to fire, the trigger must be pulled; with some people, as with hair-trigger guns, it doesn't take much to trip an explosion. Let's look first at some biological factors that influence our thresholds for aggressive behavior, then at the psychological factors that pull the trigger.

The Biology of Aggression

Aggression varies too widely from culture to culture, era to era, and person to person to be considered an unlearned instinct. But biology does *influence* aggression. We can look for biological influences at three levels—genetic, biochemical, and neural.

Genetic Influences Genes influence aggression. We know this because animals have been bred for aggressiveness—sometimes for sport, sometimes for research. The effect of genes also appears in human twin studies (Miles & Carey, 1997; Rowe et al., 1999). If one identical twin admits to "having a violent temper," the other twin will often independently admit the same. Fraternal twins are much less likely to respond similarly. Researchers

other-race effect the tendency to recall faces of one's own race more accurately than faces of other races. Also called the *cross-race effect* and the *own-race bias*.

aggression any physical or verbal behavior intended to hurt or destroy.

In the last 40 years in the United States, well over 1 million people—more than all deaths in all wars in American history—have been killed by firearms in nonwar settings. Compared with people of the same sex, race, age, and neighborhood, those who keep a gun in the home (ironically, often for protection) are almost three times more likely to be murdered in the home—nearly always by a family member or close acquaintance. For every self-defense use of a gun in the home, there have been 4 unintentional shootings, 7 criminal assaults or homicides, and 11 attempted or completed suicides (Kellermann et al., 1993, 1997, 1998; see also Branas et al., 2009).



Karl Ammann/Getty Images

A lean, mean fighting machine—the testosterone-laden female hyena The hyena's unusual embryology pumps testosterone into female fetuses. The result is revved-up young female hyenas who seem born to fight.

“We could avoid two-thirds of all crime simply by putting all able-bodied young men in cryogenic sleep from the age of 12 through 28.”

David T. Lykken, *The Antisocial Personalities*, 1995



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“It’s a guy thing.”

continue to search for genetic markers in those who commit the most violence. One is already well known and is carried by half the human race: the Y chromosome. Another such marker is the *monoamine oxidase A (MAOA) gene*, which helps break down neurotransmitters such as dopamine and serotonin, and is sometimes called the “warrior gene.” People who have low MAOA gene expression tend to behave aggressively when provoked. In one experiment, low (compared to high) MAOA gene carriers gave more unpleasant hot sauce to someone who provoked them (McDermott et al., 2009).

Biochemical Influences Our genes engineer our individual nervous systems, which operate electrochemically. The hormone testosterone, for example, circulates in the bloodstream and influences the neural systems that control aggression. A raging bull becomes a gentle Ferdinand when castration reduces its testosterone level. The same is true of mice. When injected with testosterone, gentle, castrated mice once again become aggressive.

Humans are less sensitive to hormonal changes. But as men age, their testosterone levels—and their aggressiveness—diminish. Hormonally charged, aggressive 17-year-olds mature into hormonally quieter and gentler 70-year-olds. Also, violent criminals tend to be muscular young males with higher-than-average testosterone levels, lower-than-average intelligence scores, and low levels of the neurotransmitter serotonin (Dabbs et al., 2001a; Pendick, 1994).

High testosterone correlates with irritability, assertiveness, impulsiveness, and low tolerance for frustration—qualities that predispose somewhat more aggressive responses to provocation or competition for status (Dabbs et al., 2001b; Harris, 1999; McAndrew, 2009). Among both teenage boys and adult men, high testosterone levels correlate with delinquency, hard drug use, and aggressive-bullying responses to frustration (Berman et al., 1993; Dabbs & Morris, 1990; Olweus et al., 1988). Drugs that sharply reduce testosterone levels subdue men’s aggressive tendencies.

Another drug that sometimes circulates in the bloodstream—alcohol—*unleashes* aggressive responses to frustration. Across police data, prison surveys, and experiments, aggression-prone people are more likely to drink, and to become violent when intoxicated (White et al., 1993). National crime data indicate that 73 percent of Russian homicides and 57 percent of U.S. homicides were influenced by alcohol (Landberg & Norström, 2011). Alcohol affects aggression both biologically and psychologically (Bushman, 1993; Ito et al., 1996; Taylor & Chermack, 1993). Just *thinking* you’ve imbibed alcohol can increase aggression (Bègue et al., 2009). But so, too, does unknowingly ingesting alcohol slipped into a drink. Unless people are distracted, alcohol tends to focus their attention on a provocation rather than on inhibitory cues (Giancola & Corman, 2007). Alcohol also inclines people to interpret ambiguous acts (such as a bump in a crowd) as provocations (Bègue et al., 2010).

Neural Influences There is no one spot in the brain that controls aggression. Aggression is a complex behavior, and it occurs in particular contexts. But animal and human brains have neural systems that, given provocation, will either inhibit or facilitate aggression (Denson, 2011; Moyer, 1983; Wilkowski et al., 2011). Consider:

- Researchers implanted a radio-controlled electrode in the brain of the domineering leader of a caged monkey colony. The electrode was in an area that, when stimulated, inhibits aggression. When researchers placed the control button for the electrode in the colony’s cage, one small monkey learned to push it every time the boss became threatening.
- A neurosurgeon, seeking to diagnose a disorder, implanted an electrode in the amygdala of a mild-mannered woman. Because the brain has no sensory receptors, she was unable to feel the stimulation. But at the flick of a switch she snarled, “Take my blood pressure. Take it now,” then stood up and began to strike the doctor.

- Studies of violent criminals have revealed diminished activity in the frontal lobes, which play an important role in controlling impulses. If the frontal lobes are damaged, inactive, disconnected, or not yet fully mature, aggression may be more likely (Amen et al., 1996; Davidson et al., 2000; Raine, 1999, 2005).

frustration-aggression principle the principle that frustration—the blocking of an attempt to achieve some goal—creates anger, which can generate aggression.

Psychological and Social-Cultural Factors in Aggression



13-11: What psychological and social-cultural factors may trigger aggressive behavior?

Biological factors influence how easily aggression is triggered. But what psychological and social-cultural factors pull the trigger?

Aversive Events Suffering sometimes builds character. In laboratory experiments, however, those made miserable have often made others miserable (Berkowitz, 1983, 1989). This phenomenon is called the **frustration-aggression principle**: Frustration creates anger, which can spark aggression. One analysis of 27,667 hit-by-pitch Major League Baseball incidents between 1960 and 2004 revealed this link (Timmerman, 2007). Pitchers were most likely to hit batters when

- they had been frustrated by the previous batter hitting a home run.
- the current batter had hit a home run the last time at bat.
- a teammate had been hit by a pitch in the previous half inning.

Other aversive stimuli—hot temperatures, physical pain, personal insults, foul odors, cigarette smoke, crowding, and a host of others—can also evoke hostility. In laboratory experiments, when people get overheated, they think, feel, and act more aggressively. Simply thinking about words related to hot temperatures is enough to increase hostile thoughts (DeWalt & Bushman, 2009). In baseball games, the number of hit batters rises with the temperature (Reifman et al., 1991; see **FIGURE 13.10**). And in the wider world, violent crime and spousal abuse rates have been higher during hotter years, seasons, months, and days (Anderson et al., 1997). From the available data, Craig Anderson and his colleagues (2000, 2011) have projected that, other things being equal, global warming of 4 degrees Fahrenheit (about 2 degrees Celsius) could induce tens of thousands of additional assaults and murders—and that’s before the added violence inducement from climate change-related drought, poverty, food insecurity, and migration.



AP Photo/Brita Meng Outzen

Reinforcement, Modeling, and Self-Control Aggression may naturally follow aversive events, but learning can alter natural reactions. As Chapter 7 explained, we learn when our behavior is reinforced, and we learn by watching others.

In situations where experience has taught us that aggression pays, we are likely to act aggressively again. Children whose aggression has successfully intimidated other children may become bullies. Animals that have successfully fought to get food or mates become increasingly ferocious. To foster a kinder, gentler world we had best model and reward sensitivity and cooperation from an early age, perhaps by training parents to discipline without modeling violence.

Parents of delinquent youngsters frequently cave in to (reward) their children’s tears and temper tantrums. Then, exasperated, they discipline them with beatings (Patterson et al., 1982, 1992).

Parent-training programs often advise parents to avoid modeling violence by screaming and hitting. Instead, parents should reinforce desirable behaviors and frame statements positively. (“When you finish loading the dishwasher you can go play,” rather than “If you don’t load the dishwasher, there’ll be no playing.”).

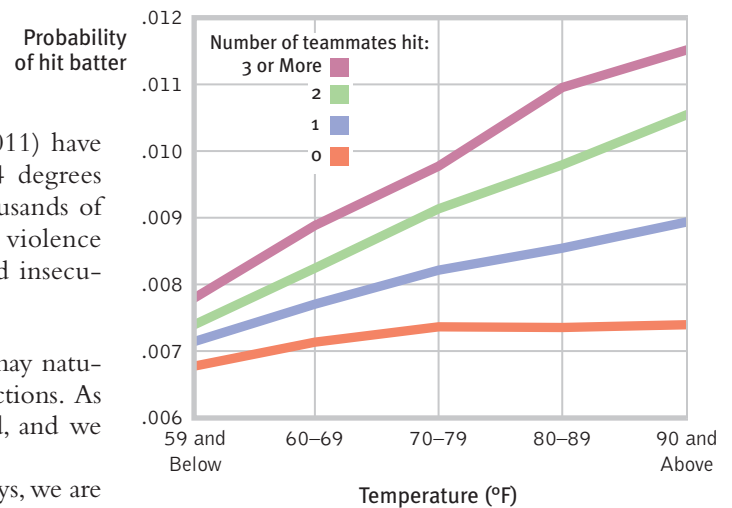


FIGURE 13.10 **Temperature and retaliation** Richard Larrick and his colleagues (2011) looked for occurrences of batters hit by pitchers during 4,566,468 pitcher-batter matchups across 57,293 Major League Baseball games since 1952. The probability of a hit batter increased if one or more of the pitcher’s teammates had been hit, and also with temperature.



Tony Freeman/Photo Edit

Aggression-replacement program

Part of the rehabilitation of these juvenile offenders at the Missouri Division of Youth Services' Rosa Parks Center involves learning anger management and peaceful ways to resolve disputes. Here they "circle up" to resolve a problem peacefully.

Self-control curbs aggressive and criminal behavior. Alas, mental exhaustion, food deprivation, and other bodily challenges often deplete our self-control (Vohs et al., 2011). Picture yourself after a long challenging day at school or work, or after missing a meal or when sleep-deprived. Might you, without realizing what's happening, begin to snap at your friends or partner? Available research indicates that poor self-control is also "one of the strongest known correlates of crime" (Pratt & Cullen, 2000, p. 952).

One *aggression-replacement program* worked with juvenile offenders and gang members and their parents. It taught both generations new ways to control anger, and more thoughtful approaches to moral reasoning (Goldstein et al., 1998). The result? The youths' re-arrest rates dropped.

Different cultures model, reinforce, and evoke different tendencies toward violence. For example, U.S. men are less approving of male-to-female violence between romantic partners than are men from India, Japan, and Kuwait (Nayak et al., 2003). Crime rates have also been higher and average happiness has been lower in times and places marked by a great disparity between rich and poor (Messias et al., 2011; Oishi et al., 2011; Wilkinson & Pickett, 2009). In the United States, cultures and families that experience minimal father care also have had high violence rates (Triandis, 1994). Even after controlling for parental education, race, income, and teen motherhood, American male youths from father-absent homes have double their peers' incarceration rate (Harper & McLanahan, 2004).

Violence can also vary by culture within a country. Richard Nisbett and Dov Cohen (1996) analyzed violence among White Americans in southern towns settled by Scots-Irish herders whose tradition emphasized "manly honor," the use of arms to protect one's flock, and a history of coercive slavery. Compared with their White counterparts in New England towns settled by the more traditionally peaceful Puritan, Quaker, and Dutch farmer-artisans, the cultural descendants of those herders have had triple the homicide rates and were more supportive of physically punishing children, of warfare initiatives, and of uncontrolled gun ownership. "Culture-of-honor" states also have higher rates of students bringing weapons to school and of school shootings (Brown et al., 2009). Greater acceptance of violence in these states also seeps into the names of towns (for example, Gunpoint, Florida; Guntown, Mississippi; and War, West Virginia) (Kelly, 1999).

Media Models for Violence Parents are hardly the only aggression models. In the United States and elsewhere, TV, films, and video games offer supersized portions of violence. Repeatedly viewing on-screen violence teaches us **social scripts**—culturally provided mental files for how to act. When we find ourselves in new situations, uncertain how to behave, we rely on social scripts. After watching so many action films, adolescent boys may acquire a script that plays in their head when they face real-life conflicts. Challenged, they may "act like a man" by intimidating or eliminating the threat.

Music lyrics also write social scripts. In one set of experiments, German university men administered hotter chili sauce to a woman and recalled more negative feelings and beliefs about women after listening to woman-hating song lyrics. Man-hating song lyrics likewise increase aggression in women (Fischer & Greitemeyer, 2006).

Sexual aggression is sometimes modeled in X-rated films and pornography. Content analyses have revealed that X-rated films have sometimes included scenes of rape and sexual exploitation of women by men (Cowan et al., 1988; NCTV, 1987; Yang & Linz, 1990). These scenes have often included enactments of the *rape myth*—the idea that some women invite or enjoy rape and get "swept away" while being "taken." (In actuality, rape is traumatic, and it frequently harms women's reproductive and psychological health [Golding, 1996].) Most rapists accept this myth (Brinson, 1992). So do many men and women who watch a great deal of TV: Compared with those who watch little television, heavy viewers are more accepting of the rape myth (Kahlor & Morrison, 2007).

Surveys of American and Australian teens, university students, and young adults reveal a huge gender difference in viewing habits: Viewing X-rated films and Internet pornography is several times higher among males than among females (Carroll et al., 2008; Flood, 2007; Wolak et al., 2007). What effects might the social scripts from the \$97 billion global pornography business have on the sexually aggressive behaviors of their

social script culturally modeled guide for how to act in various situations.

viewers (D’Orlando, 2011)? Most consumers of child and adult pornography commit no known sexual crimes (Seto, 2009). But they are more likely to accept the rape myth as reality (Kingston et al., 2009). And to people who are heavily exposed to pornography, sexual aggression seems less serious (Harris, 1994; Zillmann, 1989).

In one experiment, undergraduates viewed six brief, sexually explicit films each week for six weeks (Zillmann & Bryant, 1984). A control group viewed nonerotic films during the same six-week period. Three weeks later, both groups read a newspaper report about a man convicted but not yet sentenced for raping a hitchhiker. When asked to suggest an appropriate prison term, viewers of the sexually explicit films recommended sentences half as long as those recommended by the control group.

Experiments cannot elicit actual sexual violence, but they can assess a man’s willingness to hurt a woman. Often the research gauges the effect of violent versus nonviolent erotic films on men’s willingness to deliver supposed electric shocks to women who had earlier provoked them. These experiments suggest that it’s less the eroticism than the depictions of sexual *violence* (whether in R-rated slasher films or X-rated films) that most directly affect men’s acceptance and performance of aggression against women. A statement by 21 social scientists, including many of the researchers who conducted these experiments, noted, “Pornography that portrays sexual aggression as pleasurable for the victim increases the acceptance of the use of coercion in sexual relations” (Surgeon General, 1986). Contrary to much popular opinion, viewing such depictions does not provide an outlet for bottled-up impulses. Rather, “in laboratory studies measuring short-term effects, exposure to violent pornography increases punitive behavior toward women.”

To a lesser extent, nonviolent pornography can also influence aggression. In a series of studies, Nathaniel Lambert and his colleagues (2011) used various methods to explore pornography’s effects on aggression against relationship partners. They found that pornography consumption predicted both self-reported aggression and laboratory noise blasts to their partner, and that abstaining from customary pornography consumption decreased aggression (while abstaining from their favorite food did not).

Neil Malamuth (1996) has shown that sexually coercive men typically are sexually promiscuous and hostile in their relationships with women (**FIGURE 13.11**). Several factors can affect a man’s tendencies toward sexual aggression, including media influences, dominance motives, disinhibition by alcohol, and a history of child abuse (Malamuth et al., 1991, 1995).

Do Violent Video Games Teach Social Scripts for Violence? Experiments in North America, Western Europe, Singapore, and Japan indicate that playing positive games produces positive effects (Gentile et al., 2009; Greitemeyer & Osswald, 2010). For example, playing *Lemmings*, where a goal is to help others, increases real-life helping. So, might a parallel effect occur after playing games that enact violence? Violent video games became an issue for public debate after teenagers in more than a dozen places seemed to mimic the carnage in the shooter games they had so often played (Anderson, 2004a). In 2002, two Grand Rapids, Michigan, teens and a man in his early twenties spent part of a night drinking beer and playing *Grand Theft Auto III*. Using simulated cars, they ran down pedestrians, then beat them with fists, leaving a bloody body behind (Kolker, 2002). The same teens and man then went out for a real drive. Spotting a 38-year-old man on a bicycle, they ran him down with their car, got out, stomped and punched him, and returned home to play the game some more. (The victim, a father of three, died six days later.)

When combining data from 400 studies with 130,296 participants, Craig Anderson and his colleagues (2010) found that playing violent video games did indeed increase aggression. The finding held for youth and for young adults; in North America, Japan, and Western Europe; and with each of three major research designs (correlational, experimental, and longitudinal). In a 2010 statement submitted for a U.S. Supreme Court case, Anderson was joined by more than 100 social scientists in explaining that “the psychological processes underlying such effects are well understood and include: imitation, observational learning, priming of cognitive, emotional, and behavioral scripts, physiological arousal, and emotional desensitization” (Sacks et al., 2011).

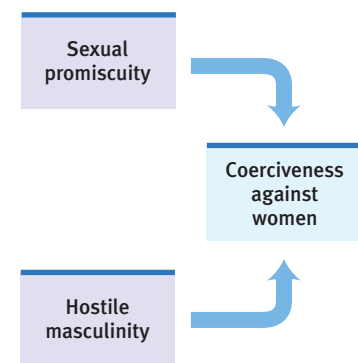


FIGURE 13.11

Men who sexually coerce women The recipe for coercion against women combines an impersonal approach to sex with a hostile masculinity. (Adapted from Malamuth, 1996.)



Coincidence or contributing factor?

In 2011, Norwegian Anders Behring Breivik bombed government buildings in Oslo, and then went to a youth camp where he shot and killed 69 people, mostly teens. As a player of first-person shooter games, Breivik stirred debate when he commented that “I see MW2 [Modern Warfare 2] more as a part of my training-simulation than anything else.” Did his violent game playing contribute to his violence, or was it a mere coincidental association? To explore such questions, psychologists experiment.

REUTERS/Andrew Berwick via www.freak.no/Handout

“What sense does it make to forbid selling to a 13-year-old a magazine with an image of a nude woman, while protecting the sale to that 13-year-old of an interactive video game in which he actively, but virtually, binds and gags the woman, then tortures and kills her?”

U.S. Supreme Court Justice Stephen Breyer, dissenting opinion, 2011

Consider some evidence:

- University men who spent the most hours playing violent video games tended to be the most physically aggressive (for example, to acknowledge having hit or attacked someone else) (Anderson & Dill, 2000).
- People with extensive experience in violent video gaming display desensitization to violence, as shown by blunted brain responses; they also are less likely to help an injured victim (Bartholow et al., 2006; Bushman & Anderson, 2009).
- After playing a violent rather than a neutral or prosocial video game, people become more likely to perceive immigrant outgroups as less than human (Greitemeyer & McLatchie, 2011).

Young adolescents who play a lot of violent video games see the world as more hostile. Compared with nongaming kids, they get into more arguments and fights and get worse grades (Gentile, 2009). Ah, but is this merely because naturally hostile kids are drawn to such games? Apparently not. Comparisons of gamers and nongamers who scored low in hostility revealed a difference in the number of reported fights: 38 percent of the violent-game players had been in fights, versus only 4 percent of the nongamers. Over time, the nongamers became more likely to have fights only if they started playing the violent games (Anderson, 2004a). Among German adolescents, today’s violent game playing also predicts future aggression, but today’s aggression does not predict future game playing (Möller & Krahe, 2008).

Some researchers believe that, due partly to the more active participation and rewarded violence of game play, violent video games have even greater effects on aggressive behavior and cognition than do violent television and movies (Anderson & Warburton, 2012). Some of these researchers suggest that the effects of violent gaming are comparable to the toxic effects of asbestos or second-hand smoke exposure (Bushman et al., 2010). “Playing violent video games probably will not turn your child into a psychopathic killer,” acknowledged researcher Brad Bushman (2011), “but I would want to know how the child treats his or her parents, how they treat their siblings, how much compassion they have.”



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Others are unimpressed by violent-game-effect findings (Ferguson & Kilburn, 2010). They note that from 1996 to 2006, youth violence was declining while video game sales were increasing. Moreover, some point out that avid game players are quick and sharp: They develop speedy reaction times and enhanced visual skills (Dye et al., 2009; Green et al., 2010). The focused fun of game playing can satisfy basic needs for a sense of competence, control, and social connection (Przybylski et al., 2010). And in fact, a 2011 Supreme Court decision overturned a California state law that banned violent video game sales to children (modeled after the bans on sales of sexually explicit materials to children). The First Amendment’s free speech guarantee protects even offensive games, said the court’s majority, which was unpersuaded by the evidence of harm. So, the debate continues.

To sum up, significant behaviors, such as aggression, usually have many determinants, making any single explanation an oversimplification. Asking what causes aggression is therefore like asking what causes cancer. Asbestos exposure, for example, is indeed a cancer cause, albeit only one among many. Research reveals many different biological, psychological, and social-cultural influences on aggressive behavior. Like so much else, aggression is a biopsychosocial phenomenon (**FIGURE 13.12**).

It is also important to note that many people are leading gentle, even heroic lives amid personal and social stresses, reminding us again that individuals differ. Indeed, historical trends suggest that the world is increasingly nonviolent (Pinker, 2011). The person matters. That people vary over time and place reminds us that environments also differ. Yesterday’s plundering Vikings have become today’s peace-promoting Scandinavians. Like all behavior, aggression arises from the interaction of persons and situations.

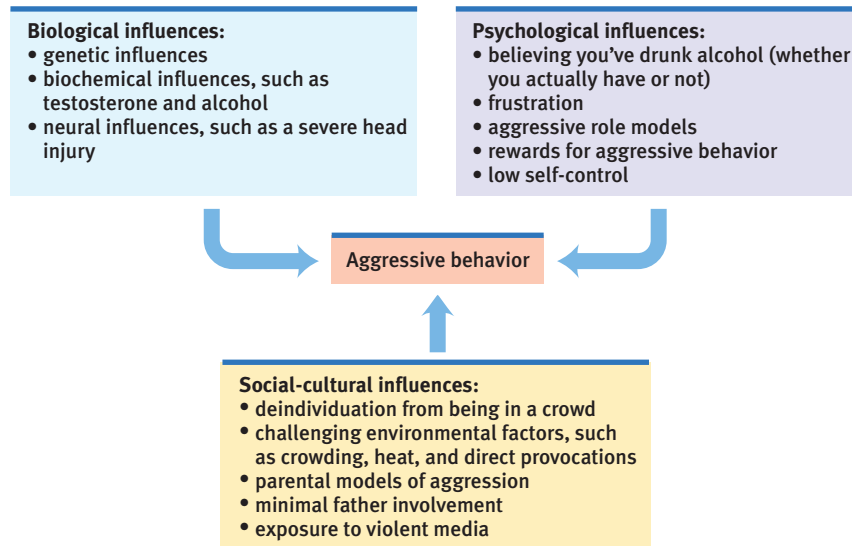


FIGURE 13.12
Biopsychosocial understanding of aggression Because many factors contribute to aggressive behavior, there are many ways to change such behavior, including learning anger management and communication skills, and avoiding violent media and video games.

RETRIEVE IT

- What psychological, biological, and social-cultural influences interact to produce aggressive behaviors?

ANSWER: Our biology (our genes, neural systems, and biochemistry—including testosterone and alcohol levels) influences our tendencies to be aggressive. Psychological factors (such as frustration, previous rewards for aggressive acts, and observation of others' aggression) can trigger any aggressive tendencies we may have. Social influences, such as exposure to violent media, and cultural influences, such as whether we've grown up in a "culture of honor" or had a father-absent home, can also affect our aggressive responses.

Attraction

Pause a moment and think about your relationships with two people—a close friend and someone who has stirred your feelings of romantic love. What psychological chemistry binds us together in these special sorts of attachments that help us cope with all other relationships? Social psychology suggests some answers.

The Psychology of Attraction



13-12: Why do we befriend or fall in love with some people but not others?

We endlessly wonder how we can win others' affection and what makes our own affections flourish or fade. Does familiarity breed contempt, or does it intensify affection? Do birds of a feather flock together, or do opposites attract? Is beauty only skin deep, or does attractiveness matter greatly? To explore these questions, let's consider three ingredients of our liking for one another: proximity, attractiveness, and similarity.

Proximity Before friendships become close, they must begin. *Proximity*—geographic nearness—is friendship's most powerful predictor. Proximity provides opportunities for aggression, but much more often it breeds liking. Study after study reveals that people are most inclined to like, and even to marry, those who live in the same neighborhood, who sit nearby in class, who work in the same office, who share the same parking lot, who eat in the same dining hall. Look around. Mating starts with meeting. (For a twenty-first-century technology that connects people not in physical proximity, see Close-Up: Online Matchmaking and Speed Dating on the next page.)

CLOSE UP:

Online Matchmaking and Speed Dating

If you have not found a romantic partner in your immediate proximity, why not cast a wider net by joining the estimated 30 million people who each year try one of the 1500 online dating services (Ellin, 2009)?

Published research on the effectiveness of Internet matchmaking services is sparse. Nevertheless, Katelyn McKenna and John Bargh and their colleagues have offered a surprising finding: Compared with relationships formed in person, Internet-formed friendships and romantic relationships are, on average, more likely to last beyond two years (Bargh et al., 2002, 2004; McKenna & Bargh, 1998, 2000; McKenna et al., 2002). In one of their studies, people disclosed more, with less posturing, to those whom they met online. When conversing online with someone for 20 minutes, they felt more liking for that person than they did for someone they had met and talked with face to face. This was true even when (unknown to them) it was the same person! Internet friendships often feel as real and important to people as in-person relationships. Small wonder that Harris Interactive (2010) found one leading online matchmaker enabling more than 500 U.S. marriages a day.

Speed dating pushes the search for romance into high gear. In a process pioneered by a matchmaking Jewish rabbi, people meet a succession of prospective partners, either in person or via webcam (Bower, 2009). After a 3- to 8-minute conversation, people move on to the next person. (In an in-person meeting, one partner—usually the woman—remains seated and the other circulates.) Those who want to meet again can arrange for future contacts. For many participants, 4 minutes is enough time to form a feeling about a conversational partner and to register whether the partner likes them (Eastwick & Finkel, 2008a,b).

Researchers have quickly realized that speed dating offers a unique opportunity for studying influences on our first impressions of potential romantic partners. Among recent findings are these:

- Men are more transparent. Observers (male or female) watching videos of speed-dating encounters can read a man's level of romantic interest more accurately than a woman's (Place et al., 2009).
- Given more options, people's choices become more superficial. Meeting lots of potential partners leads people to focus



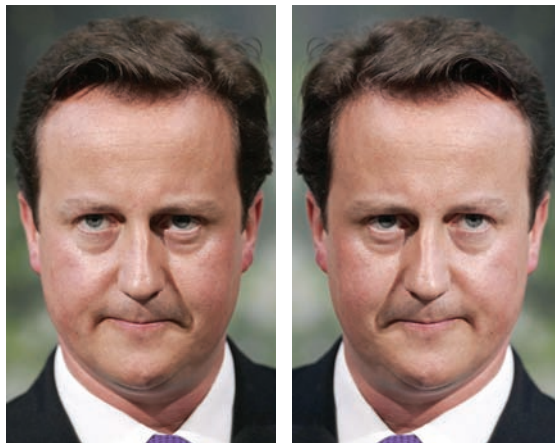
on more easily assessed characteristics, such as height and weight (Lenton & Francesconi, 2010). This was true even when researchers controlled for time spent with each partner.

- Men wish for future contact with more of their speed dates; women tend to be more choosy. But this gender difference disappears if the conventional roles are reversed, so that men stay seated while women circulate (Finkel & Eastwick, 2009).

mere exposure effect the phenomenon that repeated exposure to novel stimuli increases liking of them.

The mere exposure effect

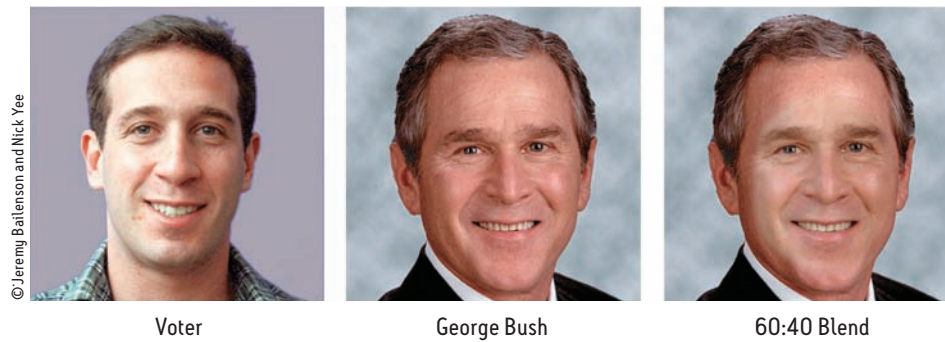
The mere exposure effect applies even to ourselves. Because the human face is not perfectly symmetrical, the face we see in the mirror is not the same face our friends see. Most of us prefer the familiar mirror image, while our friends like the reverse (Mita et al., 1977). The real British Prime Minister David Cameron is at left. The person he sees in the mirror each morning is shown at right, and that's the photo he would probably prefer.



SHAWN CURRY/AFP/Getty Images

Proximity breeds liking partly because of the **mere exposure effect**. Repeated exposure to novel stimuli increases our liking for them. This applies to nonsense syllables, musical selections, geometric figures, Chinese characters, human faces, and the letters of our own name (Moreland & Zajonc, 1982; Nuttin, 1987; Zajonc, 2001). We are even somewhat more likely to marry someone whose first or last name resembles our own (Jones et al., 2004).

So, within certain limits, familiarity breeds fondness (Bornstein, 1989, 1999). Researchers demonstrated this by having four equally attractive women silently attend a 200-student class for zero, 5, 10, or 15 class sessions (Moreland & Beach, 1992). At the end of the course, students were shown slides of each woman and asked to rate her attractiveness. The most attractive? The ones they'd seen most often. The phenomenon would come as no surprise to the young Taiwanese man who wrote more than 700 letters to his girlfriend, urging her to marry him. She did marry—the mail carrier (Steinberg, 1993).



© Jeremy Bailenson and Nick Yee

FIGURE 13.13

I like the candidate who looks a bit like dear old me Jeremy Bailenson and his colleagues (2005) incorporated morphed features of voters' faces into the faces of 2004 U.S. presidential candidates George Bush (shown here) and John Kerry. Without conscious awareness of their own incorporated features, the participants became more likely to favor the candidate whose face incorporated some of their own features.

No face is more familiar than your own. And that helps explain an interesting finding by Lisa DeBruine (2004): We like other people when their faces incorporate some morphed features of our own. When DeBruine (2002) had McMaster University students (both men and women) play a game with a supposed other player, they were more trusting and cooperative when the other person's image had some of their own facial features morphed into it. In me I trust. (See also **FIGURE 13.13**.)

Physical Attractiveness Once proximity affords us contact, what most affects our first impressions? The person's sincerity? Intelligence? Personality? Hundreds of experiments reveal that it is something far more superficial: Physical appearance. This finding is unnerving for most of us who were taught that "beauty is only skin deep" and that "appearances can be deceiving."

In one early study, researchers randomly matched new University of Minnesota students for a Welcome Week dance (Walster et al., 1966). Before the dance, the researchers gave each student a battery of personality and aptitude tests, and they rated each student's level of physical attractiveness. On the night of the blind date, the couples danced and talked for more than two hours and then took a brief intermission to rate their dates. What determined whether they liked each other? Only one thing seemed to matter: appearance. Both the men and the women liked good-looking dates best. Women are more likely than men to say that another's looks don't affect them (Lippa, 2007). But studies show that a man's looks do affect women's behavior (Feingold, 1990; Sprecher, 1989; Woll, 1986). Speed-dating experiments confirm that attractiveness influences first impressions for both sexes (Belot & Francesconi, 2006; Finkel & Eastwick, 2008).

Physical attractiveness also predicts how often people date and how popular they feel. It affects initial impressions of people's personalities. We don't assume that attractive people are more compassionate, but research participants have perceived them as healthier, happier, more sensitive, more successful, and more socially skilled (Eagly et al., 1991; Feingold, 1992; Hatfield & Sprecher, 1986). Attractive, well-dressed people have been more likely to make a favorable impression on potential employers, and they have tended to be more successful in their jobs (Cash & Janda, 1984; Langlois et al., 2000; Solomon, 1987). Income analyses show a penalty for plainness or obesity and a premium for beauty (Engemann & Owyang, 2005).

An analysis of 100 top-grossing films from 1940 into the 1990s found that attractive characters were portrayed as morally superior to unattractive characters (Smith et al., 1999). But Hollywood modeling doesn't explain why, to judge from their gazing times, even babies have preferred attractive over unattractive faces (Langlois et al., 1987). Some blind people feel similarly, as University of Birmingham professor John Hull (1990, p. 23) discovered after going blind. A colleague's remarks on a woman's beauty would strangely affect his feelings. He found this "deplorable. . . . What can it matter to me what sighted men think of women . . . yet I do care what sighted men think, and I do not seem able to throw off this prejudice."



When Neanderthals fall in love.

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"Personal beauty is a greater recommendation than any letter of introduction."

Aristotle, *Apothegems*, 330 B.C.E.

Percentage of Men and Women Who
“Constantly Think About Their Looks”

	Men	Women
Canada	18%	20%
United States	17	27
Mexico	40	45
Venezuela	47	65

From Roper Starch survey, reported by McCool (1999).

Women have 91 percent of cosmetic procedures (ASPS, 2010). Women also recall others' appearance better than do men (Mast & Hall, 2006).

For those who find importance of looks unfair and unenlightened, two attractiveness findings may be reassuring. First, people's attractiveness has been surprisingly unrelated to their self-esteem and happiness (Diener et al., 1995; Major et al., 1984). Unless we have just compared ourselves with superattractive people, few of us (thanks, perhaps, to the mere exposure effect) view ourselves as unattractive (Thornton & Moore, 1993). Second, strikingly attractive people are sometimes suspicious that praise for their work may simply be a reaction to their looks. Less attractive people have been more likely to accept praise as sincere (Berscheid, 1981).

Beauty is in the eye of the culture. Hoping to look attractive, people across the globe have pierced and tattooed various body parts, lengthened their necks, bound their feet, and dyed or painted their skin and hair. They have gorged themselves to achieve a full figure or liposuctioned fat to achieve a slim one, applied chemicals hoping to rid themselves of unwanted hair or to regrow wanted hair, strapped on leather garments to make their breasts seem smaller or surgically filled their breasts with silicone and worn Wonderbras to make them look bigger. Cultural ideals change over time. For women in North America, the ultra-thin ideal of the Roaring Twenties gave way to the soft, voluptuous Marilyn Monroe ideal of the 1950s, only to be replaced by today's lean yet busty ideal.

If we're not born attractive, we may try to buy beauty. Americans now spend more on beauty supplies than on education and social services combined. Still not satisfied, millions undergo plastic surgery, teeth capping and whitening, Botox skin smoothing, and laser hair removal (ASPS, 2010).

Some aspects of attractiveness, however, do cross place and time (Cunningham et al., 2005; Langlois et al., 2000). By providing reproductive clues, bodies influence sexual attraction. As evolutionary psychologists explain (see Chapter 5), men in many cultures, from Australia to Zambia, judge women as more attractive if they have a youthful, fertile appearance, suggested by a low waist-to-hip ratio (Karremans et al., 2010; Perilloux et al., 2010; Platek & Singh, 2010). Women feel attracted to healthy-looking men, but especially—and the more so when ovulating—to those who seem mature, dominant, masculine, and affluent (Gallup & Frederick, 2010; Gangestad et al., 2010). But faces matter, too. When people separately rate opposite-sex faces and bodies, the face tends to be the better predictor of overall physical attractiveness (Currie & Little, 2009; Peters et al., 2007).

Our feelings also influence our attractiveness judgments. Imagine two people. The first is honest, humorous, and polite. The second is rude, unfair, and abusive. Which one is more attractive? Most people perceive the person with the appealing traits as also more physically attractive (Lewandowski et al., 2007). Those we like we find attractive. In a Rodgers and Hammerstein musical, Prince Charming asks Cinderella, “Do I love you because you're beautiful, or are you beautiful because I love you?” Chances are it's both. As we see our loved ones again and again, their physical imperfections grow less noticeable and their attractiveness grows more apparent (Beaman & Klentz, 1983; Gross & Crofton, 1977). Shakespeare said it in *A Midsummer Night's Dream*: “Love looks not with the eyes, but with the mind.” Come to love someone and watch beauty grow.

In the eye of the beholder Conceptions of attractiveness vary by culture. Yet some adult physical features, such as a healthy appearance, seem attractive everywhere.



Minjam Letschi/Alamy



Danita Delimont/Alamy



Ingram Publishing / Jupiterimages

© ABC TV. Courtesy: Everett Collection



Extreme makeover In affluent, beauty-conscious cultures, increasing numbers of people, such as this woman from the American TV show *Extreme Makeover*, have turned to cosmetic surgery to improve their looks. If money were no concern, might you ever do the same?

Similarity So proximity has brought you into contact with someone, and your appearance has made an acceptable first impression. What now influences whether you will become friends? As you get to know each other better, will the chemistry be better if you are opposites or if you are alike?

It makes a good story—extremely different types liking or loving each other: Frog and Toad in Arnold Lobel’s books, Edward and Bella in the *Twilight* series. The stories delight us by expressing what we seldom experience, for in real life, opposites retract (Rosenbaum, 1986). Compared with randomly paired people, friends and couples have been far more likely to share common attitudes, beliefs, and interests (and, for that matter, age, religion, race, education, intelligence, smoking behavior, and economic status).

Moreover, the more alike people are, the more their liking has endured (Byrne, 1971). Journalist Walter Lippmann was right to suppose that love lasts “when the lovers love many things together, and not merely each other.” Similarity breeds content. Dissimilarity often fosters disfavor, which helps explain many straight men’s disapproval of gay men who are doubly dissimilar from themselves in sexual orientation and gender roles (Lehavot & Lambert, 2007).

Proximity, attractiveness, and similarity are not the only determinants of attraction. We also like those who like us. This is especially so when our self-image is low. When we believe someone likes us, we feel good and respond to them warmly, which leads them to like us even more (Curtis & Miller, 1986). To be liked is powerfully rewarding.

Indeed, all the findings we have considered so far can be explained by a simple *reward theory of attraction*: We will like those whose behavior is rewarding to us, and we will continue relationships that offer more rewards than costs. When people live or work in close proximity with us, it costs less time and effort to develop the friendship and enjoy its benefits. When people are attractive, they are aesthetically pleasing, and associating with them can be socially rewarding. When people share our views, they reward us by validating our own.

RETRIEVE IT

- People tend to marry someone who lives or works nearby. This is an example of the _____ in action.

ANSWER: mere exposure effect

- How does being physically attractive influence others’ perceptions?

ANSWER: Being physically attractive tends to elicit positive first impressions. People tend to assume that attractive people are healthier, happier, and more socially skilled than others are.



Beauty grows with mere exposure

Herman Miller, Inc.’s famed Aeron chair initially received high comfort ratings but abysmal beauty ratings. To some it looked like “lawn furniture” or “a giant prehistoric insect” (Gladwell, 2005). But then, with design awards, media visibility, and imitators, the ugly duckling came to be the company’s best-selling chair ever and to be seen as beautiful. With people, too, beauty lies partly in the beholder’s eye and can grow with exposure.

Aeron work chair, courtesy of Herman Miller, Inc.

Romantic Love



13-13: How does romantic love typically change as time passes?

Sometimes people move quickly from initial impressions, to friendship, to the more intense, complex, and mysterious state of romantic love. If love endures, temporary *passionate love* will mellow into a lingering *companionate love* (Hatfield, 1988).

Snapshots at jasonlove.com



Bill looked at Susan, Susan at Bill. Suddenly death didn't seem like an option. This was love at first sight.

"When two people are under the influence of the most violent, most insane, most delusive, and most transient of passions, they are required to swear that they will remain in that excited, abnormal, and exhausting condition continuously until death do them part."

George Bernard Shaw, "Getting Married," 1908

passionate love an aroused state of intense positive absorption in another, usually present at the beginning of a love relationship.

companionate love the deep affectionate attachment we feel for those with whom our lives are intertwined.

equity a condition in which people receive from a relationship in proportion to what they give to it.

self-disclosure revealing intimate aspects of oneself to others.

Passionate Love A key ingredient of **passionate love** is arousal. The two-factor theory of emotion (Chapter 10) can help us understand this intense positive absorption in another (Hatfield, 1988). That theory assumes that:

- emotions have two ingredients—*physical arousal* plus *cognitive appraisal*.
- arousal from any source can enhance one emotion or another, depending on how we interpret and label the arousal.

In one famous experiment, researchers studied people crossing two bridges above British Columbia's rocky Capilano River (Dutton & Aron, 1974, 1989). One, a swaying footbridge, was 230 feet above the rocks; the other was low and solid. The researchers had an attractive young woman intercept men coming off each bridge, and ask their help in filling out a short questionnaire. She then offered her phone number in case they wanted to hear more about her project. Far more of those who had just crossed the high bridge—which left their hearts pounding—accepted the number and later called the woman. To be revved up and to associate some of that arousal with a desirable person is to feel the pull of passion. Adrenaline makes the heart grow fonder. And when sexual desire is supplemented by a growing attachment, the result is the passion of romantic love (Berscheid, 2010).

Companionate Love Although the desire and attachment of romantic love often endure, the intense absorption in the other, the thrill of the romance, the giddy "floating on a cloud" feelings typically fade. Does this mean the French are correct in saying that "love makes the time pass and time makes love pass"? Or can friendship and commitment keep a relationship going after the passion cools?

The evidence indicates that, as love matures, it becomes a steadier **companionate love**—a deep, affectionate attachment (Hatfield, 1988). The flood of passion-facilitating hormones (testosterone, dopamine, adrenaline) subsides and another hormone, oxytocin, supports feelings of trust, calmness, and bonding with the mate. In the most satisfying of marriages, attraction and sexual desire endure, minus the obsession of early stage romance (Acevedo & Aron, 2009).

There may be adaptive wisdom to the shift from passion to attachment (Reis & Aron, 2008). Passionate love often produces children, whose survival is aided by the parents' waning obsession with one another. Failure to appreciate passionate love's limited half-life can doom a relationship (Berscheid et al., 1984). Indeed, recognizing the short duration of obsessive passionate love, some societies deem such feelings to be an irrational reason for marrying. Better, they say, to choose (or have someone choose for you) a partner with a compatible background and interests. Non-Western cultures, where people rate love less important for marriage, do have lower divorce rates (Levine et al., 1995).

One key to a gratifying and enduring relationship is **equity**. When equity exists—when both partners receive in proportion to what they give—their chances for sustained and satisfying companionate love have been good (Gray-Little & Burks, 1983; Van Yperen & Buunk, 1990). In one national survey, "sharing household chores" ranked third, after "faithfulness" and a "happy sexual relationship," on a list of nine things people associated with successful marriages. "I like hugs. I like kisses. But what I really love is help with the dishes," summarized the Pew Research Center (2007).

Equity's importance extends beyond marriage. Mutually sharing self and possessions, making decisions together, giving and getting emotional support, promoting and caring about each other's welfare—all of these acts are at the core of every type of loving relationship (Sternberg & Grajek, 1984). It's true for lovers, for parent and child, and for close friends.

Another vital ingredient of loving relationships is **self-disclosure**, the revealing of intimate details about ourselves—our likes and dislikes, our dreams and worries, our proud and shameful moments. "When I am with my friend," noted the Roman statesman Seneca, "I think I am alone, and as much at liberty to speak anything as to think it." Self-disclosure breeds liking, and liking breeds self-disclosure (Collins & Miller,

HI & LOIS



1994). As one person reveals a little, the other reciprocates, the first then reveals more, and on and on, as friends or lovers move to deeper and deeper intimacy (Baumeister & Bratslavsky, 1999).

One experiment marched student pairs through 45 minutes of increasingly self-disclosing conversation—from “When did you last sing to yourself?” to “When did you last cry in front of another person? By yourself?” Others spent the time with small-talk questions, such as “What was your high school like?” (Aron et al., 1997). By the experiment’s end, those experiencing the escalating intimacy felt much closer to their conversation partner than did the small-talkers.

In addition to equity and self-disclosure, a third key to enduring love is *positive support*. While relationship conflicts are inevitable, we can ask ourselves whether our communications more often express sarcasm or support, scorn or sympathy, sneers or smiles. For unhappy couples, disagreements, criticisms, and put-downs are routine. For happy couples in enduring relationships, positive interactions (compliments, touches, laughing) outnumber negative interactions (sarcasm, disapproval, insults) by at least 5 to 1 (Gottman, 2007; see also Sullivan et al., 2010).

In the mathematics of love, self-disclosing intimacy + mutually supportive equity = enduring companionate love.



AP Photo/Archaeological Society SAP, ho

Love is an ancient thing In 2007, a 5000 to 6000 year old “Romeo and Juliet” young couple was unearthed locked in embrace, near Rome.

RETRIEVE IT

- How does the two-factor theory of emotion help explain *passionate love*?
ANSWER: Emotions consist of (1) physical arousal and (2) our interpretation of that arousal. Researchers have found that any source of arousal will be interpreted as passion in the presence of a desirable person.
- Two vital components for maintaining companionate love are _____ and _____ -
ANSWERS: equity; self-disclosure

Altruism



13-14: When are people most—and least—likely to help?

Altruism is an unselfish concern for the welfare of others. In rescuing his jailer, Dirk Willems exemplified altruism. So also did Carl Wilkens and Paul Ruesabagina in Kigali, Rwanda. Wilkens, a Seventh Day Adventist missionary, was living there in 1994 with his family when Hutu militia began to slaughter the Tutsis. The U.S. government, church leaders, and friends all implored Wilkens to leave. He refused. After evacuating his family, and even after every other American had left Kigali, he alone stayed and contested the 800,000-person genocide. When the militia came to kill him and his Tutsi servants, Wilkens’ Hutu neighbors deterred them. Despite repeated death threats, he spent his days running roadblocks to take food and water to orphanages and to negotiate, plead, and bully his way through the bloodshed, saving lives time and again. “It just seemed the right thing to do,” he later explained (Kristof, 2004).

altruism unselfish regard for the welfare of others.

REUTERS/Finbarr O' Reilly



Why do genocides occur? An estimated 800,000 people died during the Rwandan Genocide of 1994, when Hutu groups carried out mass killings of Tutsis. Social psychology research helps us understand some of the factors motivating genocides. We tend to categorize our world into us and them, and, when threatened, to feel greater animosity toward outside groups.

Elsewhere in Kigali, Rusesabagina, a Hutu married to a Tutsi and the acting manager of a luxury hotel, was sheltering more than 1200 terrified Tutsis and moderate Hutus. When international peacemakers abandoned the city and hostile militia threatened his guests in the “Hotel Rwanda” (as it came to be called in a 2004 movie), the courageous Rusesabagina began cashing in past favors. He bribed the militia and telephoned influential people abroad to exert pressure on local authorities, thereby sparing the lives of the hotel’s occupants despite the surrounding chaos. Both Wilkens and Rusesabagina were displaying altruism, an unselfish regard for the welfare of others.

Altruism became a major concern of social psychologists after an especially vile act of sexual violence. On March 13, 1964, a stalker repeatedly stabbed Kitty Genovese, then raped her as she lay dying outside her Queens, New York, apartment at 3:30 A.M. “Oh, my God, he stabbed me!” Genovese screamed into the early morning stillness. “Please help me!” Windows opened and lights went on as neighbors heard her screams. Her attacker fled and then returned to stab and rape her again. Not until he had fled for good did anyone so much as call the police, at 3:50 A.M.

Bystander Intervention

Reflecting on the Genovese murder and other such tragedies, most commentators were outraged by the bystanders’ “apathy” and “indifference.” Rather than blaming the onlookers, social psychologists John Darley and Bibb Latané (1968b) attributed their inaction to an important situational factor—the presence of others. Given certain circumstances, they suspected, most of us might behave similarly.

After staging emergencies under various conditions, Darley and Latané assembled their findings into a decision scheme: We will help only if the situation enables us first to *notice* the incident, then to *interpret* it as an emergency, and finally to *assume responsibility* for helping (**FIGURE 13.14**). At each step, the presence of others can turn us away from the path that leads to helping.

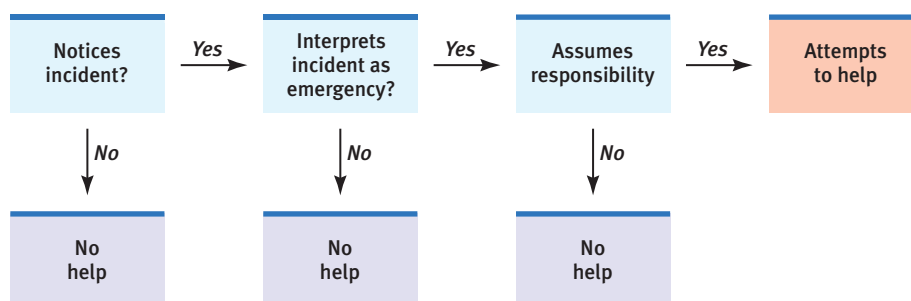
Darley and Latané reached their conclusions after interpreting the results of a series of experiments. For example, they simulated a physical emergency in their laboratory as students participated in a discussion over an intercom. Each student was in a separate cubicle, and only the person whose microphone was switched on could be heard. When his turn came, one student (an accomplice of the experimenters) made sounds as though he were having an epileptic seizure, and he called for help (Darley & Latané, 1968a).

How did the other students react? As **FIGURE 13.15** shows, those who believed only they could hear the victim—and therefore thought they alone were responsible for helping him—usually went to his aid. Students who thought others also could hear the victim’s cries were more likely to react as Kitty Genovese’s neighbors had. When more people shared responsibility for helping—when there was a *diffusion of responsibility*—any single listener was less likely to help.

Hundreds of additional experiments have confirmed this **bystander effect**. For example, researchers and their assistants took 1497 elevator rides in three cities and

FIGURE 13.14

The decision-making process for bystander intervention Before helping, one must first notice an emergency, then correctly interpret it, and then feel responsible. (From Darley & Latané, 1968b.)



Viviane Moos/Corbis

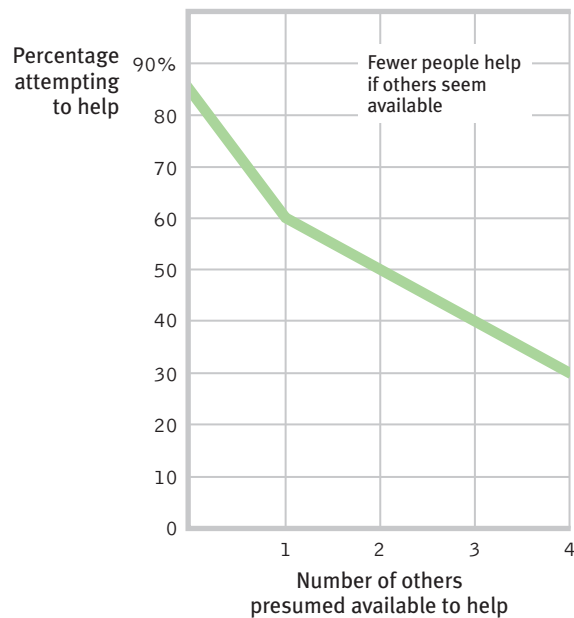


FIGURE 13.15
Responses to a simulated physical emergency When people thought they alone heard the calls for help from a person they believed to be having an epileptic seizure, they usually helped. But when they thought four others were also hearing the calls, fewer than a third responded. (From Darley & Latané, 1968a.)

bystander effect the tendency for any given bystander to be less likely to give aid if other bystanders are present.

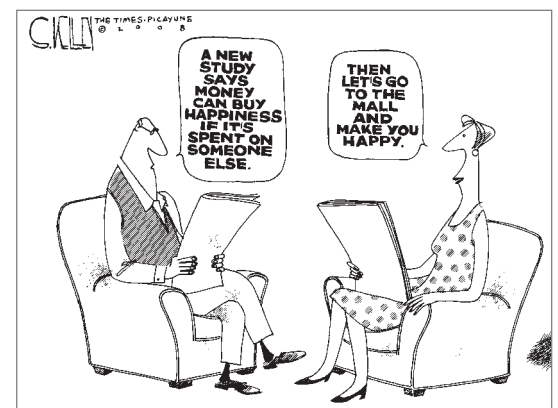
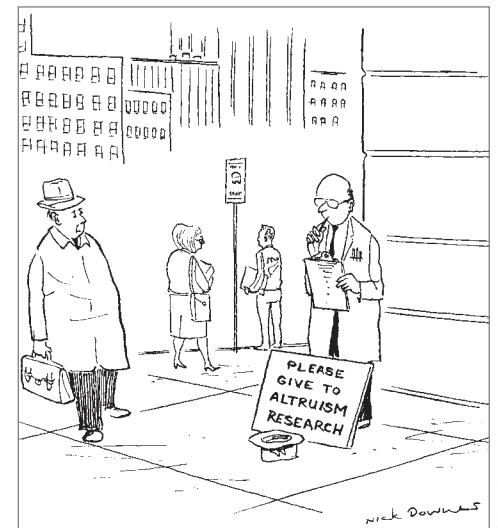
“accidentally” dropped coins or pencils in front of 4813 fellow passengers (Latané & Darley, 1975). When alone with the person in need, 40 percent helped; in the presence of 5 other bystanders, only 20 percent helped.

Observations of behavior in thousands of such situations—relaying an emergency phone call, aiding a stranded motorist, donating blood, picking up dropped books, contributing money, giving time—show that the *best* odds of our helping someone occur when

- the person appears to need and deserve help.
- the person is in some way similar to us.
- the person is a woman.
- we have just observed someone else being helpful.
- we are not in a hurry.
- we are in a small town or rural area.
- we are feeling guilty.
- we are focused on others and not preoccupied.
- we are in a good mood.

This last result, that happy people are helpful people, is one of the most consistent findings in all of psychology. As poet Robert Browning (1868) observed, “Oh, make us happy and you make us good!” It doesn’t matter how we are cheered. Whether by being made to feel successful and intelligent, by thinking happy thoughts, by finding money, or even by receiving a posthypnotic suggestion, we become more generous and more eager to help (Carlson et al., 1988).

So happiness breeds helpfulness. But it’s also true that helpfulness breeds happiness. Making charitable donations activates brain areas associated with reward (Harbaugh et al., 2007). That helps explain a curious finding: People who give money away are happier than those who spend it almost entirely on themselves. In one experiment, researchers gave people an envelope with cash and instructions either to spend it on themselves or to spend it on others (Dunn et al., 2008). Which group was happiest at the day’s end? It was, indeed, those assigned to the spend-it-on-others condition.



RETRIEVE IT

- Why didn't anybody help Kitty Genovese? What social relations principle did this incident illustrate?

ANSWER: In the presence of others, an individual is less likely to notice a situation, correctly interpret it as an emergency, and then take responsibility for offering help. The Kitty Genovese case demonstrated this *bystander effect*, as each witness assumed many others were also aware of the event.

The Norms for Helping



13-15: How do social exchange theory and social norms explain helping behavior?

Why do we help? One widely held view is that self-interest underlies all human interactions, that our constant goal is to maximize rewards and minimize costs. Accountants call it *cost-benefit analysis*. Philosophers call it *utilitarianism*. Social psychologists call it **social exchange theory**. If you are pondering whether to donate blood, you may weigh the costs of doing so (time, discomfort, and anxiety) against the benefits (reduced guilt, social approval, and good feelings). If the rewards exceed the costs, you will help.

Others believe that we help because we have been socialized to do so, through norms that prescribe how we *ought* to behave. Through socialization, we learn the **reciprocity norm**, the expectation that we should return help, not harm, to those who have helped us. In our relations with others of similar status, the reciprocity norm compels us to give (in favors, gifts, or social invitations) about as much as we receive.

The reciprocity norm kicked in after Dave Tally, a Tempe, Arizona, homeless man, found \$3300 in a backpack that had been lost by an Arizona State University student headed to buy a used car (Lacey, 2010). Instead of using the cash for much-needed bike repairs, food, and shelter, Tally turned the backpack in to the social service agency where he volunteered. To reciprocate Tally's help, the student thanked him with a monetary reward. Hearing about Tally's self-giving deeds, dozens of others also sent him money and job offers.

We also learn a **social-responsibility norm**: that we should help those who need our help, such as young children and others who cannot give as much as they receive, even if the costs outweigh the benefits. People who attend weekly religious services often are admonished to practice the social-responsibility norm, and sometimes they do. In American surveys, they have reported twice as many volunteer hours spent helping the poor and infirm, compared with those who rarely or never attend religious services (Hodgkinson & Weitzman, 1992; Independent Sector, 2002). Between 2006 and 2008, Gallup polls sampled more than 300,000 people across 140 countries, comparing those "highly religious" (who said religion was important to them and who had attended a religious service in the prior week) to those less religious. The highly religious, despite being poorer, were about 50 percent more likely to report having "donated money to a charity in the last month" and to have volunteered time to an organization (Pelham & Crabtree, 2008).

Although positive social norms encourage generosity and enable group living, conflicts often divide us.

social exchange theory the theory that our social behavior is an exchange process, the aim of which is to maximize benefits and minimize costs.

reciprocity norm an expectation that people will help, not hurt, those who have helped them.

social-responsibility norm an expectation that people will help those dependent upon them.

conflict a perceived incompatibility of actions, goals, or ideas.

social trap a situation in which the conflicting parties, by each rationally pursuing their self-interest, become caught in mutually destructive behavior.

Conflict and Peacemaking

With astonishing speed, recent democratic movements have swept away totalitarian rule in Eastern European and Arab countries. Yet *every day*, the world continues to spend more than \$3 billion for arms and armies—money that could have been used for housing, nutrition, education, and health care. Knowing that wars begin in human minds, psychologists have wondered: What in the human mind causes destructive conflict? How might the perceived threats of social diversity be replaced by a spirit of cooperation?

Elements of Conflict



13-16: How do social traps and mirror-image perceptions fuel social conflict?

To a social psychologist, a **conflict** is a perceived incompatibility of actions, goals, or ideas. The elements of conflict are much the same, whether we are speaking of nations at war, cultural groups feuding within a society, or partners sparring in a relationship. In each situation, people become enmeshed in potentially destructive processes that can produce results no one wants. Among these processes are social traps and distorted perceptions.

Social Traps In some situations, we support our collective well-being by pursuing our personal interests. As capitalist Adam Smith wrote in *The Wealth of Nations* (1776), “It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest.” In other situations, we harm our collective well-being by pursuing our personal interests. Such situations are **social traps**.

Consider the simple game matrix in **FIGURE 13.16**, which is similar to those used in experiments with countless thousands of people. Both sides can win or both can lose, depending on the players’ individual choices. Pretend you are Person 1, and that you and Person 2 will each receive the amount shown after you separately choose either *A* or *B*. (You might invite someone to look at the matrix with you and take the role of Person 2.) Which do you choose—*A* or *B*?

You and Person 2 are caught in a dilemma. If you both choose *A*, you both benefit, making \$5 each. Neither of you benefits if you both choose *B*, for neither of you makes anything. Nevertheless, on any single trial you serve your own interests if you choose *B*: You can’t lose, and you might make \$10. But the same is true for the other person. Hence, the social trap: As long as you both pursue your own immediate best interest and choose *B*, you will both end up with nothing—the typical result—when you could have made \$5.

Many real-life situations similarly pit our individual interests against our communal well-being. Individual car owners reason, “Hybrid and electric cars are more expensive and not as cool as the model I’d like to buy. Besides, the fuel that I burn in my one car doesn’t noticeably add to the greenhouse gases.” When enough people reason similarly, the collective result threatens disaster—climate change with rising seas and more extreme weather.

Social traps challenge us to find ways of reconciling our right to pursue personal well-being with our responsibility for the well-being of all. Psychologists have therefore explored ways to convince people to cooperate for their mutual betterment—through

		Person 1	
		Choose A	Choose B
Person 2	Choose A	Optimal outcome +\$5	+\$10
	Choose B	+\$5	Probable outcome 0

FIGURE 13.16

Social-trap game matrix By pursuing our self-interest and not trusting others, we can end up losers. To illustrate this, imagine playing the game above. The light-orange triangles show the outcomes for Person 1, which depend on the choices made by both players. If you were Person 1, would you choose *A* or *B*? (This game is called a *non-zero-sum* game because the outcomes need not add up to zero; both sides can win or both can lose.)



AP Photo/Lisa Poole

Not in my ocean! Many people support alternative energy sources, including wind turbines. But proposals to construct wind farms in real-world neighborhoods elicit less support. One such proposal, for locating wind turbines off the coast of Massachusetts’ Nantucket Island, produced heated debate over the future benefits of clean energy versus the costs of altering treasured ocean views and, possibly, migratory bird routes.

mirror-image perceptions mutual views often held by conflicting people, as when each side sees itself as ethical and peaceful and views the other side as evil and aggressive.

agreed-upon *regulations*, through better *communication*, and through promoting *awareness* of our responsibilities toward community, nation, and the whole of humanity (Dawes, 1980; Linder, 1982; Sato, 1987). Given effective regulations, communication, and awareness, people more often cooperate, whether it be in playing a laboratory game or the real game of life.

Enemy Perceptions Psychologists have noted that those in conflict have a curious tendency to form diabolical images of one another. These distorted images are, ironically, so similar that we call them **mirror-image perceptions**: As we see “them”—as untrustworthy, with evil intentions—so “they” see us. Each demonizes the other.

Mirror-image perceptions can often feed a vicious cycle of hostility. If Juan believes Maria is annoyed with him, he may snub her, causing her to act in ways that justify his perception. As with individuals, so with countries. Perceptions become self-fulfilling prophecies.

We tend to see our own actions as responses to provocation, not as the causes of what happens next. Perceiving ourselves as returning tit for tat, we often hit back harder, as University College London volunteers did in one experiment (Shergill et al., 2003). After feeling pressure on their own finger, they were to use a mechanical device to press on another volunteer’s finger. Although told to reciprocate with the same amount of pressure, they typically responded with about 40 percent more force than they had just experienced. Despite seeking only to respond in kind, their touches soon escalated to hard presses, much as when each child after a fight claims that “I just poked him, but he hit me harder.”

The point is not that truth must lie midway between conflicting views (one may be more accurate). The point is that enemy perceptions often form mirror images. Moreover, as enemies change, so do perceptions. In American minds and media, the “bloodthirsty, cruel, treacherous” Japanese of World War II later became our “intelligent, hardworking, self-disciplined, resourceful allies” (Gallup, 1972).

RETRIEVE IT

- Why do sports fans tend to feel a sense of satisfaction when their archival team loses? Why do such feelings, in other settings, make conflict resolution more challenging?

ANSWER: Sports fans may feel a part of an *ingroup* that sets itself apart from an *outgroup* (fans of the archival team). Ingroup bias tends to develop, leading to prejudice and the view that the outgroup “deserves” misfortune. So, the archival team’s loss may seem justified. In conflicts, this kind of thinking is problematic, especially when each side in the conflict develops *mirror-image perceptions* of the other (distorted, negative images that are ironically similar).

Promoting Peace



13-17: How can we transform feelings of prejudice, aggression, and conflict into attitudes that promote peace?

How can we make peace? Can contact, cooperation, communication, and conciliation transform the ill will fed by prejudice and conflicts into peaceful attitudes? Research indicates that, in some cases, they can.

Contact Does it help to put two conflicting parties into close contact? It depends. When contact is noncompetitive and between parties of equal status, such as fellow store clerks, it typically helps. Initially prejudiced co-workers of different races have, in such circumstances, usually come to accept one another. This finding is confirmed by a statistical digest of more than 500 studies of face-to-face contact with outgroups (such as ethnic minorities, the elderly, and those with disabilities). Among the quarter-million people studied across 38 nations, contact has been correlated with, or in experimental studies has led to, more positive attitudes (Pettigrew & Tropp, 2011). Some examples:

- With interracial contact, South African Whites’ and Blacks’ “attitudes [have moved] into closer alignment” (Dixon et al., 2007; Finchilescu & Tredoux, 2010).

- Heterosexuals' attitudes toward gay people are influenced not only by what they know but also by whom they know (Smith et al., 2009). In one national survey, those who knowingly had a gay family member or close friend were twice as likely to support gay marriage as those who didn't—55 percent versus 25 percent (Neidorf & Morin, 2007).
- Even indirect contact with an outgroup member (via story reading or through a friend who has an outgroup friend) has reduced prejudice (Cameron & Rutland, 2006; Pettigrew et al., 2007).

However, contact is not always enough. In most desegregated schools, ethnic groups resegregate themselves in the lunchrooms and classrooms, and on the school grounds (Alexander & Tredoux, 2010; Clack et al., 2005; Schofield, 1986). People in each group often think that they would welcome more contact with the other group, but they assume the other group does not reciprocate the wish (Richeson & Shelton, 2007). “I don't reach out to them, because I don't want to be rebuffed; they don't reach out to me, because they're just not interested.” When such mirror-image misperceptions are corrected, friendships may then form and prejudices melt.

Cooperation To see if enemies could overcome their differences, researcher Muzafer Sherif (1966) set a conflict in motion at a boys' summer camp. He separated 22 Oklahoma City boys into two separate camp areas. Then he had the two groups compete for prizes in a series of activities. Before long, each group became intensely proud of itself and hostile to the other group's “sneaky,” “smart-alecky stinkers.” Food wars broke out. Cabins were ransacked. Fistfights had to be broken up by camp counselors. Brought together, the two groups avoided each other, except to taunt and threaten. Little did they know that within a few days, they would be friends.

Sherif accomplished this by giving them **superordinate goals**—shared goals that could be achieved only through cooperation. When he arranged for the camp water supply to “fail,” all 22 boys had to work together to restore water. To rent a movie in those pre-Netflix days, they all had to pool their resources. To move a stalled truck, the boys needed to combine their strength, pulling and pushing together. Having used isolation and competition to make strangers into enemies, Sherif used shared predicaments and goals to turn enemies into friends. What reduced conflict was not mere contact, but *cooperative* contact.

A shared predicament likewise had a powerfully unifying effect in the weeks after 9/11. Patriotism soared as Americans felt “we” were under attack. Gallup-surveyed approval of “our President” shot up from 51 percent the week before the attack to a highest-ever 90 percent level 10 days after (Newport, 2002). In chat groups and everyday speech, even the word *we* (relative to *I*) surged in the immediate aftermath (Pennebaker, 2002).

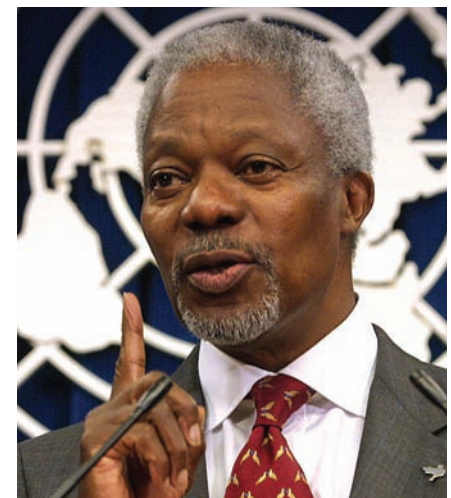
At such times, cooperation can lead people to define a new, inclusive group that dissolves their former subgroups (Dovidio & Gaertner, 1999). To accomplish this, you might seat members of two groups not on opposite sides, but alternately around a table. Give them a new, shared name. Have them work together. Then watch “us” and “them” become “we.” After 9/11, one 18-year-old New Jersey man described this shift in his own social identity: “I just thought of myself as Black. But now I feel like I'm an American, more than ever” (Sengupta, 2001). In a real experiment, White Americans who read a newspaper article about a terrorist threat against all Americans subsequently expressed reduced prejudice against Black Americans (Dovidio et al., 2004).

If cooperative contact between rival group members encourages positive attitudes, might this principle bring people together in multicultural schools? Could interracial friendships replace competitive classroom situations with cooperative ones? Could cooperative learning maintain or even enhance student achievement? Experiments with adolescents from 11 countries confirm that, in each case, the answer is *Yes* (Roseth et al., 2008). In the classroom as in the sports arena, members of interracial groups who work together on projects typically come to feel friendly toward one another. Knowing this, thousands of teachers have made interracial cooperative learning part of their classroom experience.

superordinate goals shared goals that override differences among people and require their cooperation.

“You cannot shake hands with a clenched fist.”

Indira Gandhi, 1971



Shawn Baldwin/Associated Press

Kofi Annan: “Most of us have overlapping identities which unite us with very different groups. We *can* love what we are, without hating what—and who—we are *not*. We can thrive in our own tradition, even as we learn from others” (Nobel lecture, 2001).



Syracuse Newspapers/ The Image Works

Superordinate goals override differences Cooperative efforts to achieve shared goals are an effective way to break down social barriers.

The power of cooperative activity to make friends of former enemies has led psychologists to urge increased international exchange and cooperation. As we engage in mutually beneficial trade, as we work to protect our common destiny on this fragile planet, and as we become more aware that our hopes and fears are shared, we can transform misperceptions that feed conflict into feelings of solidarity based on common interests.

Communication When real-life conflicts become intense, a third-party mediator—a marriage counselor, labor mediator, diplomat, community volunteer—may facilitate much-needed communication (Rubin et al., 1994). Mediators help each party to voice its viewpoint and to understand the other's needs and goals. If successful, mediators can replace a competitive *win-lose* orientation with a cooperative *win-win* orientation that leads to a mutually beneficial resolution. A classic example: Two friends, after quarreling over an orange, agreed to split it. One squeezed his half for juice. The other used the peel from her half to flavor a cake. If only the two had understood each other's motives, they could have hit on the win-win solution of one having all the juice, the other all the peel.

Conciliation Understanding and cooperative resolution are most needed, yet least likely, in times of anger or crisis (Bodenhausen et al., 1994; Tetlock, 1988). When conflicts intensify, images become more stereotyped, judgments more rigid, and communication more difficult, or even impossible. Each party is likely to threaten, coerce, or retaliate. In the weeks before the Persian Gulf war, the first President George Bush threatened, in the full glare of publicity, to “kick Saddam's ass.” Saddam Hussein communicated in kind, threatening to make Americans “swim in their own blood.”

Under such conditions, is there an alternative to war or surrender? Social psychologist Charles Osgood (1962, 1980) advocated a strategy of *Graduated and Reciprocated Initiatives in Tension-Reduction*, nicknamed **GRIT**. In applying GRIT, one side first announces its recognition of mutual interests and its intent to reduce tensions. It then initiates one or more small, conciliatory acts. Without weakening one's retaliatory capability, this modest beginning opens the door for reciprocity by the other party. Should the enemy respond with hostility, one reciprocates in kind. But so, too, with any conciliatory response.

In laboratory experiments, small conciliatory gestures—a smile, a touch, a word of apology—have allowed both parties to begin edging down the tension ladder to a safer rung where communication and mutual understanding can begin (Lindsfold et al., 1978, 1988). In a real-world international conflict, U.S. President John F. Kennedy's gesture of stopping atmospheric nuclear tests began a series of reciprocated conciliatory acts that culminated in the 1963 atmospheric test-ban treaty.

As working toward shared goals reminds us, we are more alike than different. Civilization advances not by conflict and cultural isolation, but by tapping the knowledge, the skills, and the arts that are each culture's legacy to the whole human race. Thanks to cultural sharing, every modern society is enriched by a cultural mix (Sowell, 1991). We have China to thank for paper and printing and for the magnetic compass that opened the great explorations. We have Egypt to thank for trigonometry. We have the Islamic world and India's Hindus to thank for our Arabic numerals. While celebrating and claiming these diverse cultural legacies, we can also welcome the enrichment of today's social diversity. We can view ourselves as instruments in a human orchestra. And we—this book's worldwide readers—can therefore each affirm our own culture's heritage while building bridges of communication, understanding, and cooperation across our cultural traditions.

RETRIEVE IT

- What are some ways to reconcile conflicts and promote peace?

GRIT Graduated and Reciprocated Initiatives in Tension-Reduction—a strategy designed to decrease international tensions.

ANSWER: Peacemakers should encourage equal-status contact, cooperation to achieve superordinate goals (shared goals that override differences), understanding through communication, and reciprocated conciliatory gestures (each side gives a little).

CHAPTER REVIEW

Social Psychology

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Social Thinking

- 13-1:** What do social psychologists study? How do we tend to explain others' behavior and our own?
- 13-2:** How do attitudes and actions interact?

Social Influence

- 13-3:** How do cultural norms affect our behavior?
- 13-4:** What is automatic mimicry, and how do conformity experiments reveal the power of social influence?
- 13-5:** What did Milgram's obedience experiments teach us about the power of social influence?
- 13-6:** How is our behavior affected by the presence of others?
- 13-7:** What are group polarization and groupthink, and how much power do we have as individuals?

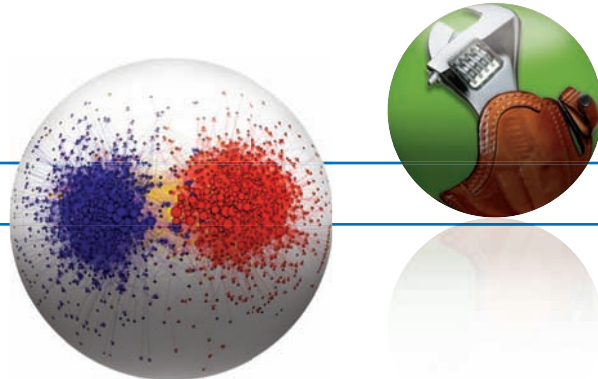
TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

social psychology, p. 458
 attribution theory, p. 458
 fundamental attribution error, p. 458
 attitude, p. 460

peripheral route persuasion, p. 460
 central route persuasion, p. 460
 foot-in-the-door phenomenon, p. 461
 role, p. 461
 cognitive dissonance theory, p. 462
 culture, p. 463
 norm, p. 464
 conformity, p. 466

normative social influence, p. 467
 informational social influence, p. 467
 social facilitation, p. 471
 social loafing, p. 472
 deindividuation, p. 472
 group polarization, p. 473
 groupthink, p. 474
 prejudice, p. 476



- stereotype, p. 476
 discrimination, p. 476
 just-world phenomenon, p. 478
 ingroup, p. 478
 outgroup, p. 478
 ingroup bias, p. 478
 scapegoat theory, p. 479
 other-race effect, p. 480
 aggression, p. 481
- frustration-aggression principle, p. 483
 social script, p. 484
 mere exposure effect, p. 488
 passionate love, p. 492
 companionate love, p. 492
 equity, p. 492
 self-disclosure, p. 492
 altruism, p. 493
 bystander effect, p. 494
- social exchange theory, p. 496
 reciprocity norm, p. 496
 social-responsibility norm, p. 496
 conflict, p. 497
 social trap, p. 497
 mirror-image perceptions, p. 498
 superordinate goals, p. 499
 GRIT, p. 500

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- If we encounter a person who appears to be high on drugs, and we make the fundamental attribution error, we will probably attribute the person's behavior to
 - moral weakness or an addictive personality.
 - peer pressure.
 - the easy availability of drugs on city streets.
 - society's acceptance of drug use.
- Celebrity endorsements in advertising often lead consumers to purchase products through _____ (central/peripheral) route persuasion.
- We tend to agree to a larger request more readily if we have already agreed to a small request. This tendency is called the _____ - _____ - _____ - _____ phenomenon.
- Jamal's therapist has suggested that Jamal should "act as if" he is confident, even though he feels insecure and shy. Which social psychological theory would best support this suggestion, and what might the therapist be hoping to achieve?
- Researchers have found that a person is most likely to conform to a group if
 - the group members have diverse opinions.
 - the person feels competent and secure.
 - the person admires the group's status.
 - no one else will observe the person's behavior.
- In Milgram's experiments, the rate of compliance was highest when
 - the "learner" was at a distance from the "teacher."
 - the "learner" was close at hand.
 - other "teachers" refused to go along with the experimenter.
 - the "teacher" disliked the "learner."
- Dr. Huang, a popular music professor, delivers fascinating lectures on music history but gets nervous and makes mistakes when describing exam statistics in front of the class. Why does his performance vary by task?
- In a group situation that fosters arousal and anonymity, a person sometimes loses self-consciousness and self-control. This phenomenon is called _____.
- Sharing our opinions with like-minded others tends to strengthen our views, a phenomenon referred to as _____.
- Prejudice toward a group involves negative feelings, a tendency to discriminate, and overly generalized beliefs referred to as _____.
- If several well-publicized murders are committed by members of a particular group, we may tend to react with fear and suspicion toward all members of that group. In other words, we
 - blame the victim.
 - overgeneralize from vivid, memorable cases.
 - view the world as just.
 - rationalize inequality.
- The other-race effect occurs when we assume that other groups are _____ (more/less) homogeneous than our own group.
- Evidence of a biochemical influence on aggression is the finding that
 - aggressive behavior varies widely from culture to culture.
 - animals can be bred for aggressiveness.
 - stimulation of an area of the brain's limbic system produces aggressive behavior.
 - a higher-than-average level of the hormone testosterone is associated with violent behavior in males.
- Studies show that parents of delinquent young people tend to use beatings to enforce discipline. This suggests that aggression can be
 - learned through direct rewards.
 - triggered by exposure to violent media.
 - learned through observation of aggressive models.
 - caused by hormone changes at puberty.

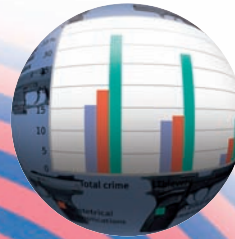
15. A conference of social scientists studying the effects of pornography unanimously agreed that violent pornography
 - a. has little effect on most viewers.
 - b. is the primary cause of reported and unreported rapes.
 - c. leads viewers to be more accepting of coercion in sexual relations.
 - d. has no effect, other than short-term arousal and entertainment.
16. The aspect of X-rated films that most directly influences men's aggression toward women seems to be the
 - a. length of the film.
 - b. eroticism portrayed.
 - c. depictions of sexual violence.
 - d. attractiveness of the actors.
17. The more familiar a stimulus becomes, the more we tend to like it. This exemplifies the _____ effect.
18. A happy couple celebrating their 50th wedding anniversary is likely to experience deep _____ love, even though their _____ love has probably decreased over the years.
19. After vigorous exercise, you meet an attractive person, and you are suddenly seized by romantic feelings for that person. This response supports the two-factor theory of emotion, which assumes that emotions, such as passionate love, consist of physical arousal plus
 - a. a reward.
 - b. proximity.
 - c. companionate love.
 - d. our interpretation of that arousal.
20. The bystander effect states that a particular bystander is less likely to give aid if
 - a. the victim is similar to the bystander in appearance.
 - b. no one else is present.
 - c. other people are present.
 - d. the incident occurs in a deserted or rural area.
21. Our enemies often have many of the same negative impressions of us as we have of them. This exemplifies the concept of _____ - _____ perceptions.
22. One way of resolving conflicts and fostering cooperation is by giving rival groups shared goals that help them override their differences. These are called _____ goals.

Find answers to these questions in Appendix E, in the back of the book.



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WHAT IS A PSYCHOLOGICAL DISORDER?

THINKING CRITICALLY ABOUT: ADHD—Normal High Energy or Genuine Disorder?

Understanding Psychological Disorders

Classifying Disorders—and Labeling People

THINKING CRITICALLY ABOUT: Insanity and Responsibility

ANXIETY DISORDERS

Generalized Anxiety Disorder

Panic Disorder

Phobias

Obsessive-Compulsive Disorder

Post-Traumatic Stress Disorder

Understanding Anxiety Disorders

MOOD DISORDERS

Major Depressive Disorder

Bipolar Disorder

Understanding Mood Disorders

CLOSE-UP: Suicide and Self-Injury

SCHIZOPHRENIA

Symptoms of Schizophrenia

Onset and Development of Schizophrenia

Understanding Schizophrenia

OTHER DISORDERS

Dissociative Disorders

Eating Disorders

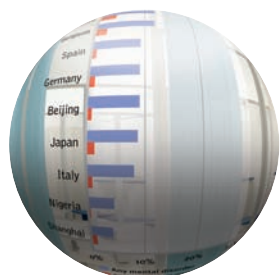
Personality Disorders

RATES OF PSYCHOLOGICAL DISORDERS





Psychological Disorders



I felt the need to clean my room . . . and would spend four to five hours at it. I would take every book out of the bookcase, dust and put it back . . . I couldn't stop.

Marc, diagnosed with obsessive-compulsive disorder (from Summers, 1996)

Whenever I get depressed it's because I've lost a sense of self. I can't find reasons to like myself. I think I'm ugly. I think no one likes me.

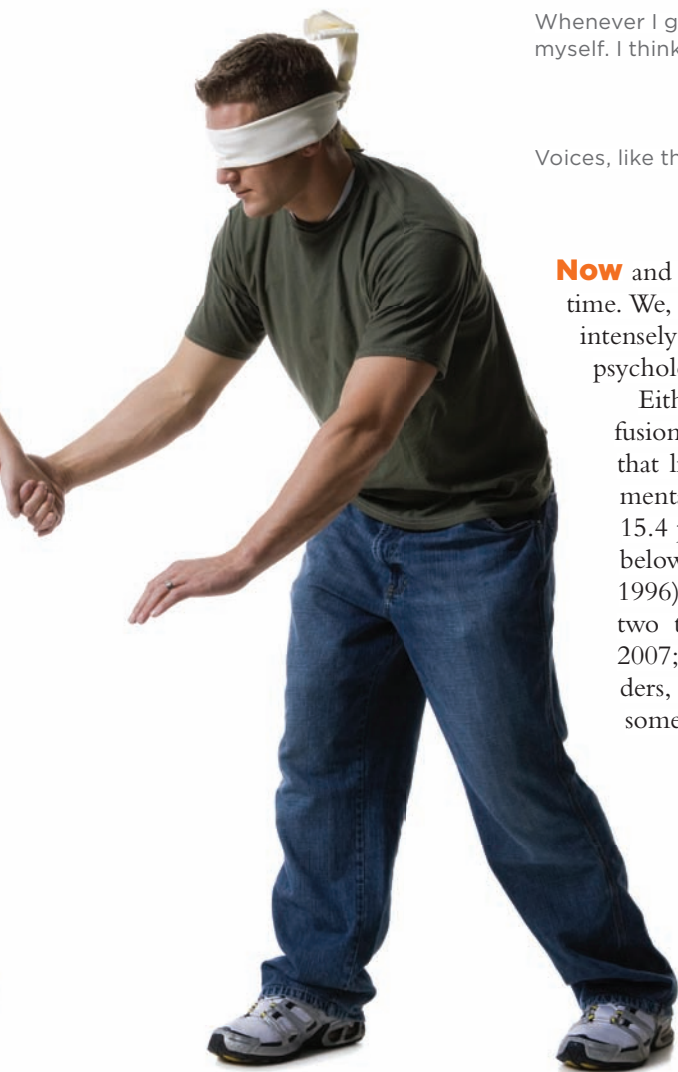
Greta, diagnosed with depression (from Thorne, 1993, p. 21)

Voices, like the roar of a crowd, came. I felt like Jesus; I was being crucified.

Stuart, diagnosed with schizophrenia (from Emmons et al., 1997)

Now and then, all of us feel, think, or act the way disturbed people do much of the time. We, too, get anxious, depressed, suspicious, deluded, or withdrawn, just less intensely and more briefly. So it's no wonder that we sometimes see ourselves in the psychological disorders we study.

Either personally or through friends or family, many of us will know the confusion and pain of unexplained physical symptoms, irrational fears, or a feeling that life is not worth living. Worldwide, some 450 million people suffer from mental or behavioral disorders (WHO, 2010). These disorders account for 15.4 percent of the years of life lost due to death or disability—scoring slightly below cardiovascular conditions and slightly above cancer (Murray & Lopez, 1996). Rates and symptoms vary by culture, but no known society is free of two terrible disorders: depression and schizophrenia (Baumeister & Härter, 2007; Draguns, 1990a,b, 1997). This chapter examines these and other disorders, and the next chapter considers their *treatment*. First, though, let's address some basic questions.



What Is a Psychological Disorder?



14-1: How should we draw the line between normal behavior and psychological disorder?

Most of us would agree that a family member who is depressed and refuses to get out of bed for three months has a psychological disorder. But what should we say about a grieving father who can't resume his usual social activities three months after his child has died? Where do we draw the line between clinical depression and understandable grief? Between bizarre irrationality and zany creativity? Between abnormality and normality?

In their search for answers, theorists and clinicians consider several perspectives:

- How should we *define* psychological disorders?
- How should we *understand* disorders—as sicknesses that need to be diagnosed and cured, or as natural responses to a troubling environment?
- How should we *classify* psychological disorders? And can we do so in a way that allows us to help people without stigmatizing them with *labels*?

A **psychological disorder** is a “significant dysfunction in an individual’s cognitions, emotions, or behaviors.” Such dysfunctions reflect “a disturbance in the psychological, biological, or developmental processes underlying mental functioning” (DSM-5 Task Force, 2012).

Dysfunctional behaviors are *maladaptive*—they interfere with normal day-to-day life. An intense fear of spiders may be abnormal, but if it doesn't interfere with your life, it is not a disorder. Marc's cleaning rituals (from this chapter's opening) did interfere with his work and leisure. If occasional sad moods persist and become disabling, they may signal a psychological disorder.

Distress often accompanies dysfunctional behaviors. Marc, Greta, and Stuart were all clearly distressed by their behaviors or emotions. In 1973, the American Psychiatric Association dropped homosexuality as a disorder as mental health workers came to consider same-sex attraction as not inherently dysfunctional or distressing. On the other hand, in the 1970s, high-energy children were typically viewed as normal youngsters running a bit wild. Today, more of them are seen as dysfunctional and diagnosed with *attention-deficit hyperactivity disorder (ADHD)*. (See Thinking Critically About: ADHD—Normal High Energy or Genuine Disorder?)

Understanding Psychological Disorders



14-3: How is our understanding of disorders affected by whether we use a medical model or a biopsychosocial approach?

The way we view a problem influences how we try to solve it. In earlier times, people often thought that strange behaviors were evidence that strange forces—the movements of the stars, god-like powers, or evil spirits—were at work. Had you lived during the Middle Ages, you might have said “The devil made him do it.” To drive out demons, people considered “mad” were sometimes caged or given “therapies” such as genital mutilation, beatings, removal of teeth or lengths of intestines, or transfusions of animal blood (Farina, 1982).

Reformers, such as Philippe Pinel (1745–1826) in France, opposed such brutal treatments. Madness is not demon possession, he insisted, but a sickness of the mind caused by severe stress and inhumane conditions. Curing the sickness, he said, requires “moral treatment,” including boosting patients' morale by unchaining them and talking with them. He and others worked to replace brutality with gentleness, isolation with activity, and filth with clean air and sunshine.

psychological disorder a significant dysfunction in a person's thoughts, feelings, or behaviors.

medical model the concept that diseases, in this case psychological disorders, have physical causes that can be *diagnosed, treated, and, in most cases, cured, often through treatment in a hospital.*

THINKING CRITICALLY ABOUT:

ADHD—Normal High Energy or Genuine Disorder?


14-2: Why is there controversy over attention-deficit hyperactivity disorder?

Eight-year-old Todd has always been energetic. At home, he chatters away and darts from one activity to the next, rarely settling down to read a book or focus on a game. At play, he is reckless and overreacts when playmates bump into him or take one of his toys. At school, his exasperated teacher complains that fidgety Todd doesn't listen, follow instructions, or stay in his seat and do his lessons. As he matures to adulthood, Todd's hyperactivity likely will subside, but his inattentiveness may persist (Kessler et al., 2010).

If taken for a psychological evaluation, Todd may be diagnosed with **attention-deficit hyperactivity disorder (ADHD)**, as are some 5 percent of children and 3 percent of adolescents who display at least one of its key symptoms (extreme inattention, hyperactivity, and impulsivity) (Polanczyk et al., 2007). Studies also find 2.5 percent of adults—though a diminishing number with age—exhibiting ADHD symptoms (Simon et al., 2009).

To skeptics, being distractible, fidgety, and impulsive sounds like a “disorder” caused by a single genetic variation: a Y chromosome. And sure enough, ADHD is diagnosed three times more often in boys than in girls. Does energetic child + boring school = ADHD overdiagnosis? Is the label being applied to healthy schoolchildren who, in more natural outdoor environments, would seem perfectly normal?

Skeptics think so. In the decade after 1987, they note, the proportion of American children being treated for ADHD nearly quadrupled (Olson et al., 2003). How commonplace the diagnosis is depends in part on teacher referrals. Some teachers refer lots of kids for ADHD assessment, others none. ADHD rates have varied by a factor of 10 in different counties of New York State (Carlson, 2000). Depending on where they live, children who are “a persistent pain in the neck in school” are often diagnosed with ADHD and given powerful prescription drugs, notes Peter Gray (2010). But the problem resides less in the child, he argues, than in today's abnormal environment that forces children to do what evolution has not prepared them to do—to sit for long hours in chairs.

On the other side of the debate are those who argue that the more frequent diagnoses of ADHD today reflect increased awareness of the disorder, especially in those areas where rates are highest. They acknowledge that diagnoses can be subjective and sometimes inconsistent—ADHD is not as objectively defined as is a broken arm. Nevertheless, declared the World Federation for Mental Health (2005), “there is strong agreement among the international scientific community that ADHD is a real neurobiological disorder whose existence should no longer be debated.” In neuroimaging studies, ADHD has associations with abnormal brain

activity patterns, noted a consensus statement by 75 researchers (Barkley et al., 2002).

What, then, is known about ADHD's causes? It is not caused by too much sugar or poor schools. ADHD often coexists with a learning disorder or with defiant and temper-prone behavior. ADHD is *heritable*, and research teams are sleuthing the culprit gene variations and abnormal neural pathways (Nikolas & Burt, 2010; Poelmans et al., 2011; Volkow et al., 2009; Williams et al., 2010). It is treatable with medications such as Ritalin and Adderall, which are considered stimulants but help calm hyperactivity and increase one's ability to sit and focus on a task—and to progress normally in school (Barbaresi et al., 2007). Psychological therapies, such as those focused on shaping behaviors in the classroom and at home, have also helped address the distress of ADHD (Fabiano et al., 2008).

The bottom line: Extreme inattention, hyperactivity, and impulsivity can derail social, academic, and vocational achievements, and these symptoms can be treated with medication and other treatment. But the debate continues over whether normal rambunctiousness is too often diagnosed as a psychiatric disorder, and whether there is a cost to the long-term use of stimulant drugs in treating ADHD.

.....
attention-deficit hyperactivity disorder (ADHD) a psychological disorder marked by the appearance by age 7 of one or more of three key symptoms: extreme inattention, hyperactivity, and impulsivity.

The Medical Model

By the 1800s, a medical breakthrough prompted further reform. Researchers discovered that syphilis, a sexually transmitted infection, invades the brain and distorts the mind. This discovery triggered an excited search for physical causes of mental disorders and for treatments that would cure them. Hospitals replaced asylums, and the **medical model** of mental disorders was born. This model is reflected in words we still use today. We speak of the mental *health* movement. A mental *illness* (also called a *psychopathology*) needs to be *diagnosed* on the basis of its *symptoms*. It needs to be *treated* through *therapy*, which may include treatment in a psychiatric *hospital*. Recent discoveries that genetically influenced abnormalities in brain structure and biochemistry contribute to many disorders have energized the medical perspective.

“Moral treatment” Under Philippe Pinel’s influence, hospitals sometimes sponsored patient dances, often called “lunatic balls,” depicted in this painting by George Bellows (*Dance in a Madhouse*).



George Wesley Bellows, *Dance in a Madhouse*, 1907. © 1997 The Art Institute of Chicago

The Biopsychosocial Approach

To call psychological disorders “sicknesses” tilts research heavily toward the influence of biology and away from the influence of our personal histories and social and cultural surroundings. But as we have seen throughout this text, our behaviors, our thoughts, and our feelings are formed by the interaction of our biology, our psychology, and our social-cultural environment. As individuals, we differ in the amount of stress we experience and in the ways we cope with stressors. Cultures also differ in the sources of stress they produce and in the ways of coping they provide.

The environment’s influence on disorders can be seen in culture-related symptoms (Beardsley, 1994; Castillo, 1997). Anxiety, for example, may be manifested in different ways in different cultures. In Malaysia, *amok*—a sudden outburst of violent behavior (thus the phrase “run amok”)—may occur. In Latin American cultures, people may display symptoms of *susto*, a condition marked by severe anxiety, restlessness, and a fear of black magic. In Japanese culture, people may experience *taijin-kyofusho*, social anxiety about their appearance, combined with a readiness to blush and a fear of eye contact, or the extreme withdrawal of *hikikomori*. The eating disorders *anorexia nervosa* and *bulimia nervosa* occur mostly in North American and other Western cultures. Increasingly, however, such North American disorders are, along with McDonald’s and MTV, spreading across the globe (Watters, 2010).

Other disorders, such as depression and schizophrenia, occur worldwide. From Asia to Africa and across the Americas, people with schizophrenia often act irrationally and speak in disorganized ways.

Disorders, it seems, reflect genetic predispositions and physiological states as well as psychological dynamics and social and cultural circumstances. The biopsychosocial approach recognizes that mind and body are inseparable (FIGURE 14.1). Negative emotions contribute to physical illness, and physical abnormalities contribute to negative emotions. We are physically embodied and socially embedded.

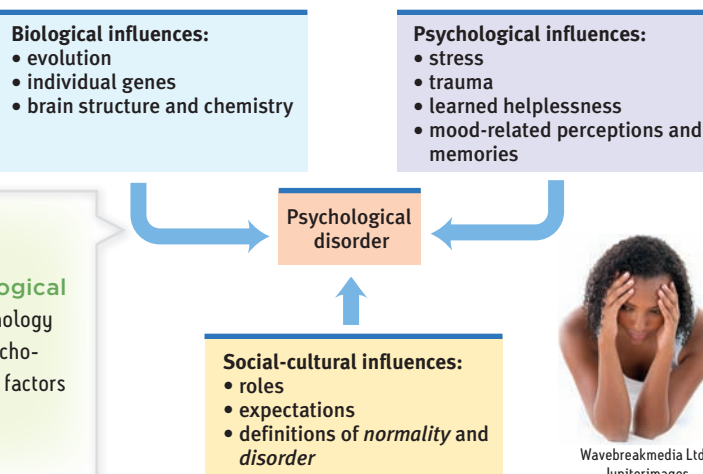


FIGURE 14.1
The biopsychosocial approach to psychological disorders Today’s psychology studies how biological, psychological, and social-cultural factors interact to produce specific psychological disorders.

RETRIEVE IT

- Are psychological disorders universal, or are they culture-specific? Explain with examples.

ANSWER: Some psychological disorders are culture-specific. For example, anorexia nervosa occurs mostly in Western cultures, and *taijin-kyofusho* appears largely in Japan. Other disorders, such as schizophrenia, occur in all cultures.

- What is the biopsychosocial perspective, and why is it important in our understanding of psychological disorders?

ANSWER: Biological, psychological, and social-cultural influences combine to produce psychological disorders. This broad perspective helps us understand that our well-being is affected by our genes, brain functioning, inner thoughts and feelings, and the influences of our social and cultural environment.

DSM-IV-TR the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, with an updated "text revision"; a widely used system for classifying psychological disorders.

Classifying Disorders—and Labeling People



14-4: How and why do clinicians classify psychological disorders, and why do some psychologists criticize the use of diagnostic labels?

In biology, classification creates order and helps us communicate. To classify an animal as a "mammal" tells us a great deal—that it is warm-blooded, has hair or fur, and produces milk to feed its young. In psychiatry and psychology, classification serves the same ends. To classify a person's disorder as "schizophrenia" also tells us a great deal. It says that the person speaks in a disorganized way, has bizarre beliefs, shows either little emotion or inappropriate emotion, or is socially withdrawn. "Schizophrenia" is a quick way of describing a complex set of behaviors.

But diagnostic classification does more than give us a thumbnail sketch of a person's disordered behavior. In psychiatry and psychology, classification also attempts to predict the disorder's future course and to suggest appropriate treatment. It stimulates research into causes. Indeed, to study a disorder, we must first name and describe it.

Our current best scheme for describing disorders and estimating how often they occur has been the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, now in its "text-revised" fourth edition (**DSM-IV-TR**).

A new edition, DSM-5, is slated to appear in 2013. In 2010, the American Psychiatric Association released the first draft of that revision (Clay, 2011; www.DSM5.org; Miller & Holden, 2010). Some diagnostic labels are changing. "Mental retardation," for example, becomes "intellectual developmental disorder." Some new categories, such as "hypersexual disorder," "hoarding disorder," and "binge-eating disorder" have been added. The eleventh edition of the World Health Organization's *International Classification of Diseases* (ICD-11), covering both medical and psychological disorders, is expected in 2014 (Clay, 2010).

Despite its medical terminology (*diagnosing, symptoms, illness*), most practitioners find the DSM-IV-TR a helpful and practical tool. It is also financially necessary: North American health insurance companies usually require an ICD/DSM diagnosis before they pay for therapy.

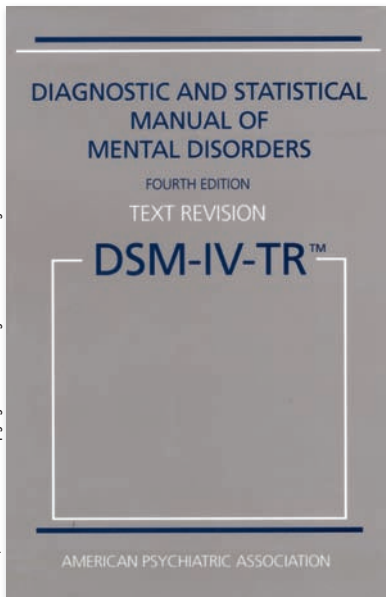
The DSM-IV-TR categories and diagnostic guidelines (**TABLE 14.1** on the next page) have been fairly reliable. If one psychiatrist or psychologist diagnoses someone as having, say, schizophrenia, the chances are good that another mental health worker will independently give the same diagnosis. To reach a diagnosis, clinicians use a structured-interview procedure, consisting of a series of objective questions about observable behaviors, such as, "Is the person afraid to leave home?"

In one study, 16 psychologists used DSM guidelines in structured interviews with 75 patients with disorders. The psychologists' task was to diagnose each patient as having (1) depression, (2) generalized anxiety, or (3) some other disorder (Riskind et al., 1987). Another psychologist then viewed a videotape of each interview and offered a second, independent opinion. For 83 percent of the patients, the two opinions agreed.

Many examples in this chapter were drawn from case illustrations accompanying the DSM-IV-TR.



"I'm always like this, and my family was wondering if you could prescribe a mild depressant."

**Table 14.1****How Are Psychological Disorders Diagnosed?**

Based on assessments, interviews, and observations, many clinicians diagnose by answering the following questions from the five levels, or *axes*, of the DSM-IV-TR. (Chapters in parentheses locate the topics in this text.)

Axis I Is a *Clinical Syndrome* present?

Using specifically defined criteria, clinicians may select none, one, or more syndromes from the following list:

- Disorders usually first diagnosed in infancy, childhood, and adolescence
- Delirium, dementia, amnesia, and other cognitive disorders (Chapter 5 and Chapter 8)
- Mental disorders due to a general medical condition
- Substance-related disorders (Chapter 3)
- Schizophrenia and other psychotic disorders (this chapter)
- Mood disorders (this chapter)
- Anxiety disorders (this chapter)
- Somatoform disorders
- Factitious disorders (intentionally faked)
- Dissociative disorders (this chapter)
- Eating disorders (this chapter)
- Sexual disorders and gender identity disorder (Chapter 5)
- Sleep disorders (Chapter 3)
- Impulse-control disorders not classified elsewhere
- Adjustment disorders
- Other conditions that may be a focus of clinical attention

Axis II Is a *Personality Disorder* or *Mental Retardation [Intellectual Developmental Disorder]* present?

Clinicians may or may not also select one of these two conditions.

Axis III Is a *General Medical Condition*, such as diabetes, hypertension, or arthritis, also present?**Axis IV** Are *Psychosocial* or *Environmental Problems*, such as school or housing issues, also present?**Axis V** What is the *Global Assessment* of this person's functioning?

Clinicians assign a code from 0–100.

Nevertheless, the DSM has its critics. Some have been concerned that it casts too wide a net and brings “almost any kind of behavior within the compass of psychiatry” (Eysenck et al., 1983). The number of DSM-IV disorder categories (nearly 300) is five times the number in the 1952 first edition. As that number has ballooned, so has the number of adults who meet the criteria for at least one of them. According to the U.S. National Institute of Mental Health (2008), 26 percent of all adults meet those criteria in any year, and 46 percent have met them at some time in their lives (Kessler et al., 2005).

Other critics register a more basic complaint—that these labels are at best arbitrary and at worst value judgments masquerading as science. Once we label a person, we view that person differently (Bathje & Pryor, 2011; Sadler et al., 2012). Labels can change reality by putting us on alert for evidence that confirms our view. When teachers were told certain students are “gifted,” they acted in ways that brought out the creative behaviors they expected (Snyder, 1984). If we hear that a new co-worker is a difficult person, we may treat him suspiciously. He may in turn react to us as a difficult person would. Labels can be self-fulfilling.

The biasing power of labels was clear in a classic study. David Rosenhan (1973) and seven others went to hospital admissions offices, complaining of “hearing voices” saying *empty*, *hollow*, and *thud*. Apart from this complaint and giving false names and occupations, they answered questions truthfully. All eight of these normal people were misdiagnosed with disorders.

Should we be surprised? Surely not. As one psychiatrist noted, if someone swallowed blood, went to an emergency room, and spat it up, would we blame a doctor for diagnosing a bleeding ulcer? But what followed the Rosenhan study diagnoses was startling. Until being released an average of 19 days later, these eight “patients” showed no other symptoms. Yet after analyzing their (quite normal) life histories, clinicians were able to “discover” the causes of their disorders, such as having mixed emotions about a parent. Even the patients’ routine note-taking behavior was misinterpreted as a symptom.

In another study, people watched videotaped interviews. If told the interviewees were job applicants, the viewers perceived them as normal (Langer & Abelson, 1974, 1980). Other viewers who were told they were watching psychiatric or cancer patients perceived the same interviewees as “different from most people.” Labels matter. Therapists who thought they were watching an interview of a psychiatric patient perceived him as “frightened of his own aggressive impulses,” a “passive, dependent type,” and so forth. As Rosenhan discovered, a label can have “a life and an influence of its own.”

Labels also have power outside the laboratory. Getting a job or finding a place to rent can be a challenge for people recently released from a mental hospital. The shame seems to be lifting as people better understand that many psychological disorders involve diseases of the brain, not failures of character (Solomon, 1996). Public figures have helped foster this understanding by speaking openly about their own struggles with disorders such as depression. The more contact we have with people with disorders, the more accepting our attitudes are (Kolodziej & Johnson, 1996).

The increased understanding of psychological disorders is reflected in some media portrayals that are reasonably accurate and sympathetic. But people with disorders have too often been portrayed as objects of humor or ridicule (*As Good as It Gets*), as homicidal maniacs (Hannibal Lecter in *Silence of the Lambs*), or as freaks (Nairn, 2007). In real life, mental disorders seldom lead to violence. The few who do commit violent acts tend to be those experiencing threatening delusions and hallucinated voices commanding them to act, or those whose dysfunctionality includes substance abuse (Douglas et al., 2009; Elbogen & Johnson, 2009; Fazel et al., 2009, 2010). In real life, people with disorders also are more likely to be the *victims* of violence than the perpetrators (Marley & Bulia, 2001). Indeed, reported the U.S. Surgeon General’s Office (1999, p. 7), “There is very little risk of violence or harm to a stranger from casual contact with an individual who has a mental disorder.” (Although most people with psychological disorders are not violent, those who are create a moral dilemma for society. For more on this topic, see *Thinking Critically About: Insanity and Responsibility* on the next page.)

Despite their risks, diagnostic labels have *benefits*. Mental health professionals have good reasons for using labels. Diagnostic labels help them communicate about their cases, pinpoint underlying causes, and share information about effective treatments. Diagnostic definitions are also useful in research exploring causes and treatments of disorder.

“What’s the use of their having names,” the Gnat said, “if they won’t answer to them?”

“No use to *them*,” said Alice; “but it’s useful to the people that name them, I suppose.”

Lewis Carroll, *Through the Looking-Glass*, 1871



Protozoa Pictures/Phoenix Pictures/The Kobal Collection

Accurate portrayal Recent films have offered some realistic depictions of psychological disorders. *Black Swan* (2010), shown here, portrayed a main character suffering a delusional disorder. *Temple Grandin* (2010) dramatized a lead character who successfully copes with autism. *A Single Man* (2009) depicted depression.

THINKING CRITICALLY ABOUT:

Insanity and Responsibility

The legal insanity defense was created in 1843, after deluded Scotsman Daniel M’Naughten tried to shoot England’s prime minister (who he thought was persecuting him) but killed an assistant by mistake. Like U.S. President Ronald Reagan’s near-assassin, John Hinckley, M’Naughten was sent to a mental hospital rather than to prison.

In both cases, the public was outraged. “Hinckley Insane, Public Mad,” declared one headline. They were mad again when a deranged Jeffrey Dahmer in 1991 admitted murdering 15 young men and eating parts of their bodies. They were mad in 1998 when 15-year-old Kip Kinkel, driven by “those voices in my head,” killed his parents and two fellow Springfield, Oregon, students and wounded 25 others. They were mad in 2002 when Andrea Yates, after being taken off her antipsychotic medication, was tried in Texas for drowning her five children. And they were mad in 2011, when an irrational Jared Loughner gunned down a crowd of people, including survivor Congresswoman Gabrielle Giffords, in an Arizona supermarket parking lot. Following their arrests, all of these people were sent to jails, not hospitals (though later, after another trial, Yates was instead hospitalized). As Yates’ fate illustrates, 99 percent of those whose insanity defense is accepted are nonetheless institutionalized,

often for as long as those convicted of crimes (Lilienfeld & Arkowitz, 2011). Moreover, use of the insanity defense is actually rare—in only 8 uncontested instances in one analysis of 60,432 indictments (Council of State Governments, 2002).

Most people with psychological disorders are not violent. But what should society do with those who are? Many people who have been executed or are now on death row have been limited by intellectual disability or motivated by delusional voices. The State of Arkansas forced one murderer with schizophrenia,

Charles Singleton, to take two antipsychotic drugs—to make him mentally competent, so that he could then be put to death.

Which of Yates’ two juries made the right decision? The first, which decided that people who commit such rare but terrible crimes should be held responsible? Or the second, which decided to blame the “madness” that clouds their vision? As we come to better understand the biological and environmental bases for all human behavior, from generosity to vandalism, when should we—and should we not—hold people accountable for their actions?



AP/Arizona Daily Star, Manta Popat

Jail or hospital? Jared Lee Loughner was charged with the 2011 Tucson, Arizona, shooting that killed six people and left over a dozen others injured, including former U.S. Representative Gabrielle Giffords. Loughner had a history of mental health issues, including paranoid beliefs, and was diagnosed with schizophrenia. His behavior is not typical of people with schizophrenia. That disorder is usually associated with violence only when accompanied by substance abuse (Fazel et al., 2009).

RETRIEVE IT

- What is the value, and what are the dangers, of labeling individuals with disorders?

ANSWER: Therapists and others use disorder labels to communicate with one another in a common language, and to share concepts during research. Insurance companies require a diagnosis (a label) before they will pay for therapy. The danger of labeling people is that they will begin to act as they have been labeled, and also that labels can create expectations that will change our behavior toward the people we label.

Anxiety Disorders



14-5: What are the main anxiety disorders, and how do they differ from the ordinary worries and fears we all experience?

Anxiety is part of life. Speaking in front of a class, peering down from a ladder, or waiting to play in a big game might make any one of us feel nervous. At times we may feel anxious enough to avoid making eye contact or talking with someone—“shyness,” we call it. Fortunately for most of us, our uneasiness is not intense and persistent.

Some of us, however, are more prone to notice and remember threats (Mitte, 2008). This tendency may place us at risk for one of the **anxiety disorders**, which occurs when the brain's danger detection system becomes hyperactive—producing distressing, persistent anxiety when no threat exists. Let's consider these five:

- *Generalized anxiety disorder*, in which a person is constantly tense, worried, and uneasy for no apparent reason
- *Panic disorder*, in which a person experiences sudden episodes of intense dread
- *Phobias*, in which a person is intensely and irrationally afraid of a specific object, activity, or situation
- *Obsessive-compulsive disorder*, in which a person is troubled by unwanted, repetitive thoughts or actions
- *Post-traumatic stress disorder*, in which a person has lingering memories, nightmares, and possibly other symptoms for weeks after a severely threatening, uncontrollable event

Generalized Anxiety Disorder

Tom is a 27-year-old electrician. For the past two years, he has been bothered by dizziness, sweating palms, and irregular heartbeat. He feels edgy and sometimes finds himself shaking. Tom has been reasonably successful in hiding his symptoms from his family and co-workers, but occasionally he has to leave work. He allows himself few other social contacts. Neither his family doctor nor a neurologist has been able to find any physical problem.

Tom's unfocused, out-of-control, negative feelings suggest a **generalized anxiety disorder**. The symptoms of this disorder are commonplace; their persistence, for six months or more, is not. People with this condition (two-thirds women) worry continually, and they are often jittery, on edge, and sleep deprived (McLean & Anderson, 2009). Concentration is difficult as attention switches from worry to worry. Their tension and apprehension may leak out through furrowed brows, twitching eyelids, trembling, perspiration, or fidgeting.

People may not be able to identify the cause of their anxiety, and therefore cannot relieve or avoid it. To use Sigmund Freud's term, the anxiety is *free-floating*. Generalized anxiety disorder and depression often go hand in hand, but even without depression this disorder tends to be disabling (Hunt et al., 2004; Moffitt et al., 2007b). Moreover, it may lead to physical problems, such as high blood pressure.

Panic Disorder

Panic disorder is an anxiety tornado. It strikes suddenly, wreaks havoc, and disappears. For the 1 person in 75 with this disorder, anxiety suddenly escalates into a terrifying *panic attack*—a minutes-long episode of intense fear that something horrible is about to happen. Irregular heartbeat, chest pains, shortness of breath, choking, trembling, or dizziness may accompany the panic.

One woman recalled suddenly feeling “hot and as though I couldn't breathe. My heart was racing and I started to sweat and tremble and I was sure I was going to faint. Then my fingers started to feel numb and tingly and things seemed unreal. It was so bad I wondered if I was dying and asked my husband to take me to the emergency room. By the time we got there (about 10 minutes) the worst of the attack was over and I just felt washed out” (Greist et al., 1986).

Panic attack symptoms are often misread as a heart attack or other serious physical ailment. Smokers have at least a doubled risk of panic disorder (Zvolensky & Bernstein, 2005). Because nicotine is a stimulant, lighting up doesn't help us to lighten up.

Phobias

We all live with some fears. People with **phobias** are consumed by a persistent, irrational fear and avoidance of some object, activity, or situation. Marilyn, an otherwise healthy and happy 28-year-old, so fears thunderstorms that she feels anxious as soon as a weather

anxiety disorders psychological disorders characterized by distressing, persistent anxiety or maladaptive behaviors that reduce anxiety.

generalized anxiety disorder an anxiety disorder in which a person is continually tense, apprehensive, and in a state of autonomic nervous system arousal.

panic disorder an anxiety disorder marked by unpredictable, minutes-long episodes of intense dread in which a person experiences terror and accompanying chest pain, choking, or other frightening sensations.

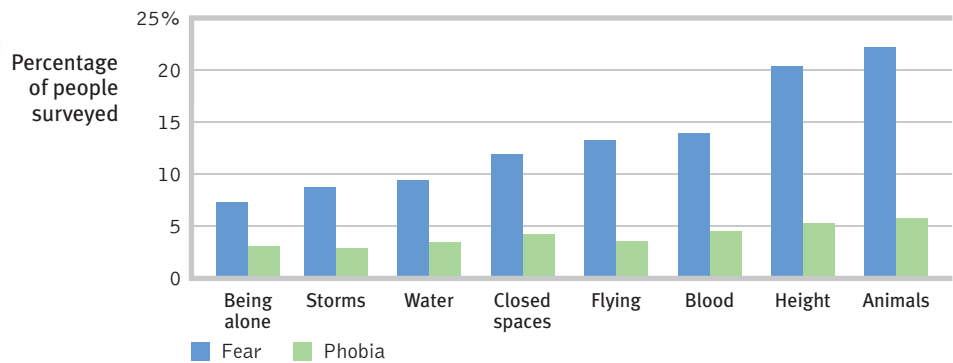
phobia an anxiety disorder marked by a persistent, irrational fear and avoidance of a specific object, activity, or situation.



Martin Harvey/Jupiterimages

FIGURE 14.2**Some common and uncommon**

specific fears This national interview study identified the commonality of various specific fears. A strong fear becomes a phobia if it provokes a compelling but irrational desire to avoid the dreaded object or situation. (From Curtis et al., 1998.)



forecaster mentions possible storms later in the week. If her husband is away and a storm is forecast, she may stay with a close relative. During a storm, she hides from windows and buries her head to avoid seeing the lightning. *Specific phobias* such as Marilyn's typically focus on particular animals, insects, heights, blood, or closed spaces (**FIGURE 14.2**). People avoid the stimulus, such as high places, that arouses the fear.

Not all phobias are so specific. *Social phobia* is shyness taken to an extreme. Those with a social phobia have an intense fear of being judged by others. They avoid threatening social situations, such as speaking up in a group, eating out, or going to parties. Finding themselves in such a situation, they will sweat or tremble.

Much as fretting over insomnia may, ironically, cause insomnia, so worrying about anxiety—perhaps fearing another panic attack, or fearing anxiety-caused sweating in public—can amplify anxiety symptoms (Olatunji & Wolitzky-Taylor, 2009). After several panic attacks, people may come to fear the fear itself. This may trigger *agoraphobia*, fear or avoidance of situations in which panic may strike, escape might be difficult, and help unavailable. People with agoraphobia may avoid being outside the home, in a crowd, on a bus, or on an elevator.

After spending five years sailing the world, Charles Darwin began suffering panic disorder at age 28. Because of the attacks, he moved to the country, avoided social gatherings, and traveled only in his wife's company. But the relative seclusion did free him to focus on developing his evolutionary theory. "Even ill health," he reflected, "has saved me from the distraction of society and its amusements" (quoted in Ma, 1997).

Making everything perfect Soccer star David Beckham has openly discussed his obsessive-compulsive tendencies, which have driven him to line up objects in pairs or to spend hours straightening furniture (Adams, 2011).



Stephen Dunn/Getty Images

Obsessive-Compulsive Disorder

As with generalized anxiety and phobias, we can see aspects of our own behavior in **obsessive-compulsive disorder (OCD)**. *Obsessive thoughts* (recall Marc's focus on cleaning his room) are unwanted and so repetitive it may seem they will never end. *Compulsive behaviors* are responses to those thoughts (cleaning and cleaning and cleaning).

We all are at times obsessed with senseless or offensive thoughts that will not go away. Have you ever caught yourself behaving compulsively, perhaps rigidly checking, ordering, and cleaning before guests arrive, or lining up books and pencils "just so" before studying? On a small scale, obsessive thoughts and compulsive behaviors are a part of everyday life. They cross the fine line between normality and disorder when they *interfere* with everyday life and cause us distress. Checking to see that you locked the door is normal; checking 10 times is not. Washing your hands is normal; washing so often that your skin becomes raw is not. (**TABLE 14.2**

Table 14.2
Common Obsessions and Compulsions Among Children and Adolescents With Obsessive-Compulsive Disorder

Thought or Behavior	Percentage Reporting Symptom
Obsessions (repetitive <i>thoughts</i>)	
Concern with dirt, germs, or toxins	40
Something terrible happening (fire, death, illness)	24
Symmetry, order, or exactness	17
Compulsions (repetitive <i>behaviors</i>)	
Excessive hand washing, bathing, toothbrushing, or grooming	85
Repeating rituals (in/out of a door, up/down from a chair)	51
Checking doors, locks, appliances, car brakes, homework	46

Source: Adapted from Rapoport, 1989.

offers more examples.) At some time during their lives, often during their late teens or twenties, 2 to 3 percent of people cross that line from normal rehearsals and fussy behaviors to debilitating disorder (Karno et al., 1988). Although the person knows them to be irrational, the anxiety-fueled obsessive thoughts become so haunting, the compulsive rituals so senselessly time consuming, that effective functioning becomes impossible.

OCD is more common among teens and young adults than among older people (Samuels & Nestadt, 1997). A 40-year follow-up study of 144 Swedish people diagnosed with the disorder found that, for most, the obsessions and compulsions had gradually lessened, though only 1 in 5 had completely recovered (Skoog & Skoog, 1999).

Post-Traumatic Stress Disorder

As an Iraq war soldier, Jesse “saw the murder of children, women. It was just horrible for anyone to experience.” After calling in a helicopter strike on one house where he had seen ammunition crates carried in, he heard the screams of children from within. “I didn’t know there were kids there,” he recalls. Back home in Texas, he suffered “real bad flashbacks” (Welch, 2005).

Jesse is not alone. In one study of 103,788 veterans returning from Iraq and Afghanistan, 25 percent were diagnosed with a psychological disorder (Seal et al., 2007). The most frequent diagnosis was **post-traumatic stress disorder (PTSD)**. Typical symptoms include recurring haunting memories and nightmares, a numb feeling of social withdrawal, jumpy anxiety, and trouble sleeping (Hoge et al., 2004, 2006, 2007; Kessler, 2000). Many battle-scarred veterans have been diagnosed with PTSD. Survivors of accidents, disasters, and violent and sexual assaults (including an estimated two-thirds of prostitutes) have also experienced these symptoms (Brewin et al., 1999; Farley et al., 1998; Taylor et al., 1998).

The greater one’s emotional distress during a trauma, the higher the risk for post-traumatic symptoms (Ozer et al., 2003). One in 3 Vietnam veterans who had experienced heavy combat were diagnosed with PTSD (Centers for Disease Control Vietnam Experience Study, 1988; Dohrenwend et al., 2006). One in 10 veterans who had never seen combat received that diagnosis. Similar rates were found among New Yorkers who witnessed the 9/11 terrorist attacks. PTSD diagnoses among survivors who had been inside the World Trade Center during the attack were double the rates found among those who were outside (Bonanno et al., 2006). The more frequent and severe the trauma, the worse the long-term outcomes tend to be (Golding, 1999). In the 30 years after the Vietnam war, veterans who came home with a PTSD diagnosis had twice the normal likelihood of dying (Crawford et al., 2009).

About half of us will experience at least one traumatic event in our lifetime. Why do some people develop PTSD after a traumatic event, but others don’t? Some people

obsessive-compulsive disorder (OCD) an anxiety disorder characterized by unwanted repetitive thoughts (obsessions), actions (compulsions), or both.

post-traumatic stress disorder (PTSD) an anxiety disorder characterized by haunting memories, nightmares, social withdrawal, jumpy anxiety, and/or insomnia that lingers for four weeks or more after a traumatic experience.

Bringing the war home During his three deployments to Iraq, this Marine Staff Sergeant suffered traumatic brain injury. After his return home, he was diagnosed with post-traumatic stress disorder. He regularly travels two hours each way with his wife to Bethesda Naval Hospital for psychiatric and medical appointments.



Whitney Sheffer/The Washington Post via Getty Images

may have more sensitive emotion-processing limbic systems that flood their bodies with stress hormones (Kosslyn, 2005; Ozer & Weiss, 2004). The odds of getting this disorder after a traumatic event are higher for women (about 1 in 10) than for men (1 in 20) (Olff et al., 2007; Ozer & Weiss, 2004).

Some psychologists believe that PTSD has been overdiagnosed, due partly to a broadening definition of *trauma* (Dobbs, 2009; McNally, 2003). Too often, say some critics, PTSD gets stretched to include normal bad memories and dreams after a bad experience. In such cases, well-intentioned attempts to have people relive the trauma may exacerbate their emotions and pathologize normal stress reactions (Wakefield & Spitzer, 2002). For example, survivors may be “debriefed” right after a trauma and asked to revisit the experience and vent emotions. This tactic has been generally ineffective and sometimes harmful (Bonanno et al., 2010).

Most people, male and female, display an impressive *survivor resiliency*, or ability to recover after severe stress (Bonanno et al., 2010). For more on human resilience and on the *post-traumatic growth* that some experience, see Chapter 15.

RETRIEVE IT

- Unfocused tension, apprehension, and arousal is called _____ disorder. If a person is focusing anxiety on specific feared objects or situations, that person may have a(n) _____. Those who express anxiety through unwanted repetitive thoughts or actions may have a(n) _____ - _____ disorder. Anxiety accompanied by recurring memories and nightmares, social withdrawal, and insomnia for weeks after a traumatic event may be diagnosed with _____ - _____ disorder. Those who experience unpredictable periods of terror and intense dread, accompanied by frightening physical sensations, may be diagnosed with a(n) _____ disorder.

ANSWERS: generalized anxiety; phobia; obsessive-compulsive; post-traumatic stress; panic

Understanding Anxiety Disorders



14-6: How do conditioning, cognition, and biology contribute to the feelings and thoughts that mark anxiety disorders?

Anxiety is both a feeling and a cognition—a doubt-laden appraisal of one’s safety or social skill. How do these anxious feelings and cognitions arise? Sigmund Freud’s psychoanalytic theory (Chapter 12) proposed that, beginning in childhood, people *repress* intolerable impulses, ideas, and feelings. This submerged mental energy sometimes, he thought, leaks out in odd symptoms, such as anxious hand washing. Few of today’s psychologists interpret anxiety disorders this way. Most believe that three modern perspectives are more helpful:

Conditioning

When bad events happen unpredictably and uncontrollably, anxiety often develops (Field, 2006; Mineka & Oehlberg, 2008). In experiments, researchers have shown how classical conditioning can produce fear and anxiety. You may recall from Chapter 7 that infants have learned to fear furry objects that were paired with frightening noises. And by giving rats unpredictable electric shocks, researchers have created anxious animals (Schwartz, 1984). The rats, like assault victims who report feeling anxious when returning to the scene of the crime, become uneasy in their lab environment. That environment has become a cue for fear.

Such research helps explain how panic-prone people come to associate anxiety with certain cues, and why anxious people are hyperattentive to possible threats (Bar-Haim et al., 2007; Bouton et al., 2001). In one survey, 58 percent of those with social phobia said their disorder began after a traumatic event (Ost & Hugdahl, 1981).

How might conditioning magnify a single painful and frightening event into a full-blown phobia? The answer lies in part in stimulus generalization and reinforcement.

Stimulus generalization occurs when a person experiences a fearful event and later develops a fear of similar events. My car was once struck by another whose driver missed a stop sign. For months afterward, I felt a twinge of unease when any car approached from a side street. My fear eventually disappeared, but for others, fear may linger and grow. Marilyn's phobia (also shared by recording artist Madonna) may have similarly generalized after a terrifying or painful experience during a thunderstorm.

Once phobias and compulsions arise, *reinforcement* helps maintain them. Anything that helps us avoid or escape the feared situation reduces anxiety. This feeling of relief can reinforce phobic behaviors. Fearing a panic attack, a person may decide not to leave the house. Reinforced by feeling calmer, the person is likely to repeat that maladaptive behavior in the future (Antony et al., 1992). So, too, with compulsive behaviors. If washing your hands relieves your feelings of anxiety, you may wash your hands again when those feelings return.

Cognition

We learn some fears by observing others. Susan Mineka (1985, 2002) sought to explain why nearly all monkeys reared in the wild fear snakes, yet lab-reared monkeys do not. Surely, most wild monkeys do not actually suffer snake bites. Do they learn their fear through observation? To find out, Mineka experimented with six monkeys reared in the wild (all strongly fearful of snakes) and their lab-reared offspring (virtually none of which feared snakes). After repeatedly observing their parents or peers refusing to reach for food in the presence of a snake, the younger monkeys developed a similar strong fear of snakes. When retested three months later, their learned fear persisted. Humans likewise learn fears by observing others (Olsson et al., 2007).

Observational learning is not the only cognitive influence on anxiety. As the next chapter's discussion of cognitive-behavioral therapy illustrates, our interpretations and expectations, whether rational or irrational, shape our reactions. Whether we interpret the creaky sound in the old house simply as the wind or as a possible knife-wielding intruder determines whether we panic. People with anxiety disorders tend to be *hypervigilant*. For them, a pounding heart signals a heart attack. A lone spider near the bed is the frontrunner in an infestation. An everyday disagreement with a mate or a boss spells doom for the relationship. Anxiety is especially common when people cannot switch off such intrusive thoughts and perceive a loss of control and a sense of helplessness (Franklin & Foa, 2011).

Biology

Some aspects of anxiety disorders are not easily understandable in terms of conditioning and cognitive processes alone. Why do some of us develop lasting phobias after suffering traumas but others do not? Why do we learn some fears more readily than others? Why are some individuals more vulnerable to anxiety disorders? Our biology also plays a role.

Genes Among monkeys, fearfulness runs in families. A monkey reacts more strongly to stress if its close biological relatives have sensitive, high-strung temperaments (Suomi, 1986). So, too, with people. Some of us are predisposed to anxiety. If one identical twin has an anxiety disorder, the other is also likely to have it (Hetttema et al., 2001; Kendler et al., 1992, 1999, 2002a,b). Even when raised separately, identical twins may develop similar phobias (Carey, 1990; Eckert et al., 1981). One pair of separated identical twins independently became so afraid of water that, at age 35, they would wade into the ocean backward and only up to their knees.

Given the genetic contribution to anxiety disorders, researchers are now sleuthing the culprit gene combinations. Among their findings are 17 gene variations that appear to be expressed with typical anxiety disorder symptoms (Hovatta et al., 2005), and others that are associated specifically with OCD (Dodman et al., 2010; Hu et al., 2006).



Some genes influence anxiety disorders by regulating brain levels of neurotransmitters, such as *serotonin*, which influences sleep and mood (Canli, 2008), and *glutamate*, which influences activity in the brain's alarm centers (Lafleur et al., 2006; Welch et al., 2007).

Genes matter. Some of us have genes that make us like orchids—fragile, yet capable of beauty under favorable circumstances. Others of us are like dandelions—hardy, and able to thrive in varied circumstances (Ellis & Boyce, 2008).

The Brain Our experiences alter our brain, paving new pathways. Traumatic fear-learning experiences can leave tracks in the brain creating fear circuits within the amygdala (Etkin & Wager, 2007; Kolassa & Elbert, 2007; Maren, 2007). These fear pathways create easy inroads for more fear experiences (Armony et al., 1998). Some antidepressant drugs dampen this fear-circuit activity and associated obsessive-compulsive behaviors.

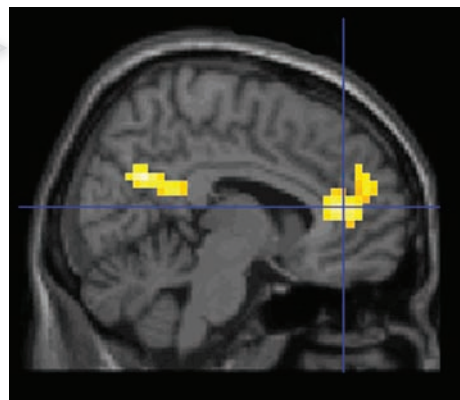
Generalized anxiety, panic attacks, PTSD, and even obsessions and compulsions are manifested biologically. When the disordered brain detects that something is amiss, it generates a mental hiccup of repeating thoughts or actions (Gehring et al., 2000). Brain scans of people with anxiety disorders show higher-than-normal activity in areas involved in impulse control

and habitual behaviors. Brain scans of people with OCD, for example, reveal elevated activity in specific brain areas during behaviors such as compulsive hand washing, checking, ordering, or hoarding (Insel, 2010; Mataix-Cols et al., 2004, 2005). As **FIGURE 14.3** shows, the *anterior cingulate cortex*, a brain region that monitors our actions and checks for errors, seems especially likely to be hyperactive in those with OCD (Maltby et al., 2005).

FIGURE 14.3

An obsessive-compulsive brain

Neuroscientists Nicholas Maltby, David Tolin, and their colleagues (2005) used functional MRI scans to compare the brains of those with and without OCD as they engaged in a challenging cognitive task. The scans of those with OCD showed elevated activity in the anterior cingulate cortex in the brain's frontal area (indicated by the yellow area on the far right).



Reprinted from *NeuroImage*, 24, Maltby, N., Tolin, D.F., Worhunsky, P., O'Keefe, T. M., & Kiehl, K. A. Dysfunctional action monitoring hyperactivates frontal-striatal circuits in obsessive-compulsive disorder: An event-related fMRI study. 495-503, 2005, with permission from Elsevier.

Natural Selection No matter how fearful or fearless we are, we humans seem biologically prepared to fear the threats our ancestors faced—spiders and snakes, closed spaces and heights, storms and darkness. (In the distant past, those who did not fear these threats were less likely to survive and leave descendants.) Thus, even in Britain, which has only one poisonous snake species, people often fear snakes. And we have fears at very young ages. Preschool children detect snakes in a scene faster than they spot flowers, caterpillars, or frogs (LoBue & DeLoache, 2008). Our Stone Age fears are easy to condition and hard to extinguish (Coelho & Purkis, 2009; Davey, 1995; Öhman, 2009).

Our modern fears may also have an evolutionary explanation. A modern fear of flying may have grown from a fear of confinement and heights, which can be traced to our biological past.

Moreover, consider what people tend *not* to learn to fear. World War II air raids produced remarkably few lasting phobias. As the air strikes continued, the British, Japanese, and German populations did not become more and more panicked. Rather, they grew more indifferent to planes outside their immediate neighborhoods (Mineka & Zinbarg, 1996). Evolution has not prepared us to fear bombs dropping from the sky.

Our phobias focus on dangers our ancestors faced. Our compulsive acts typically exaggerate behaviors that helped them survive. Grooming had survival value; it detected insects and infections. Gone wild, it becomes compulsive hair pulling. Washing up helped people stay healthy. Out of control, it becomes ritual hand washing. Checking territorial boundaries helped ward off enemies. In OCD, it becomes checking and rechecking an already locked door (Rapoport, 1989).

The biological perspective cannot explain all aspects of anxiety disorders, but it is clearly an important component.

Fearless The biological perspective helps us understand why most people would be too afraid to try U.S. Olympic snowboarder Shaun White's tricks. White is less vulnerable to a fear of heights than most of us!



REUTERS/Mike Blake

RETRIEVE IT

- Researchers believe that anxiety disorders are influenced by conditioning, observational learning, and cognition. What biological factors contribute to these disorders?

ANSWER: Biological factors include inherited temperament differences; trauma-altered fear pathways in the brain; and outdated, inherited responses that had survival value for our distant ancestors.

mood disorders psychological disorders characterized by emotional extremes. See *major depressive disorder*, *mania*, and *bipolar disorder*.

Mood Disorders



14-7: What are mood disorders? How does major depressive disorder differ from bipolar disorder?

Most of us will indirectly or directly have some experience with **mood disorders**. These disorders, which are characterized by emotional extremes, appear in two principal forms. *Major depressive disorder* is a prolonged state of hopeless depression. *Bipolar disorder* (formerly called *manic-depressive disorder*) alternates between depression and overexcited hyperactivity.

Anxiety is a response to the threat of future loss. Depressed mood is often a response to past and current loss. To feel bad in reaction to profoundly sad events (such as the death of a loved one) is to be in touch with reality. In such times, depression is like a car's oil-pressure light—a signal that warns us to stop and take appropriate measures.

In the past year, have you at some time “felt so depressed that it was difficult to function”? If so, you may have more company than you know (Jordan et al., 2011). In one national survey, 31 percent of American collegians answered *Yes* to that question (ACHA, 2009). The college years are exciting, but also stressful. Perhaps you're weary from juggling school, work, and family responsibilities. Perhaps social stresses, such as a relationship gone sour or a feeling of being excluded have made you feel isolated or plunged you into despair. Dwelling on these thoughts may leave you feeling deeply discouraged about your life or your future. You may lack the energy to get things done or even to force yourself out of bed. You may be unable to concentrate, eat, or sleep normally. Occasionally you may even wonder if you would be better off dead.

These feelings are more likely to strike during the dark months of winter than the bright days of summer. For some people, winter darkness means more blue moods. When asked “Have you cried today?” Americans answered *Yes* doubly often in the winter (**TABLE 14.3**). For others, recurring depression during winter's dark months constitutes a *seasonal affective disorder*.

From an evolutionary perspective, depression makes sense. As social psychologist Daniel Gilbert (2006) warned, “If someone offered you a pill that would make you permanently happy, you would be well advised to run fast and run far. Emotion is a compass that tells us what to do, and a compass that is perpetually stuck on NORTH is worthless.” Depression helps us face and solve problems.

Biologically speaking, life's purpose is survival and reproduction, not happiness. Coughing, vomiting, and various sorts of pain protect our body from dangerous toxins. Depression similarly protects us from dangerous thoughts and feelings, sending us into a sort of psychic hibernation. It slows us down, defuses aggression, helps us let go of unattainable goals, and restrains risk taking (Andrews & Thomson, 2009a,b; Wrosch & Miller, 2009). Grinding temporarily to a halt, as we do when feeling threatened, or when finding our goals are beyond our reach, gives us time to think hard and reconsider our options (Wrosch & Miller, 2009). After reassessing our life, we may redirect our energy in more promising ways (Watkins, 2008). Even mild sadness can improve people's recall, make them more discerning, and help them make complex decisions (Forgas, 2009). There is sense to suffering. But sometimes depression becomes seriously maladaptive. How do we recognize the fine line between a normal blue mood and abnormal depression?



Image Source/Getty Images

Table 14.3
Percentage Answering *Yes* When Asked “Have You Cried Today?”

	Men	Women
<i>In August</i>	4%	7%
<i>In December</i>	8%	21%

Source: Time/CNN survey, 1994

Major Depressive Disorder

Joy, contentment, sadness, and despair are different points on a continuum, points at which any of us may be found at any given moment. The difference between a blue mood after bad news and **major depressive disorder** is like the difference between gasping for breath after a hard run and having chronic asthma. Major depressive disorder occurs when at least five signs of depression last two or more weeks (TABLE 14.4). To sense what major depression feels like, suggest some clinicians, imagine combining the anguish of grief with the exhaustion you feel after pulling an all-nighter.



Table 14.4

Classifying Major Depressive Disorder

The DSM-IV-TR classifies major depressive disorder as the presence over a two-week period of at least five of the following symptoms (including depressed mood or loss of interest or pleasure). The symptoms must cause distress or impairment and not be attributable to substance abuse, bereavement, or another medical illness.

- Depressed mood most of the day
- Markedly diminished interest or pleasure in activities
- Significant weight loss or gain when not dieting, or significant decrease or increase in appetite
- Insomnia or sleeping too much
- Physical agitation or lethargy
- Fatigue or loss of energy nearly every day
- Feeling worthless, or excessive or inappropriate guilt
- Daily problems in thinking, concentrating, or making decisions
- Recurrent thoughts of death and suicide

“My life had come to a sudden stop. I was able to breathe, to eat, to drink, to sleep. I could not, indeed, help doing so; but there was no real life in me.”

Leo Tolstoy, My Confession, 1887

Although phobias are more common, depression is the number-one reason people seek mental health services. At some point during their lifetime, 12 percent of Canadian adults and 17 percent of U.S. adults will experience depression (Holden, 2010; Patten et al., 2006). Worldwide, it is the leading cause of disability. In any given year, 5.8 percent of men and 9.5 percent of women will have a depressive episode (WHO, 2002).

Bipolar Disorder

In **bipolar disorder**, people bounce from one emotional extreme to the other. When a depressive episode ends, an intensely happy, hyperactive, wildly optimistic state called **mania** follows. But before long, the elated mood either returns to normal or plunges again into depression.

If depression is living in slow motion, mania is fast forward. During this phase, people are typically overtalkative, overactive, and elated. They have little need for sleep. They show fewer sexual inhibitions. Their speech is loud, flighty, and hard to interrupt, and they are easily irritated if crossed. Feeling extreme optimism and self-esteem, they find advice irritating. Yet they need protection from their poor judgment, which may lead to reckless spending or unsafe sex.

In milder forms, mania’s energy and free-flowing thinking can fuel creativity. George Frideric Handel (1685–1759), who many believe suffered from a mild form of bipolar disorder, composed his three-hour-long *Messiah* during three weeks of intense, creative energy in 1742 (Keynes, 1980). Bipolar disorder strikes more often among those who rely on emotional expression and vivid imagery, such as poets and artists, and less often among those who rely on precision and logic, such as architects, designers, and journalists (Jamison, 1993, 1995; Kaufman & Baer, 2002; Ludwig, 1995).

major depressive disorder a mood disorder in which a person experiences, in the absence of drugs or another medical condition, two or more weeks of significantly depressed moods or diminished interest or pleasure in most activities, along with at least four other symptoms.

bipolar disorder a mood disorder in which a person alternates between the hopelessness and lethargy of depression and the overexcited state of mania. (Formerly called *manic-depressive disorder*.)

mania a hyperactive, wildly optimistic state in which dangerously poor judgment is common.



Actress Catherine Zeta-Jones
Kevin Mazur/WireImage



Writer Virginia Woolf
George C. Beresford/Hulton Getty
Pictures Library



Humorist Samuel Clemens (Mark Twain)
The Granger Collection



Producer Tim Burton
Jemal Countess/Getty Images

Bipolar disorder is much less common than major depressive disorder, but it is often more dysfunctional. It afflicts as many men as women. The diagnosis is on the rise among adolescents, whose mood swings, sometimes prolonged, range from rage to bubbly. The trend was clear in U.S. National Center for Health Statistics annual physician surveys. Between 1994 and 2003, bipolar diagnoses in under-20 people showed an astonishing 40-fold increase—from an estimated 20,000 to 800,000 (Carey, 2007; Flora & Bobby, 2008; Moreno et al., 2007). The new popularity of the diagnosis, given in two-thirds of the cases to boys, has been a boon to companies whose drugs are prescribed to lessen mood swings.

Understanding Mood Disorders



14-8: How do the biological and social-cognitive perspectives explain mood disorders?

From thousands of studies of the causes, treatment, and prevention of mood disorders, researchers have pulled out some common threads. Any theory of depression must explain at least the following (Lewinsohn et al., 1985, 1998, 2003):

Behaviors and thoughts change with depression People trapped in a depressed mood are inactive and feel unmotivated. They are sensitive to negative happenings (Peckham et al., 2010). They recall negative information. And they expect negative outcomes (my team will lose, my grades will fall, my love will fail). When the mood lifts, these behaviors and thoughts disappear. Nearly half the time, people with depression also have symptoms of another disorder, such as anxiety or substance abuse.

Depression is widespread Depression is one of two disorders found worldwide. This suggests that depression's causes must also be common.

Women's risk of major depression is nearly double men's In 2009, when Gallup asked more than a quarter-million Americans if they had ever been diagnosed with depression, 13 percent of men and 22 percent of women said *Yes* (Pelham, 2009). This gender gap has been found worldwide (**FIGURE 14.4** on the next page). The trend begins in adolescence; preadolescent girls are not more depression prone than boys are (Hyde et al., 2008). With adolescence, girls often ruminate more and fret more about their bodies.

The depression gender gap fits a bigger pattern: Women are generally more vulnerable to disorders involving internalized states, such as depression, anxiety, and inhibited sexual desire. Men's disorders tend to be more external—alcohol dependence, antisocial conduct, lack of impulse control. When women get sad, they often get sadder than men do. When men get mad, they often get madder than women do.

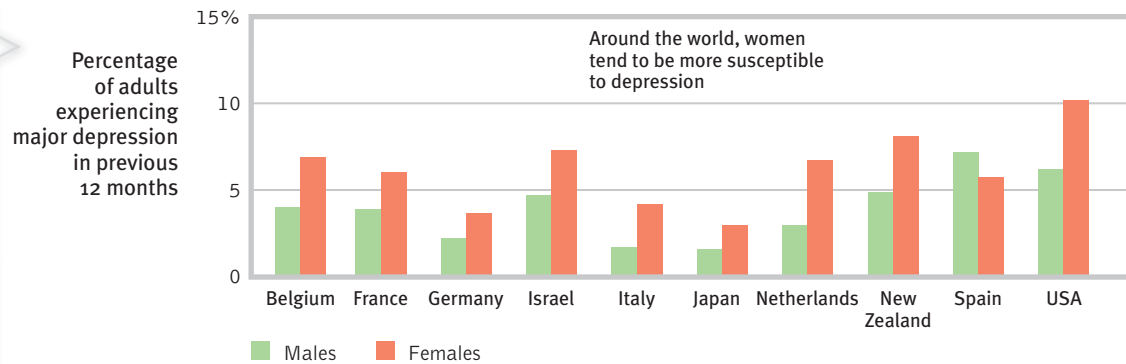
Creativity and bipolar disorder There are many creative artists, composers, writers, and musical performers with bipolar disorder. Madeleine L'Engle wrote in *A Circle of Quiet* (1972): "All the people in history, literature, art, whom I most admire: Mozart, Shakespeare, Homer, El Greco, St. John, Chekhov, Gregory of Nyssa, Dostoevsky, Emily Brontë: not one of them would qualify for a mental-health certificate."

Life after depression Writer J. K. Rowling reports suffering acute depression—a "dark time," with suicidal thoughts—between ages 25 and 28. It was, she said, a "terrible place" that did, however, form a foundation that allowed her "to come back stronger" (McLaughlin, 2010).



FIGURE 14.4

Gender and major depression Interviews with 89,037 adults in 18 countries (10 of which are shown here) confirm what many smaller studies have found: Women's risk of major depression is nearly double that of men's (Bromet et al., 2011). Data shown here are from "developed countries." "Developing countries," from Brazil to Ukraine, show the same pattern, with an overall female to male depression ratio of 1.97 to 1.



Most major depressive episodes end on their own Although therapy often helps and tends to speed recovery, most people with major depression eventually return to normal even without professional help. The black cloud of depression comes and, a few weeks or months later, it often goes. For about half of those people, their depression will eventually recur (Borcusa & Iacono, 2007; Curry et al., 2011; Hardeveld et al., 2010). The condition will be chronic for about 20 percent (Klein, 2010).

On average, people with major depression today will spend about three-fourths of the next decade in a normal, nondepressed state (Furukawa et al., 2009). Recovery is more likely to endure (Belsher & Costello, 1988; Fergusson & Woodward, 2002; Kendler et al., 2001) when

- the first episode strikes later in life.
- there were few previous episodes.
- the person experiences minimal stress.
- there is ample social support.

Stressful events often precede depression A family member's death, a job loss, a marital crisis, or a physical assault increase one's risk of depression (Kendler et al., 2008; Monroe & Reid, 2009; Orth et al., 2009). One long-term study tracked rates of depression in 2000 people (Kendler, 1998). Among those who had experienced no stressful life event in the preceding month, the risk of depression was less than 1 percent. Among those who had experienced three such events in that month, the risk was 24 percent.

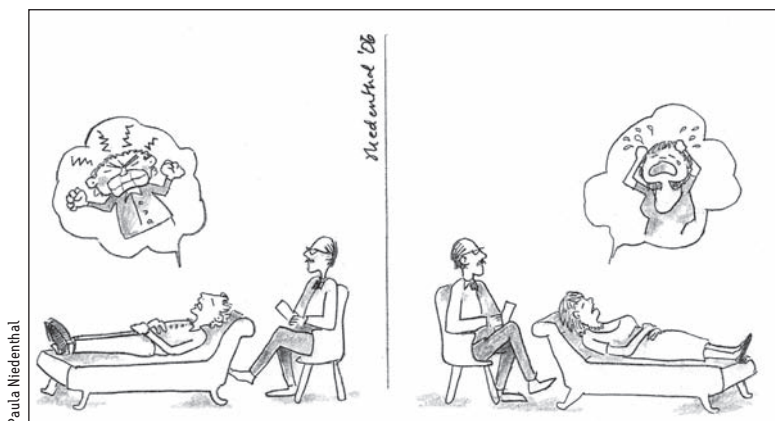
With each new generation, depression is striking earlier (now often in the late teens) and affecting more people, with the highest rates in developed countries among young adults This has been true in Canada, England, France, Germany, Italy, Lebanon, New Zealand, Puerto Rico, Taiwan, and the United States (Collishaw et al., 2007; Cross-National Collaborative Group, 1992; Kessler et al., 2010; Twenge et al., 2008).

In one study of Australian adolescents, 12 percent reported symptoms of depression (Sawyer et al., 2000). Most hid it from their parents; almost 90 percent of those parents perceived their depressed teen as *not* suffering depression. In North America, today's young adults are three times more likely than their grandparents to report having recently—or ever—suffered depression. This is true even though their grandparents have been at risk for many more years.

The increased risk among young adults appears partly real, but it may also reflect cultural differences between generations. Today's young people are more willing to talk openly about their depression. Psychological processes may also be at work. We tend to forget many negative experiences over time, so older generations may overlook depressed feelings they had in earlier years.

"I see depression as the plague of the modern era."

Lewis Judd, former chief, National Institute of Mental Health, 2000



The emotional lives of men and women?

The Biological Perspective

Depression is a whole-body disorder. It involves genetic predispositions and biochemical imbalances as well as negative thoughts and a gloomy mood.

Genes and Depression We have long known that mood disorders run in families. The risk of major depression and bipolar disorder increases if you have a parent or sibling with the disorder (Sullivan et al., 2000). If one identical twin is diagnosed with major depressive disorder, the chances are about 1 in 2 that at some time the other twin will be, too. If one identical twin has bipolar disorder, the chances are 7 in 10 that the other twin will at some point be diagnosed similarly. Among fraternal twins, the corresponding odds are just under 2 in 10 (Tsuang & Faraone, 1990). The greater similarity among identical twins holds even among twins reared apart (DiLalla et al., 1996). Summarizing the major twin studies (see **FIGURE 14.5**), one research team estimated the heritability of major depression (the extent to which individual differences are attributable to genes) at 37 percent.

Moreover, adopted people with mood disorders often have close biological relatives who have mood disorders, become dependent on alcohol, or commit suicide (Wender et al., 1986). (Close-Up: Suicide and Self-Injury reports other research findings on the next page.)

Emotions are “postcards from our genes” (Plotkin, 1994). To tease out the genes that put people at risk for depression, researchers may use *linkage analysis*. After finding families in which the disorder appears across several generations, geneticists look for differences in DNA from affected and unaffected family members. Linkage analysis points them to a chromosome neighborhood. “A house-to-house search is then needed to find the culprit gene,” note behavior genetics researchers Robert Plomin and Peter McGuffin (2003). Such studies reinforce the view that depression is a complex condition. Many genes work together, producing a mosaic of small effects that interact with other factors to put some people at greater risk. If the culprit gene variations can be identified, they may open the door to more effective drug therapy.

The Depressed Brain Scanning devices open a window on the brain’s activity during depressed and manic states. During depression, brain activity slows; during mania, it increases (**FIGURE 14.6**). The left frontal lobe and an adjacent brain reward center, which are active during positive emotions, are less active during depressed states (Davidson et al., 2002; Heller et al., 2009). In one study of people with severe depression, MRI scans also found their frontal lobes were 7 percent smaller than normal (Coffey et al., 1993). Other studies show that the *hippocampus*, the memory-processing center linked with the brain’s emotional circuitry, is vulnerable to stress-related damage.

At least two neurotransmitter systems are at work during the periods of brain activity and inactivity that accompany mood disorders. *Norepinephrine*, which increases arousal and boosts mood, is scarce during depression. Many people with a history of depression also have

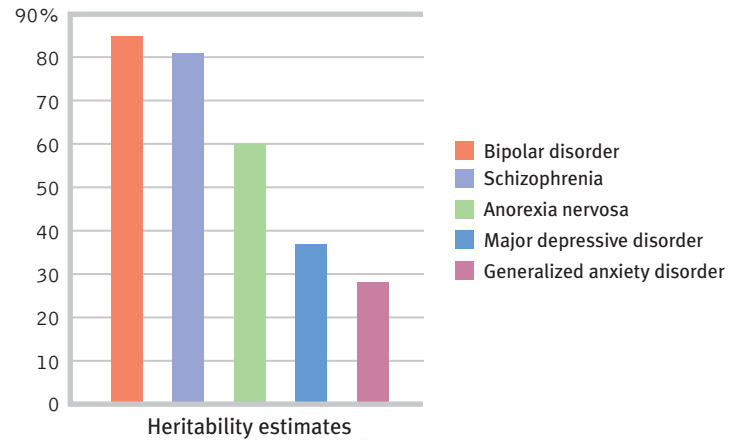


FIGURE 14.5
The heritability of various psychological disorders Researchers Joseph Bienvenu, Dimitry Davydow, and Kenneth Kendler (2011) aggregated data from studies of identical and fraternal twins to estimate the heritability of bipolar disorder, schizophrenia, anorexia nervosa, major depressive disorder, and generalized anxiety disorder.

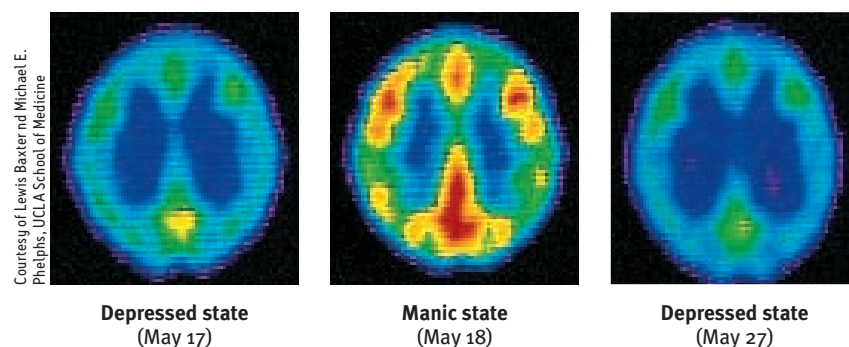


FIGURE 14.6
The ups and downs of bipolar disorder These top-facing PET scans show that brain energy consumption rises and falls with the patient’s emotional switches. Areas where the brain rapidly consumes glucose are shown in red in these images.

CLOSE UP:

Suicide and Self-Injury



14-9: What factors affect suicide and self-injuring, and what are some of the important warning signs to watch for in suicide prevention efforts?

*“But life, being weary of these worldly bars,
Never lacks power to dismiss itself.”*

William Shakespeare, *Julius Caesar*, 1599

Each year nearly 1 million despairing people worldwide will elect a permanent solution to what might have been a temporary problem. Comparing the suicide rates of different groups, researchers have found

- **national differences:** Britain’s, Italy’s, and Spain’s suicide rates are little more than half those of Canada, Australia, and the United States. Austria’s and Finland’s are about double (WHO, 2011). Within Europe, people in the most suicide-prone country (Belarus) have been 16 times more likely to kill themselves than those in the least (Georgia).
 - **racial differences:** Within the United States, Whites and Native Americans kill themselves twice as often as Blacks, Hispanics, and Asians (CDC, 2012).
 - **gender differences:** Women are much more likely than men to attempt suicide (WHO, 2011). But men are two to four times more likely (depending on the country) to actually end their lives. Men use more lethal methods, such as firing a bullet into the head, the method of choice in 6 of 10 U.S. suicides.
 - **age differences and trends:** In late adulthood, rates increase, peaking in middle age and beyond. In the last half of the twentieth century, the global rate of annual suicide deaths nearly doubled (WHO, 2008).
- **other group differences:** Suicide rates are much higher among those who are rich, not religious; single, widowed, or divorced (Hoyer & Lund, 1993; Stack, 1992; Stengel, 1981). When facing an unsupportive environment, including family or peer rejection, gay and lesbian youth are at increased risk of attempting suicide (Goldfried, 2001; Haas et al., 2011; Hatzenbuehler, 2011).
 - **day of the week:** 25 percent of suicides occur on Wednesdays (Kposowa & D’Auria, 2009).

The risk of suicide is at least 5 times greater for those who have been depressed than for the general population (Bostwick & Pankratz, 2000). People seldom commit suicide while in the depths of depression, when energy and initiative are lacking. The risk increases when they begin to rebound and become capable of following through. Compared with people who do not have a disorder, those with alcohol dependence are roughly 100 times more likely to commit suicide; some 3 percent of them do (Murphy & Wetzel, 1990; Sher, 2006).

Because suicide is so often an impulsive act, environmental barriers (such as jump barriers on high bridges and the unavailability of loaded guns) can reduce suicides (Anderson, 2008). Although common sense might suggest that a determined person would simply find another way to complete the act, such restrictions give time for self-destructive impulses to subside.

Social suggestion may trigger suicide. Following highly publicized suicides and TV programs featuring suicide, known suicides

increase. So do fatal auto and private airplane “accidents.” One six-year study tracked suicide cases among all 1.2 million people who lived in metropolitan Stockholm at any time during the 1990s (Hedström et al., 2008). Men exposed to a family suicide were 8 times more likely to commit suicide than were nonexposed men. Although that phenomenon may be partly attributable to family genes, shared genetic predispositions do not explain why men exposed to a co-worker’s suicide were 3.5 times more likely to commit suicide, compared with nonexposed men.

Suicide is not necessarily an act of hostility or revenge. The elderly sometimes choose death as an alternative to current or future suffering. In people of all ages, suicide may be a way of switching off unendurable pain and relieving a perceived burden on family members. “People desire death when two fundamental needs are frustrated to the point of extinction,” noted Thomas Joiner (2006, p. 47): “The need to belong with or connect to others, and the need to feel effective with or to influence others.” Suicidal urges typically arise when people feel disconnected from others, and a burden to them (Joiner, 2010), or when they feel defeated and trapped by an inescapable situation (Taylor et al., 2011). Thus, suicide rates increase a bit during economic recessions (Luo et al., 2011). Suicidal thoughts also may increase when people are driven to reach a goal or standard—to become thin or straight or rich—and find it unattainable (Chatard & Selimbegović, 2011).

In hindsight, families and friends may recall signs they believe should have forewarned them—verbal hints, giving away possessions, or withdrawal and preoccupation with death. To judge from surveys of 84,850 people across 17 nations, about 9 percent of people at some

a history of habitual smoking. This may indicate an attempt to self-medicate with inhaled nicotine, which can temporarily increase norepinephrine and boost mood (HMHL, 2002). But smoking also increases one’s risk for future depression (Pasco et al., 2008).

Norepinephrine is overabundant during mania. Drugs that alleviate mania reduce norepinephrine. *Serotonin* is also scarce or inactive during depression (Carver et al., 2008). Drugs that relieve depression tend to increase serotonin or norepinephrine supplies by blocking either their reuptake (as Prozac, Zoloft, and Paxil do with serotonin) or their chemical breakdown. Repetitive physical exercise, such as jogging, reduces depression as it increases serotonin (Ilardi et al., 2009; Jacobs, 1994). Boosting serotonin may

point in their lives have thought seriously of suicide. About 30 percent of them (3 percent of the people in those nations) actually attempt it (Nock et al., 2008). For only about 1 in 25 does the attempt become their final act (AAS, 2009). Of those who die, one-third had tried to kill themselves previously, and most had discussed it beforehand. So, if a friend talks suicide to you, it's important to listen and to direct the person to professional help. Anyone who threatens suicide is at least sending a signal of feeling desperate or despondent.

Non-Suicidal Self-Injury

Suicide is not the only way to send a message or deal with distress. Some people, especially

adolescents and young adults, may engage in *non-suicidal self-injury (NSSI)* (FIGURE 14.7). Such behavior includes cutting or burning the skin, hitting oneself, pulling out hair, inserting objects under the nails or skin, and self-administered tattooing (Fikke et al., 2011).

Why do people hurt themselves? Those who do so tend to be less able to tolerate emotional distress. They are often extremely self-critical, with poor communication and problem-solving skills (Nock, 2010). They may engage in NSSI to

- gain relief from intense negative thoughts through the distraction of pain.
- ask for help and gain attention.

- relieve guilt by self-punishment.
- get others to change their negative behavior (bullying, criticism).
- to fit in with a peer group.

Does NSSI lead to suicide? Usually not. Those who engage in NSSI are typically *suicide gesturers*, not *suicide attempters* (Nock & Kessler, 2006). Suicide gesturers engage in NSSI as a desperate but non-life-threatening form of communication or when they are feeling overwhelmed. But NSSI is a risk factor for *future* suicide attempts (Wilkinson & Goodyer, 2011). If people do not find help, their non-suicidal behavior may escalate to suicidal thoughts and, finally, to suicide attempts.

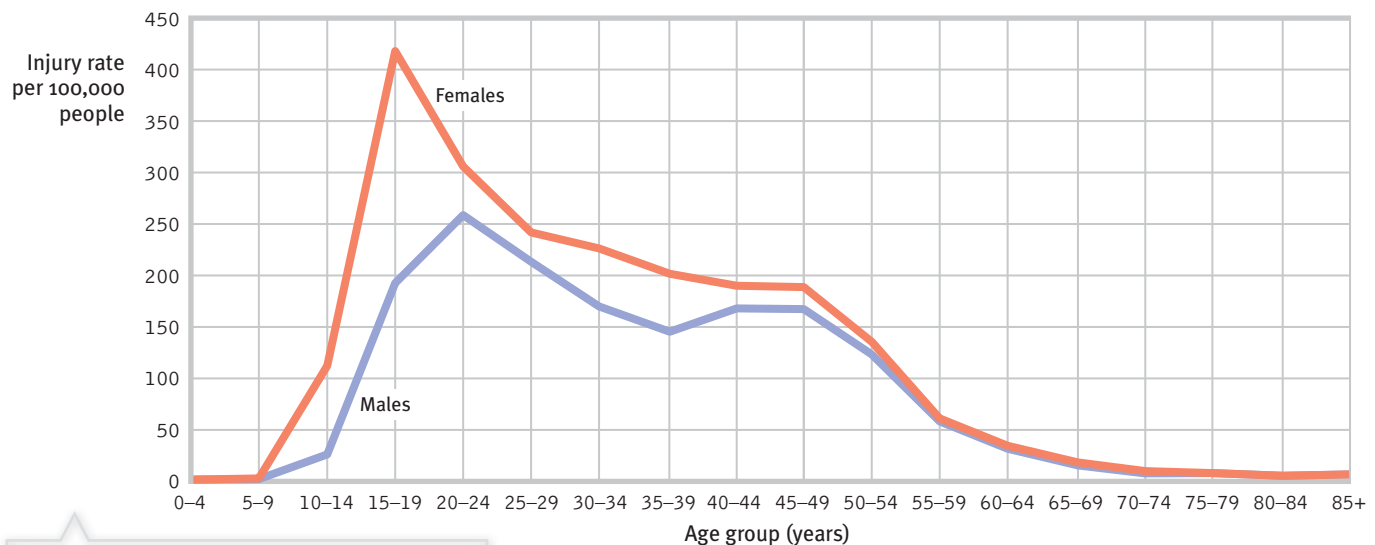


FIGURE 14.7
Rates of nonfatal self-injury in the U.S. Self-injury rates peak higher for females than for males (CDC, 2009).

promote recovery from depression by stimulating hippocampus neuron growth (Airan et al., 2007; Jacobs et al., 2000).

What's good for the heart is also good for the brain and mind. People who eat a heart-healthy "Mediterranean diet" (heavy on vegetables, fish, and olive oil) have a comparatively low risk of developing heart disease, late-life cognitive decline, and depression—all of which are associated with chronic inflammation (Dowlati et al., 2010; Sánchez-Villegas et al., 2009; Tangney et al., 2011). Excessive alcohol use also correlates with depression partly because depression can increase alcohol use but mostly because alcohol misuse *leads to* depression (Fergusson et al., 2009).



Susan Nolen-Hoeksema “This epidemic of morbid meditation is a disease that women suffer much more than men. Women can ruminate about anything and everything—our appearance, our families, our career, our health.” (*Women Who Think Too Much: How to Break Free of Overthinking and Reclaim Your Life*, 2003)

The Social-Cognitive Perspective

Biological influences contribute to depression, but in the nature–nurture dance, thinking and acting also play a part. The *social-cognitive perspective* explores how people’s assumptions and expectations influence what they perceive.

Depressed people see life through the dark glasses of low self-esteem (Orth et al., 2009). They have intensely negative views of themselves, their situation, and their future. Listen to Norman, a Canadian college professor, recalling his depression:

I [despaired] of ever being human again. I honestly felt subhuman, lower than the lowest vermin. Furthermore, I . . . could not understand why anyone would want to associate with me, let alone love me. . . . I was positive that I was a fraud and a phony and that I didn’t deserve my Ph.D. I didn’t deserve to have tenure; I didn’t deserve to be a Full Professor. . . . I didn’t deserve the research grants I had been awarded; I couldn’t understand how I had written books and journal articles. . . . I must have conned a lot of people. (Endler, 1982, pp. 45–49)

Expecting the worst, depressed people magnify bad experiences and minimize good ones, as Norman does here. Their *self-defeating beliefs* and *negative explanatory style* feed depression’s vicious cycle.

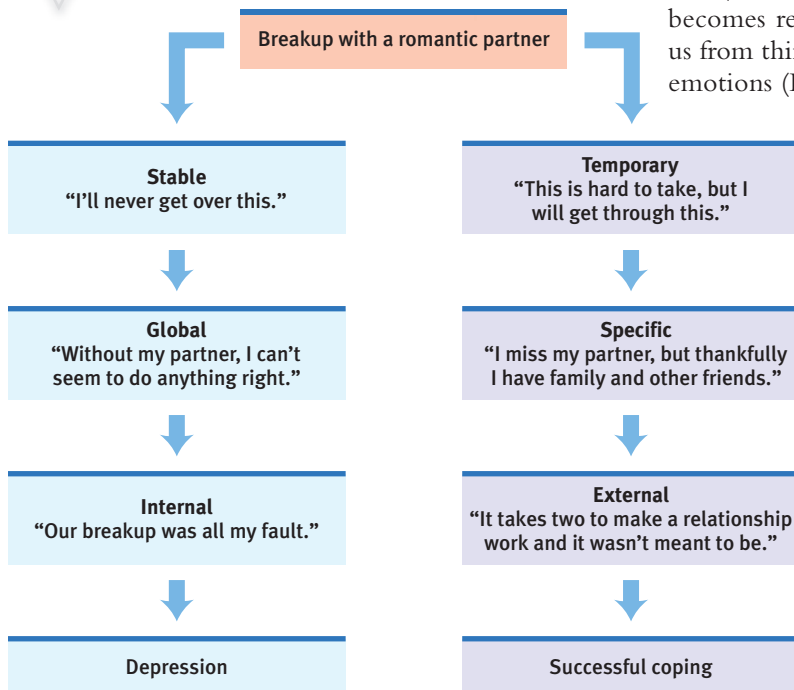
Negative Thoughts and Negative Moods Interact Self-defeating beliefs may arise from *learned helplessness*. As we saw in Chapter 11, both dogs and humans act depressed, passive, and withdrawn after experiencing uncontrollable painful events. Learned helplessness is more common in women, who may respond more strongly to stress (Hankin & Abramson, 2001; Mazure et al., 2002; Nolen-Hoeksema, 2001, 2003). Do you agree or disagree that “I at least occasionally feel overwhelmed by all I have to do”? In a survey of women and men, 38 percent of women, but only 17 percent of men, agreed (Pryor et al., 2006). (Did your answer fit that pattern?) Men report spending more of their time in “light anxiety” activities such as sports, TV watching, and partying, possibly avoiding activities that might make them feel overwhelmed.

Why are women nearly twice as vulnerable to depression? Susan Nolen-Hoeksema (2003) believes this higher risk may relate to women’s tendency to *overthink*, to brood or ruminate. Rumination can be adaptive when it helps us focus intently on a problem, thanks to the continuous firing of an attention-sustaining frontal lobe area (Altamirano et al., 2010; Andrews & Thomson, 2009a,b). When it becomes relentless, self-focused rumination is not adaptive. It diverts us from thinking about other life tasks and leaves us mired in negative emotions (Kuppens et al., 2010).

Even so, why do life’s unavoidable failures lead only some people—women and men—and not others to become depressed? The answer lies partly in their *explanatory style*—who or what they blame for their failures. Think of how you might feel if you failed a test. If you can blame someone else (“What an unfair test!”), you are more likely to feel angry. If you blame yourself, you probably will feel stupid and depressed.

When bad events happen, depression-prone people tend to blame themselves (Mor & Winquist, 2002; Pyszczynski et al., 1991; Wood et al., 1990a,b). As **FIGURE 14.8** illustrates, they explain bad events in terms that are *stable* (“I’ll never get over this”), *global* (“I can’t do anything right”), and *internal* (“It’s all my fault”). Their explanations are pessimistic, overgeneralized, self-focused, and self-blaming. The result may be a depressing sense of hopelessness (Abramson et al., 1989; Panzarella et al., 2006). As Martin Seligman has noted, “A recipe for severe depression is preexisting pessimism encountering failure” (1991, p. 78).

FIGURE 14.8
Explanatory style and depression
After a negative experience, a depression-prone person may respond with a negative explanatory style.



What then might we expect of new college students who are not depressed but do exhibit a pessimistic explanatory style? Lauren Alloy and her collaborators (1999) monitored Temple University and University of Wisconsin students every 6 weeks for 2.5 years. Among those identified as having a pessimistic thinking style, 17 percent had a first episode of major depression, as did only 1 percent of those who began college with an optimistic thinking style.

Critics note a chicken-and-egg problem nesting in the social-cognitive explanation of depression. Which comes first? The pessimistic explanatory style, or the depressed mood? Certainly, the negative explanations *coincide* with a depressed mood, and they are *indicators* of depression. But do they *cause* depression, any more than a speedometer's reading 70 mph *causes* a car's speed? Before or after being depressed, people's thoughts are less negative. Perhaps a depressed mood triggers negative thoughts. If you temporarily put people in a bad or sad mood, their memories, judgments, and expectations suddenly become more pessimistic. (See *state-dependent memory* in Chapter 8.)

Cultural forces may also nudge people toward or away from depression. Seligman (1991, 1995) has argued that in the West the rise of individualism and the decline of commitment to religion and family have forced young people to take personal responsibility for failure or rejection. In non-Western cultures, where close-knit relationships and cooperation are the norm, major depression is less common and less tied to self-blame over personal failure (WHO, 2004). In Japan, for example, depressed people instead tend to report feeling shame over letting others down (Draguns, 1990a).

Depression's Vicious Cycle No matter which comes first, rejection and depression feed each other. Depression, as we have seen, is often brought on by events that disrupt our sense of who we are and why we are worthy. The stressful experience may be losing a job, getting divorced or rejected, or suffering physical trauma. Such disruptions in turn lead to brooding, which is rich soil for growing negative feelings. And that negativity—being withdrawn, self-focused, and complaining—can by itself cause others to reject us (Furr & Funder, 1998; Gotlib & Hammen, 1992). Indeed, people deep in depression are at high risk for divorce, job loss, and other stressful life events. Weary of the person's fatigue, hopeless attitude, and lethargy, a spouse may threaten to leave, or a boss may begin to question the person's competence. New losses and stress then plunge the already-depressed person into even deeper misery. Misery may love another's company, but company does not love another's misery.

We can now assemble pieces of the depression puzzle (**FIGURE 14.9**): (1) Stressful events interpreted through (2) a brooding, negative explanatory style create (3) a hopeless, depressed state that (4) hampers the way the person thinks and acts. These thoughts and actions, in turn, fuel (1) negative experiences such as rejection. Depression is a snake that bites its own tail.

It is a cycle we can all recognize. When we *feel* down, we *think* negatively and remember bad experiences. On the brighter side, if we can recognize the cycle, we can break out of it. Each of the four points offers an exit. We could reverse our self-blame and negative outlook. We could turn our attention outward. We could engage in more pleasant activities and more competent behavior.

Britain's Prime Minister Winston Churchill called depression a "black dog" that periodically hounded him. Abraham Lincoln was so withdrawn and brooding as a young man that his friends feared he might take his own life (Kline, 1974). As their lives remind us, people can and do struggle through depression. Most regain their capacity to love, to work, and even to succeed at the highest levels.

"Some cause happiness wherever they go; others, whenever they go."
Irish writer Oscar Wilde (1854–1900)

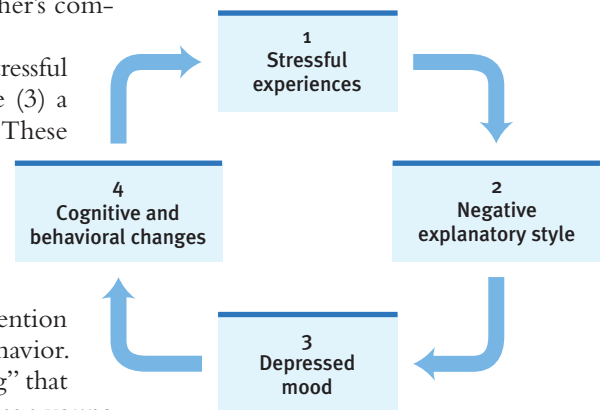


FIGURE 14.9
The vicious cycle of depressed thinking Cognitive therapists attempt to break this cycle, as we will see in Chapter 15, by changing the way depressed people process events. Psychiatrists prescribe medications to try to alter the biological roots of persistently depressed moods.

RETRIEVE IT

- What does it mean to say that “depression is a whole-body disorder”?

ANSWER: Many factors contribute to depression, including the biological influences of genetics and brain function. Social-cognitive factors also matter, including the interaction of explanatory style, mood, our responses to stressful experiences, and changes in our patterns of thinking and behaving. The whole body is involved.

schizophrenia a group of severe disorders characterized by disorganized and delusional thinking, disturbed perceptions, and inappropriate emotions and behaviors.

psychosis a psychological disorder in which a person loses contact with reality, experiencing irrational ideas and distorted perceptions.

delusions false beliefs, often of persecution or grandeur, that may accompany psychotic disorders.

Schizophrenia

During their most severe periods, people with **schizophrenia** live in a private inner world, preoccupied with the strange ideas and images that haunt them. The word itself means “split” (*schizo*) “mind” (*phrenia*). It refers *not* to a multiple-personality split but rather that the mind has suffered a split from reality that may show itself in disorganized thinking, disturbed perceptions, and inappropriate emotions and actions. Schizophrenia is the chief example of a **psychosis**, a disorder marked by irrationality, distorted perceptions, and lost contact with reality.

As you can imagine, these characteristics profoundly disrupt relationships and work. Given a supportive environment and medication, over 40 percent of people with schizophrenia will have periods of a year or more of normal life experience (Jobe & Harrow, 2010). Many others remain socially withdrawn and isolated or rejected for much of their lives (Hooley, 2010).

Symptoms of Schizophrenia



14-10: What are the schizophrenia subtypes, and what patterns of thinking, perceiving, feeling, and behaving characterize schizophrenia?

Schizophrenia comes in varied forms. Schizophrenia patients with *positive symptoms* may experience hallucinations, talk in disorganized and deluded ways, and exhibit inappropriate laughter, tears, or rage. Those with *negative symptoms* have toneless voices, expressionless faces, or mute and rigid bodies. Thus, positive symptoms are the *presence* of inappropriate behaviors, and negative symptoms are the *absence* of appropriate behaviors. Because schizophrenia is a cluster of disorders, these varied symptoms may have more than one cause. **TABLE 14.5** lists the subtypes of schizophrenia.

Disorganized Thinking Imagine trying to communicate with Maxine, a young woman whose thoughts spill out in no logical order. Her biographer, Susan Sheehan (1982, p. 25), observed her saying aloud to no one in particular, “This morning, when I was at Hillside [Hospital], I was making a movie. I was surrounded by movie stars. . . . I’m Mary Poppins. Is this room painted blue to get me upset? My grandmother died four weeks after my eighteenth birthday.”

As this strange monologue illustrates, the thinking of a person with schizophrenia is fragmented and often distorted by false beliefs called **delusions**. Maxine believed she was Mary Poppins. People with paranoid tendencies often believe they are being threatened or pursued.



Table 14.5

Subtypes of Schizophrenia

Subtype	Symptoms
<i>Paranoid</i>	Preoccupation with delusions or hallucinations, often with themes of persecution or grandiosity
<i>Disorganized</i>	Disorganized speech or behavior, or flat or inappropriate emotion
<i>Catatonic</i>	Immobility (or excessive, purposeless movement), extreme negativism, and/or parrot-like repeating of another’s speech or movements
<i>Undifferentiated</i>	Many and varied symptoms
<i>Residual</i>	Withdrawal, after hallucinations and delusions have disappeared

Disorganized thinking may appear as *word salad*, jumbled ideas that make no sense to others. One young man begged for “a little more allegro in the treatment,” and suggested that “liberationary movement with a view to the widening of the horizon” will “ergo extort some wit in lectures.”

Disorganized thoughts may result from a breakdown in *selective attention*. We normally have a remarkable capacity for giving our undivided attention to one set of sensory stimuli while filtering out others (Chapter 3). People with schizophrenia cannot do this. Thus, tiny, irrelevant stimuli, such as the grooves on a brick or the inflections of a voice, may distract their attention from a bigger event or a speaker’s meaning. As one former patient recalled, “What had happened to me . . . was a breakdown in the filter, and a hodge-podge of unrelated stimuli were distracting me from things which should have had my undivided attention” (MacDonald, 1960, p. 218). This selective-attention difficulty is but one of dozens of cognitive differences associated with schizophrenia (Reichenberg & Harvey, 2007).

Disturbed Perceptions Delusions are false *beliefs*. *Hallucinations* are false perceptions—sensory experiences without sensory stimulation. People with schizophrenia may see, feel, taste, or smell things that are not there. Most often, however, the hallucinations are sounds, often voices making insulting remarks or giving orders. The voices may tell the person that she is bad or that she must burn herself with a cigarette lighter. Imagine your own reaction if a dream broke into your waking consciousness. Stuart Emmons described his experience:

When someone asks me to explain schizophrenia I tell them, you know how sometimes in your dreams you are in them yourself and some of them feel like real nightmares? My schizophrenia was like I was walking through a dream. But everything around me was real. At times, today’s world seems so boring and I wonder if I would like to step back into the schizophrenic dream, but then I remember all the scary and horrifying experiences (Emmons et al., 1997).

When the unreal seems real, the resulting perceptions are at best bizarre, at worst terrifying.

Inappropriate Emotions and Actions The expressed emotions of schizophrenia are often utterly inappropriate, split off from reality (Kring & Caponigro, 2010). Maxine laughed after recalling her grandmother’s death. On other occasions, she cried when others laughed, or became angry for no apparent reason. Others with schizophrenia lapse into an emotionless *flat affect* state of no apparent feeling. Many people with schizophrenia have difficulty reading other peoples’ facial emotions and states of mind (Green & Horan, 2010; Kohler et al., 2010).

Inappropriate motor behavior takes many forms. Some perform senseless, compulsive acts, such as continually rocking, or rubbing an arm. Others may remain motionless for hours (a condition called *catatonia*) and then become agitated.

Onset and Development of Schizophrenia



14-11: How do chronic and acute schizophrenia differ?

Nearly 1 in 100 people (about 60 percent of them men) will develop schizophrenia, joining the estimated 24 million people worldwide who have this dreaded disorder (Abel et al., 2010; WHO, 2011). It typically strikes as young people are maturing into adulthood. It knows no national boundaries. Men tend to be struck earlier, more severely, and slightly more often (Aleman et al., 2003; Picchioni & Murray, 2007). In studies of Swedish and Danish men, the risk was highest for those who were thin and young, and for those who had not been breast-fed (Sørensen et al., 2005, 2006; Zammit et al., 2007).



Art by someone diagnosed with schizophrenia Commenting on the kind of artwork shown here (from Craig Geiser’s 2010 art exhibit in Michigan), poet and art critic John Ashbery wrote: “The lure of the work is strong, but so is the terror of the unanswerable riddles it proposes.”

Most schizophrenia patients smoke, often heavily. Nicotine apparently stimulates certain brain receptors, which helps focus attention (Diaz et al., 2008; Javitt & Coyle, 2004).

For some, schizophrenia appears suddenly, seemingly as a reaction to stress. For others, as was the case with Maxine, schizophrenia develops gradually, emerging from a long history of social inadequacy and poor school performance (MacCabe et al., 2008). This may help explain why people predisposed to schizophrenia often are found in the lower socioeconomic levels, or even homeless.

One rule holds true around the world (WHO, 1979): When schizophrenia is a slow-developing process (called *chronic*, or *process*, *schizophrenia*), recovery is doubtful. Social withdrawal, a negative symptom, is common among those with chronic schizophrenia (Kirkpatrick et al., 2006). Men, whose schizophrenia develops on average four years earlier than women's, more often exhibit negative symptoms and chronic schizophrenia (Räsänen et al., 2000).

Recovery is much more likely when a previously well-adjusted person develops schizophrenia rapidly (called *acute*, or *reactive*, *schizophrenia*) following some sort of life stress. People with reactive schizophrenia more often have the positive symptoms that respond to drug therapy (Fenton & McGlashan, 1991, 1994; Fowles, 1992).

Understanding Schizophrenia

Schizophrenia is the most dreaded psychological disorder. It is also one of the most heavily researched. Most research studies now link it with abnormal brain tissue and activity, and with genetic predispositions. Schizophrenia is a disease of the brain manifested in symptoms of the mind.



Ralph Hutchings/Visuals Unlimited, Inc.

Studying the neurophysiology of schizophrenia Psychiatrist E. Fuller Torrey is collecting the brains of hundreds of those who died as young adults and suffered disorders such as schizophrenia and bipolar disorder. Torrey is making tissue samples available to researchers worldwide.



Chris Usher

Brain Abnormalities



14-12: What brain abnormalities are associated with schizophrenia?

Might chemical imbalances in the brain explain schizophrenia? Scientists have long known that strange behavior can have strange chemical causes. Have you ever heard the saying “mad as a hatter”? That phrase dates back to the behavior of British hatmakers whose brains were slowly poisoned as they used their tongue and lips to moisten the brims of mercury-laden felt hats (Smith, 1983). Could schizophrenia symptoms have a similar biochemical key? Scientists are tracking the mechanisms by which chemicals produce hallucinations and other symptoms.

Dopamine Overactivity One possible answer emerged when researchers examined schizophrenia patients' brains after death. They found an excess number of *dopamine* receptors, including a sixfold excess for the dopamine receptor D4 (Seeman et al., 1993; Wong et al., 1986). The resulting hyper-responsive dopamine system could intensify brain signals, creating positive symptoms such as hallucinations and paranoia (Grace, 2010). Other evidence reinforces this idea: Drugs that block dopamine receptors often lessen these symptoms; drugs that increase dopamine levels, such as amphetamines and cocaine, sometimes intensify them (Seeman, 2007; Swerdlow & Koob, 1987).

Abnormal Brain Activity and Anatomy People with chronic schizophrenia often display abnormal activity in multiple brain areas. Some have abnormally low brain activity in the brain's frontal lobes, which are critical for reasoning, planning, and problem solving (Morey et al., 2005; Pettegrew et al., 1993; Resnick, 1992). The brain waves that reflect synchronized neural firing in the frontal lobes decline noticeably (Spencer et al., 2004; Symond et al., 2005). These out-of-sync neurons may disrupt neural network functioning.

One study took PET scans of brain activity while people were hallucinating (Silbersweig et al., 1995). When participants heard a voice or saw something, their brain became vigorously active in several core regions. One was the thalamus, the structure that filters incoming sensory signals and transmits them to the brain's cortex. Another PET scan study of people with paranoia found increased activity in the amygdala, a fear-processing center (Epstein et al., 1998).

Many studies of people with schizophrenia have found enlarged, fluid-filled areas and a corresponding shrinkage and thinning of cerebral tissue (Goldman et al., 2009; Wright et al., 2000). Such brain abnormalities have even appeared in studies of people who would *later* develop this disorder, and in their close relatives (Karlsgodt et al., 2010). The greater the brain shrinkage, the more severe the thought disorder (Collinson et al., 2003; Nelson et al., 1998; Shenton, 1992).

One smaller-than-normal area is the cortex. Another is the corpus callosum connecting the two hemispheres (Arnone et al., 2008). The thalamus shrinks as well, which may explain why filtering sensory input and focusing attention can be difficult for people with schizophrenia (Andreasen et al., 1994; Ellison-Wright et al., 2008). The bottom line is that schizophrenia involves not one isolated brain abnormality but problems with several brain regions and their interconnections (Andreasen, 1997, 2001).

Prenatal Environment and Risk



14-13: What prenatal events are associated with increased risk of developing schizophrenia?

What causes brain abnormalities in people with schizophrenia? Some researchers point to mishaps during prenatal development or delivery (Fatemi & Folsom, 2009; Walker et al., 2010). Risk factors for schizophrenia include low birth weight, maternal diabetes, older paternal age, and oxygen deprivation during delivery (King et al., 2010). Famine may also increase risks. People conceived during the peak of World War II's Dutch famine developed schizophrenia at twice the normal rate. Those conceived during the famine of 1959 to 1961 in eastern China also displayed this doubled rate (St. Clair et al., 2005; Susser et al., 1996).

Let's consider another possible culprit. Might a midpregnancy viral infection impair fetal brain development (Patterson, 2007)? To test this fetal-virus idea, scientists have asked these questions:

- *Are people at increased risk of schizophrenia if, during the middle of their fetal development, their country experienced a flu epidemic?* The repeated answer has been *Yes* (Mednick et al., 1994; Murray et al., 1992; Wright et al., 1995).
- *Are people born in densely populated areas, where viral diseases spread more readily, at greater risk for schizophrenia?* The answer, confirmed in a study of 1.75 million Danes, has again been *Yes* (Jablensky, 1999; Mortensen, 1999).
- *Are people born during the winter and spring months—after the fall-winter flu season—also at increased risk?* The answer is again *Yes*, and the risk increases from 5 to 8 percent (Fox, 2010; Torrey et al., 1997, 2002).
- *In the Southern Hemisphere, where the seasons are the reverse of the Northern Hemisphere, are the months of above-average schizophrenia births similarly reversed?* Again, the answer has been *Yes*. In Australia, people born between August and October are at greater risk. But there is an exception: For people born in the Northern Hemisphere, who later moved to Australia, the risk is greater if they were born between January and March (McGrath et al., 1995, 1999).
- *Are mothers who report being sick with influenza during pregnancy more likely to bear children who develop schizophrenia?* In one study of nearly 8000 women, the answer was *Yes*. The schizophrenia risk increased from the customary 1 percent to about 2 percent—but only when infections occurred during the second trimester (Brown et al., 2000). Maternal influenza infection during pregnancy also affects brain development in monkeys (Short et al., 2010).
- *Does blood drawn from pregnant women whose offspring develop schizophrenia show higher-than-normal levels of antibodies that suggest a viral infection?* In one study of 27 women whose children later developed schizophrenia, the answer was *Yes* (Buka et al., 2001). In a huge California study, which collected blood samples from some 20,000 pregnant

women during the 1950s and 1960s, the answer was again *Yes* (Brown et al., 2004). Another study found traces of a specific retrovirus (HERV) in nearly half of people with schizophrenia and virtually none in healthy people (Perron et al., 2008).

These converging lines of evidence suggest that fetal-virus infections contribute to the development of schizophrenia. This finding strengthens the U.S. government recommendation that “women who expect to be more than three months pregnant during the flu season” should have a flu shot (CDC, 2011).

Why might a second-trimester maternal flu bout put fetuses at risk? Is it the virus itself? The mother’s immune response to it? Medications taken? (Wyatt et al., 2001). Does the infection weaken the brain’s supportive glial cells, leading to reduced synaptic connections (Moises et al., 2002)? In time, answers may become available.

Genetic Influences



14-14: How do genes influence schizophrenia?

Fetal-virus infections may increase the odds that a child will develop schizophrenia. But many women get the flu during their second trimester of pregnancy, and only 2 percent of them bear children who develop schizophrenia. Why does prenatal exposure to the flu virus put some children at risk but not others? Could the answer be that some people are more vulnerable because of an inherited predisposition? The evidence is clear: The answer is *Yes*. For most people, the odds of being diagnosed with schizophrenia are nearly 1 in 100. For those who have a sibling or parent with the disorder, the odds increase to about 1 in 10. And if the affected sibling is an identical twin, the odds are close to 1 in 2 (FIGURE 14.10). Those odds are unchanged even when the twins are reared apart (Plomin et al., 1997). (Only about a dozen such cases are on record.)

Remember, though, that identical twins share more than their genes. They also share a prenatal environment. About two-thirds share a placenta and the blood it supplies; the other one-third have separate placentas. Shared placentas matter. If the co-twin of an identical twin with schizophrenia shared the placenta, the chances of developing the disorder are 6 in 10. If they had separate placentas (as do fraternal twins), the chances are only 1 in 10 (Davis et al., 1995a,b; Phelps et al., 1997). Twins who share a placenta are more likely to experience the same prenatal viruses. So perhaps shared germs as well as shared genes produce identical twin similarities.

Adoption studies help untangle genetic and environmental influences. Children adopted by someone who develops schizophrenia seldom “catch” the disorder. Rather, adopted children have a higher risk if a *biological* parent has schizophrenia (Gottesman, 1991). Genes matter.

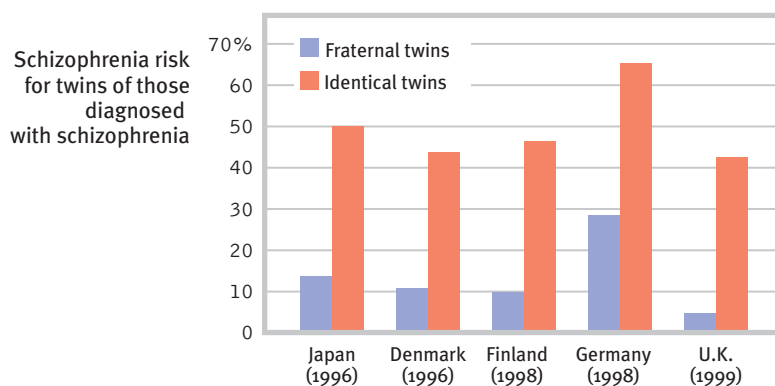
The search is on for specific genes that, in some combination, might lead to schizophrenia-inducing brain abnormalities (Levinson et al., 2011; Mitchell & Porteous, 2011; Vacic et al., 2011; Wang et al., 2010). (It is not our genes but our brains that directly

control our behavior.) Some of these genes influence the activity of dopamine and other brain neurotransmitters. Others affect the production of *myelin*, a fatty substance that coats the axons of nerve cells and lets impulses travel at high speed through neural networks.

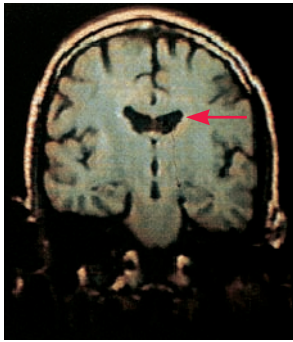
Although genes matter, the genetic formula is not as straightforward as the inheritance of eye color. Genome studies of thousands of individuals with and without schizophrenia indicate that schizophrenia is influenced by many genes, each with very small effects (International Schizophrenia Consortium, 2009; Pogue-Geile & Yokley, 2010). Recall from Chapter 2 that *epigenetic* (literally “in addition to genetic”) factors influence gene expression.

FIGURE 14.10

Risk of developing schizophrenia The lifetime risk of developing schizophrenia varies with one’s genetic relatedness to someone having this disorder. Across countries, barely more than 1 in 10 fraternal twins, but some 5 in 10 identical twins, share a schizophrenia diagnosis. (Adapted from Gottesman, 2001.)



Both photos: Courtesy of Daniel R. Weinberger, M.D., NIH-NIMH/NSC



Schizophrenia



No schizophrenia

Schizophrenia in identical twins When twins differ, only the one afflicted with schizophrenia typically has enlarged, fluid-filled cranial cavities (right) (Suddath et al., 1990). The difference between the twins implies some nongenetic factor, such as a virus, is also at work.

Like hot water activating a tea bag, environmental factors such as viral infections, nutritional deprivation, and maternal stress can “turn on” the genes that put some of us at higher risk for this disorder. Identical twins’ differing histories in the womb and beyond explain why only one may show differing gene expressions (Walker et al., 2010). As we have seen in so many different contexts, nature and nurture interact. Neither hand claps alone.

Thanks to our expanding understanding of genetic and brain influences on maladies such as schizophrenia, the general public increasingly attributes psychiatric disorders to biological factors (Pescosolido et al., 2010).

Courtesy of Genain family



The Genain quadruplets The odds of any four people picked at random all being diagnosed with schizophrenia are 1 in 100 million. But genetically identical sisters Nora, Iris, Myra, and Hester Genain all have the disease. Two of the sisters have more severe forms of the disorder than the others, suggesting the influence of environmental as well as biological factors.

Most of us can relate more easily to the ups and downs of mood disorders than to the strange thoughts, perceptions, and behaviors of schizophrenia. Sometimes our thoughts do jump around, but we rarely talk nonsensically. Occasionally we feel unjustly suspicious of someone, but we do not believe the world is plotting against us. Often our perceptions err, but rarely do we see or hear things that are not there. We have felt regret after laughing at someone’s misfortune, but we rarely giggle in response to bad news. At times we just want to be alone, but we do not live in social isolation. However, millions of people around the world do talk strangely, suffer delusions, hear nonexistent voices, see things that are not there, laugh or cry at inappropriate times, or withdraw into private imaginary worlds. The quest to solve the cruel puzzle of schizophrenia therefore continues, more vigorously than ever.

RETRIEVE IT

- A person with schizophrenia who has _____ (positive/negative) symptoms may have an expressionless face and toneless voice. These symptoms are most common with _____ (chronic/acute) schizophrenia and are not likely to respond to drug therapy. Those with _____ (positive/negative) symptoms are likely to experience delusions and to be diagnosed with _____ (chronic/acute) schizophrenia, which is much more likely to respond to drug therapy.

ANSWERS: negative; chronic; negative; chronic; positive; acute

- What factors contribute to the onset and development of schizophrenia?

ANSWER: Biological factors include abnormalities in brain structure and function, prenatal exposure to a maternal virus, and genetic factors. However, schizophrenia is more likely to develop given a high-risk environment.

Other Disorders

Dissociative Disorders



14-15: What are dissociative disorders, and why are they controversial?

Among the most bewildering disorders are the rare **dissociative disorders**. The person's conscious awareness is said to *dissociate* (become separated) from painful memories, thoughts, and feelings. The result may be a “fugue state,” a sudden loss of memory or change in identity, often in response to an overwhelmingly stressful situation. Such was the case for one Vietnam veteran who was haunted by his comrades' deaths, and who had left his World Trade Center office shortly before the 9/11 attack. He disappeared on the way to work one day and was discovered six months later in a Chicago homeless shelter, reportedly with no memory of his identity or family (Stone, 2006).

Dissociation itself is not so rare. Any one of us may have a fleeting sense of being unreal, of being separated from our body, of watching ourselves as if in a movie. A massive dissociation of self from ordinary consciousness occurs in **dissociative identity disorder (DID)**. At different times, two or more distinct identities seem to control the person's behavior, each with its own voice and mannerisms. Thus, the person may be prim and proper one moment, loud and flirtatious the next. Typically, the original personality denies any awareness of the other(s).

People diagnosed with DID (formerly called *multiple personality disorder*) are rarely violent, but cases have been reported of dissociations into a “good” and a “bad” (or aggressive) personality—a modest version of the Dr. Jekyll–Mr. Hyde split immortalized in Robert Louis Stevenson's story. One unusual case involved Kenneth Bianchi, accused in the “Hillside Strangler” rapes and murders of 10 California women. During a hypnosis session with Bianchi, psychologist John Watkins (1984) “called forth” a hidden personality: “I've talked a bit to Ken, but I think that perhaps there might be another part of Ken that . . . maybe feels somewhat differently from the part that I've talked to. . . . Would you talk with me, Part, by saying, ‘I'm here?’” Bianchi answered “Yes” and then claimed to be “Steve.”

Speaking as Steve, Bianchi stated that he hated Ken because Ken was nice and that he (Steve), aided by a cousin, had murdered women. He also claimed Ken knew nothing about Steve's existence and was innocent of the murders. Was Bianchi's second personality a ruse, simply a way of disavowing responsibility for his actions? Indeed, Bianchi—a practiced liar who had read about multiple personality in psychology books—was later convicted.



Multiple personalities Chris Sizemore's story, told in the book and movie, *The Three Faces of Eve*, gave early visibility to what is now called *dissociative identity disorder*.

The “Hillside Strangler” Kenneth Bianchi is shown here at his trial.



AP/Wide World Photos

Understanding Dissociative Identity Disorder Skeptics have raised some serious questions about DID. First, they find it suspicious that the disorder has such a short history. Between 1930 and 1960, the number of North American DID diagnoses was 2 per decade. By the 1980s, when the DSM contained the first formal code for this disorder, the number exploded to more than 20,000 (McHugh, 1995a). The average number of displayed personalities also mushroomed—from 3 to 12 per patient (Goff & Simms, 1993).

Second, note the skeptics, DID is much less prevalent outside North America, although in other cultures some people are said to be “possessed” by an alien spirit (Aldridge-Morris, 1989; Kluff, 1991). In Britain, DID—which some have considered “a wacky American fad” (Cohen, 1995)—is rare. In India and Japan, it is essentially nonexistent (or at least unreported). Such findings, skeptics say, point to a cultural explanation—a disorder created by therapists in a particular social context (Merskey, 1992). Rather than being provoked by trauma, dissociative symptoms tend to be exhibited by suggestible, fantasy-prone people (Giesbrecht et al., 2008, 2010).

Third, instead of being a real disorder, skeptics have asked, could DID be an extension of our normal capacity for personality shifts? Nicholas Spanos (1986, 1994, 1996) asked college students to pretend they were accused murderers being examined by a psychiatrist. Given the same hypnotic treatment Bianchi received, most spontaneously expressed a second personality. This discovery made Spanos wonder: Are dissociative identities simply a more extreme version of the varied “selves” we normally present, as when we display a goofy, loud self while hanging out with friends, and a subdued, respectful self around grandparents? If so, say the critics, clinicians who discover multiple personalities may merely have triggered role-playing by fantasy-prone people. After all, clients do not enter therapy saying “Allow me to introduce myself.” Rather, note these skeptics, some therapists go fishing for multiple personalities: “Have you ever felt like another part of you does things you can’t control? Does this part of you have a name? Can I talk to the angry part of you?” Once patients permit a therapist to talk, by name, “to the part of you that says those angry things,” they begin acting out the fantasy. Like actors who lose themselves in their roles, vulnerable patients may “become” the parts they are acting out. The result may be the experience of another self.

Other researchers and clinicians believe DID is a real disorder. They have found support for this view in the distinct brain and body states associated with differing personalities (Putnam, 1991). Brain scans of people with DID have revealed activity in areas linked with traumatic memories (Elzinga et al., 2007). Handedness sometimes switches with personality (Henninger, 1992). Shifts in visual acuity and eye-muscle balance have been recorded as DID patients switched personalities, but not as control group members tried to simulate DID behavior (Miller et al., 1991).

Both the psychodynamic and learning perspectives have interpreted DID symptoms as ways of dealing with anxiety. Some psychodynamic theorists see them as defenses against the anxiety caused by unacceptable impulses. In this view, an immoral second personality could allow the discharge of forbidden impulses. (This explanation presumes the existence of repressed memories, which has been questioned by memory researchers; see Chapters 8 and 12.) Learning theorists see dissociative disorders as behaviors reinforced by anxiety reduction.

Some clinicians suggest including dissociative disorders under the umbrella of post-traumatic stress disorders. In this view, DID would be a natural, protective response to traumatic experiences during childhood (Putnam, 1995; Spiegel, 2008). Many DID patients recall being physically, sexually, or emotionally abused as children (Gleaves, 1996; Lilienfeld et al., 1999). In one study of 12 murderers diagnosed with DID, 11 had suffered severe abuse, even torture, in childhood (Lewis et al., 1997). One had been set afire by his parents. Another had been used in child pornography and was scarred from being made to sit on a stove burner. Some critics wonder, however, whether vivid imagination or therapist suggestion contributed to such recollections (Kihlstrom, 2005).

So the debate continues. On one side are those who believe multiple personalities are the desperate efforts of people trying to detach from a horrific existence. On the other are the skeptics who think DID is a condition constructed out of the therapist-patient interaction and acted out by fantasy-prone, emotionally vulnerable people. If the skeptics’ view wins, predicted psychiatrist Paul McHugh (1995b), “this epidemic will end in the way that the witch craze ended in Salem. The [multiple personality phenomenon] will be seen as manufactured.”

RETRIEVE IT

- The psychodynamic and learning perspectives agree that dissociative identity disorder symptoms are ways of dealing with anxiety. How do their explanations differ?

ANSWER: The psychodynamic explanation of DID symptoms is that they are defenses against anxiety generated by unacceptable urges. The learning perspective attempts to explain these symptoms as behaviors that have been reinforced by relieving anxiety in the past.

“Pretense may become reality.”

Chinese proverb



“Would it be possible to speak with the personality that pays the bills?”

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dissociative disorders disorders in which conscious awareness becomes separated (dissociated) from previous memories, thoughts, and feelings.

dissociative identity disorder (DID) a rare dissociative disorder in which a person exhibits two or more distinct and alternating personalities. Formerly called *multiple personality disorder*.

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Dying to be thin Anorexia was identified and named in the 1870s, when it appeared among affluent adolescent girls (Brumberg, 2000). This 1930s photo illustrates the physical condition.

“Why do women have such low self-esteem? There are many complex psychological and societal reasons, by which I mean Barbie.”

Dave Barry, 1999

Eating Disorders



14-16: What are the three main eating disorders, and how do biological, psychological, and social-cultural influences make people more vulnerable to these disorders?

Our bodies are naturally disposed to maintain a normal weight, including stored energy reserves for times when food becomes unavailable. Yet sometimes psychological influences overwhelm biological wisdom. This becomes painfully clear in three eating disorders:

- **Anorexia nervosa** typically begins as a weight-loss diet. People with anorexia—usually adolescents and 9 out of 10 times females—drop significantly below normal weight, typically by 15 percent or more. Yet they feel fat, fear gaining weight, remain obsessed with losing weight, and sometimes exercise excessively. About half of those with anorexia display a binge-purge-depression cycle.
- **Bulimia nervosa** may also be triggered by a weight-loss diet, broken by gorging on forbidden foods. In a cycle of repeating episodes, people with this disorder—mostly women in their late teens or early twenties—alternate binge eating and purging (through vomiting or laxative use) (Wonderlich et al., 2007). Fasting or excessive exercise may follow. Preoccupied with food (craving sweets and high-fat foods), and fearful of becoming overweight, binge-purge eaters experience bouts of depression and anxiety during and following binges (Hinz & Williamson, 1987; Johnson et al., 2002). Unlike anorexia, bulimia is marked by weight fluctuations within or above normal ranges, making the condition easy to hide.
- Those with **binge-eating disorder** engage in significant binge eating, followed by remorse, but they do not purge, fast, or exercise excessively, and thus may be overweight.

A U.S. National Institute of Mental Health-funded study reported that, at some point during their lifetime, 0.6 percent of people meet the criteria for anorexia, 1 percent for bulimia, and 2.8 percent for binge-eating disorder (Hudson et al., 2007). So, how can we explain these disorders?

Understanding Eating Disorders

Eating disorders do *not* provide (as some have speculated) a telltale sign of childhood sexual abuse (Smolak & Murnen, 2002; Stice, 2002). The family environment may provide a fertile ground for the growth of eating disorders in other ways, however.

- Mothers of girls with eating disorders tend to focus on their own weight and on their daughters’ weight and appearance (Pike & Rodin, 1991).
- Bulimia patients’ families have a higher-than-usual incidence of childhood obesity and negative self-evaluation (Jacobi et al., 2004).
- Anorexia patients’ families tend to be competitive, high achieving, and protective (Pate et al., 1992; Yates, 1989, 1990).

Those with eating disorders often have low self-evaluations, set perfectionist standards, fret about falling short of expectations, and are intensely concerned with how others perceive them (Pieters et al., 2007; Polivy & Herman, 2002; Sherry & Hall, 2009). Some of these factors also predict teen boys’ pursuit of unrealistic muscularity (Ricciardelli & McCabe, 2004).

Genetics also influence susceptibility to eating disorders. Twins are more likely to share the disorder if they are identical rather than fraternal (Culbert et al., 2009; Klump et al., 2009; Root et al., 2010). Scientists are now searching for culprit genes, which may influence the body’s available serotonin and estrogen (Klump & Culbert, 2007).



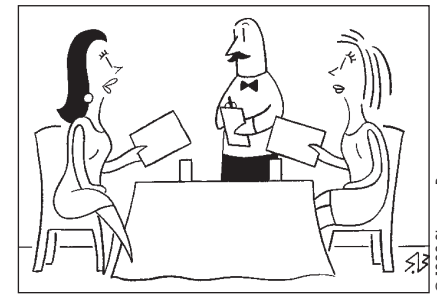
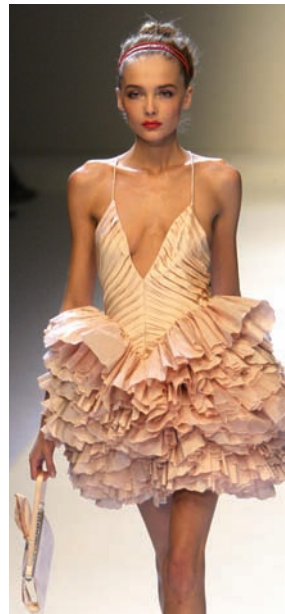
© Julie Ridge/iStockphoto

A too-fat body image underlies anorexia.

But these disorders also have cultural and gender components. Ideal shapes vary across culture and time. In impoverished countries, including much of Africa—where plumpness means prosperity and thinness can signal poverty or illness—bigger seems better (Knickmeyer, 2001; Swami et al., 2010). Bigger does not seem better in Western cultures, where, according to 222 studies of 141,000 people, the rise in eating disorders in the last half of the twentieth century coincided with a dramatic increase in women having a poor body image (Feingold & Mazzella, 1998).

Those most vulnerable to eating disorders are also those (usually women or gay men) who most idealize thinness and have the greatest body dissatisfaction (Feldman & Meyer, 2010; Kane, 2010; Stice et al., 2010). Should it surprise us, then, that when women view real and doctored images of unnaturally thin models and celebrities, they often feel ashamed, depressed, and dissatisfied with their own bodies—the very attitudes that predispose eating disorders (Grabe et al., 2008; Myers & Crowther, 2009; Tiggeman & Miller, 2010)? Eric Stice and his colleagues (2001) tested this modeling idea by giving some adolescent girls (but not others) a 15-month subscription to an American teen-fashion magazine. Compared with their counterparts who had not received the magazine, vulnerable girls—defined as those who were already dissatisfied, idealizing thinness, and lacking social support—exhibited increased body dissatisfaction and eating disorder tendencies. But even ultra-thin models do not reflect the impossible standard of the classic Barbie doll, who had, when adjusted to a height of 5 feet 7 inches, a 32–16–29 figure (in centimeters, 82–41–73) (Norton et al., 1996).

It seems clear that the sickness of today's eating disorders lies in part within our weight-obsessed culture—a culture that says, in countless ways, “Fat is bad,” that motivates millions of women to be “always dieting,” and that encourages eating binges by pressuring women to live in a constant state of semistarvation. If cultural learning contributes to eating behavior, then might prevention programs increase acceptance of one's body? Reviews of prevention studies answer Yes, and especially if the programs are interactive and focused on girls over age 15 (Stice et al., 2007; Vocks et al., 2010).



“Thanks, but we don't eat.”

© 1999 Shannon Burns
www.shannonburns.com/cartoon4.htm

“Skeletons on Parade” A newspaper article used this headline in criticizing the display of superthin models. Do such models make self-starvation fashionable?

RETRIEVE IT

- People with _____ (anorexia nervosa/bulimia nervosa) continue to want to lose weight even when they are underweight. Those with _____ (anorexia nervosa/bulimia nervosa) tend to have weight that fluctuates within or above normal ranges.

ANSWERS: anorexia nervosa; bulimia nervosa

Personality Disorders



14-17: What are the three clusters of personality disorders? What behaviors and brain activity characterize the antisocial personality?

The disruptive, inflexible, and enduring behavior patterns of **personality disorders** interfere with social functioning. These disorders tend to form three clusters, characterized by

- anxiety, such as a fearful sensitivity to rejection that predisposes the withdrawn *avoidant personality disorder*.
- eccentric or odd behaviors, such as the emotionless disengagement of the *schizoid personality disorder*.

anorexia nervosa an eating disorder in which a person (usually an adolescent female) maintains a starvation diet despite being significantly (15 percent or more) underweight.

bulimia nervosa an eating disorder in which a person alternates binge eating (usually of high-calorie foods) with purging (by vomiting or laxative use) or fasting.

binge-eating disorder significant binge-eating episodes, followed by distress, disgust, or guilt, but without the compensatory purging or fasting that marks bulimia nervosa.

personality disorders psychological disorders characterized by inflexible and enduring behavior patterns that impair social functioning.

No remorse Dennis Rader, known as the “BTK killer” in Kansas, was convicted in 2005 of killing 10 people over a 30-year span. Rader exhibited the extreme lack of conscience that marks antisocial personality disorder.



EPA/Jeff Tuttle/Landov

- dramatic or impulsive behaviors, such as the attention-getting *histrionic personality disorder*, the self-focused and self-inflating *narcissistic personality disorder*, and the *antisocial personality disorder*.

These categories are not sharply distinguished, however, and some are slated to be revised or eliminated in the next DSM revision (Holden, 2010).

Antisocial Personality Disorder

The most troubling and heavily researched personality disorder is the **antisocial personality disorder**. You may have heard the older terms *sociopath* or *psychopath*. A person with this disorder is typically a male who shows no conscience, even toward friends and family. When an antisocial personality combines a keen intelligence with no con-

science, the result may be a charming and clever con artist, a ruthless corporate executive (*Snakes in Suits* is a book on antisocial behavior in business)—or worse.

The disorder usually appears before age 15, as the person begins to lie, steal, fight, or display unrestrained sexual behavior (Cale & Lilienfeld, 2002). Not all such children become antisocial adults. Those who do (about half of them) will generally be unable to keep a job, irresponsible as a spouse and parent, and violent or otherwise criminal (Farrington, 1991). Despite their remorseless and sometimes criminal behavior, criminality is not an essential component of antisocial behavior (Skeem & Cooke, 2010). Moreover, many criminals do not fit the description of antisocial personality disorder. Why? Because they show responsible concern for their friends and family members.

Antisocial personalities behave impulsively, and then feel and fear little (Fowles & Dindo, 2009). The results can be horrifying, as they were in the case of Henry Lee Lucas. He killed his first victim when he was 13. He felt little regret then or later. He confessed that, during his 32 years of crime, he had brutally beaten, suffocated, stabbed, shot, or mutilated some 360 women, men, and children. For the last 6 years of his reign of terror, Lucas teamed with Ottis Elwood Toole, who reportedly slaughtered about 50 people he “didn’t think was worth living anyhow” (Darrach & Norris, 1984).



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“Thursday is out. I have jury duty.”

Many criminals, like this one, exhibit a sense of conscience and responsibility in other areas of their life, and thus do not exhibit antisocial personality disorder.

antisocial personality disorder a personality disorder in which a person (usually a man) exhibits a lack of conscience for wrongdoing, even toward friends and family members. May be aggressive and ruthless or a clever con artist.

Understanding Antisocial Personality Disorder Antisocial personality disorder is woven of both biological and psychological strands. No single gene codes for a complex behavior such as crime. Molecular geneticists have, however, identified some specific genes that are more common in those with antisocial personality disorder (Gunter et al., 2010). There may be a genetic predisposition toward a fearless and uninhibited life. Twin and adoption studies have revealed that biological relatives of people with antisocial and unemotional tendencies are at increased risk for antisocial behavior (Larsson et al., 2007; Livesley & Jang, 2008). The genes that put people at risk for antisocial behavior also increase the risk for dependence on alcohol and other drugs, which helps explain why these disorders often appear in combination (Dick, 2007).

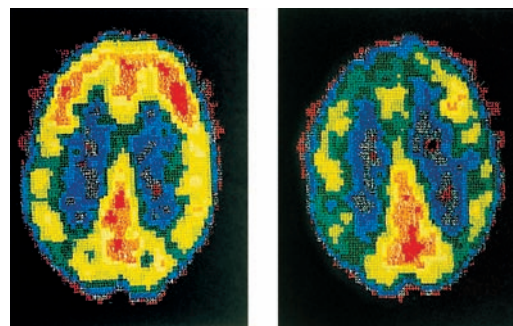
Genetic influences, often in combination with childhood abuse, help wire the brain (Dodge, 2009). The genetic vulnerability of those with antisocial and unemotional

tendencies appears as low arousal. Awaiting events that most people would find unnerving, such as electric shocks or loud noises, they show little autonomic nervous system arousal (Hare, 1975; van Goozen et al., 2007). Long-term studies show that their stress hormone levels are lower than average in their early teens, before they have committed any crime (FIGURE 14.11). And children who are slow to develop conditioned fears at age 3 are in later years more likely to commit a crime (Gao et al., 2010).

Other studies have found that preschool boys who later became aggressive or antisocial adolescents tended to be impulsive, uninhibited, unconcerned with social rewards, and low in anxiety (Caspi et al., 1996; Tremblay et al., 1994). These traits, if channeled in more productive directions, may lead to courageous heroism, adventurism, or star-level athleticism (Poulton & Milne, 2002). Lacking a sense of social responsibility, the same disposition may produce a cool con artist or killer (Lykken, 1995).

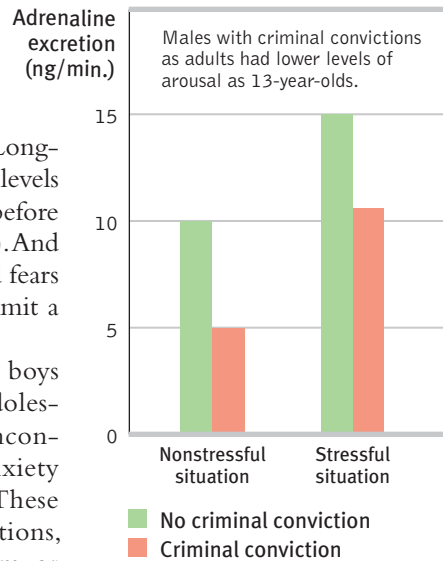
With antisocial behavior, as with so much else, nature and nurture interact and leave their marks on the brain. To explore the neural basis of antisocial personality disorder, scientists are identifying brain activity differences in antisocial criminals. Shown emotionally evocative photographs, such as a man holding a knife to a woman's throat, they display blunted heart rate and perspiration responses, and less activity in brain areas that typically respond to emotional stimuli (Harenski et al., 2010; Kiehl & Buckholtz, 2010). They also display a hyper-reactive dopamine reward system that predisposes their impulsive drive to do something rewarding, despite the consequences (Buckholtz et al., 2010). One study compared PET scans of 41 murderers' brains with those from people of similar age and sex. The murderers' frontal lobes, an area that helps control impulses, displayed reduced activity (Raine, 1999, 2005; FIGURE 14.12). This reduction was especially apparent in those who murdered impulsively. In a follow-up study, researchers found that violent repeat offenders had 11 percent less frontal lobe tissue than normal (Raine et al., 2000). This helps explain another finding: People with antisocial personality disorder fall far below normal in aspects of thinking such as planning, organization, and inhibition, which are all frontal lobe functions (Morgan & Lilienfeld, 2000). Such data remind us: Everything psychological is also biological.

Courtesy of Adrian Raine, University of Southern California



Normal

Murderer



Males with criminal convictions as adults had lower levels of arousal as 13-year-olds.

FIGURE 14.11
Cold-blooded arousability and risk of crime Levels of the stress hormone adrenaline were measured in two groups of 13-year-old Swedish boys. In both stressful and nonstressful situations, those who would later be convicted of a crime as 18- to 26-year-olds showed relatively low arousal. (From Magnusson, 1990.)

Does a full Moon trigger “madness” in some people? James Rotton and I. W. Kelly (1985) examined data from 37 studies that related lunar phase to crime, homicides, crisis calls, and mental hospital admissions. Their conclusion: There is virtually no evidence of “Moon madness.” Nor does lunar phase correlate with suicides, assaults, emergency room visits, or traffic disasters (Martin et al., 1992; Raison et al., 1999).

FIGURE 14.12
Murderous minds These top-facing PET scans illustrate reduced activation (less red and yellow) in a murderer's frontal cortex—a brain area that helps brake impulsive, aggressive behavior. (From Raine, 1999.)

RETRIEVE IT

- How do biological and psychological factors contribute to antisocial personality disorder?

ANSWER: Twin and adoption studies show that biological relatives of people with this disorder are at increased risk for antisocial behavior. Negative environmental factors, such as poverty or childhood abuse, may channel genetic traits such as fearlessness in more dangerous directions—toward aggression and away from social responsibility.

Table 14.6

Percentage of Americans Reporting Selected Psychological Disorders in the Past Year

Psychological Disorder	Percentage
Generalized anxiety	3.1
Social phobia	6.8
Phobia of specific object or situation	8.7
Mood disorder	9.5
Obsessive-compulsive disorder (OCD)	1.0
Schizophrenia	1.1
Post-traumatic stress disorder (PTSD)	3.5
Attention-deficit hyperactivity disorder (ADHD)	4.1
Any mental disorder	26.2

Source: National Institute of Mental Health, 2008.

Rates of Psychological Disorders



14-18: How many people currently have, or have had, a psychological disorder? Is poverty a risk factor?

Who is most vulnerable to psychological disorders? At what times of life? To answer such questions, various countries have conducted lengthy, structured interviews with representative samples of thousands of their citizens. After asking hundreds of questions that probe for symptoms—“Has there ever been a period of two weeks or more when you felt like you wanted to die?”—the researchers have estimated the current, prior-year, and lifetime prevalence of various disorders.

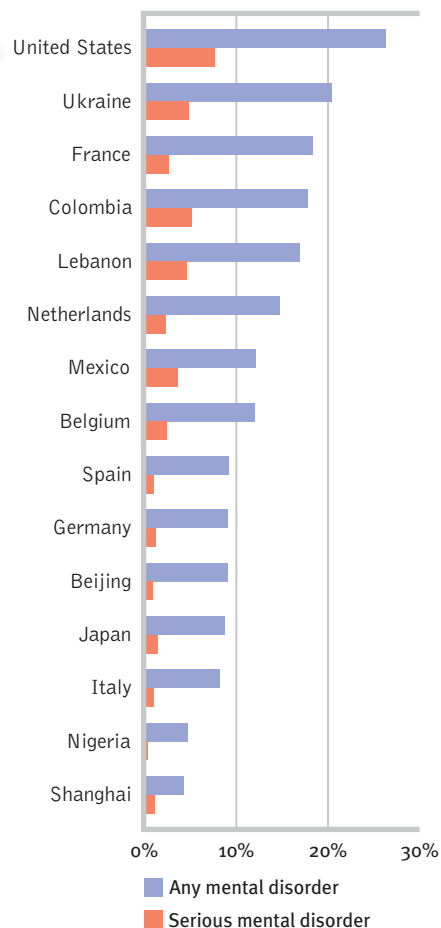
How many people have, or have had, a psychological disorder? More than most of us suppose:

- The U.S. National Institute of Mental Health (2008, based on Kessler et al., 2005) estimates that 26 percent of adult Americans “suffer from a diagnosable mental disorder in a given year” (**TABLE 14.6**).
- A twenty-first-century World Health Organization (2004) study—based on 90-minute interviews of 60,463 people—estimated the number of prior-year mental disorders in 20 countries. As **FIGURE 14.13** displays, the lowest rate of reported mental disorders was in Shanghai, the highest rate in the United States. Moreover, people immigrating to the United States from Mexico, Africa, and Asia average better mental health than their U.S. counterparts with the same ethnic heritage (Breslau et al., 2007; Maldonado-Molina et al., 2011). For example, compared with people who

have recently immigrated from Mexico, Mexican-Americans born in the United States are at greater risk of mental disorder—a phenomenon known as the *immigrant paradox* (Schwartz et al., 2010).

Who is most vulnerable to mental disorders? As we have seen, the answer varies with the disorder. One predictor of mental disorders—poverty—crosses ethnic and gender lines. The incidence of serious psychological disorders has been doubly high among those below the poverty line (Centers for Disease Control, 1992). This correlation, like so many others, raises further questions: Does poverty cause disorders? Or do disorders cause poverty? It is both, though the answer varies with the disorder. Schizophrenia understandably leads to poverty. Yet the stresses and demoralization of poverty can also precipitate disorders, especially depression in women and substance abuse in men (Dohrenwend et al., 1992). In one natural experiment on the poverty-pathology link, researchers tracked rates of behavior problems in North Carolina Native American children as economic development enabled a dramatic reduction in their community’s poverty rate. As the study began, children of poverty exhibited more deviant and aggressive behaviors. After four years, children whose families had moved above the poverty line exhibited a 40 percent decrease in the behavior problems; those who continued in their previous positions below or above the poverty line exhibited no change (Costello et al., 2003).

FIGURE 14.13
Prior-year prevalence of disorders in selected areas
From World Health Organization
(2004) interviews in 20 countries.



At what times of life do disorders strike? Usually by early adulthood. “Over 75 percent of our sample with any disorder had experienced [their] first symptoms by age 24,” reported Lee Robins and Darrel Regier (1991, p. 331). Among the earliest to appear are symptoms of antisocial personality disorder (median age 8) and of phobias (median age 10). Alcohol dependence, obsessive-compulsive disorder, bipolar disorder, and schizophrenia symptoms appear at a median age near 20. Major depression often hits somewhat later, at a median age of 25. Such findings make clear the need for research and treatment to help the growing number of people, especially teenagers and young adults, with psychological disorders.

Although mindful of the pain, we can be encouraged by the many ordinary and exceptional people who pursue successful careers and enjoy fulfilling lives while enduring psychological difficulties. The bewilderment, fear, and sorrow caused by psychological disorders are real. But, as Chapter 15 shows, hope, too, is real.

RETRIEVE IT

- What is the relationship between poverty and psychological disorders?

ANSWER: Poverty-related stressors can help trigger disorders, but disabling disorders can also contribute to poverty. Thus, poverty and disorder are often a chicken-and-egg situation, and it's hard to know which came first.

CHAPTER REVIEW

Psychological Disorders

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

What Is a Psychological Disorder?

- 14-1:** How should we draw the line between normal behavior and psychological disorder?
- 14-2:** Why is there controversy over attention-deficit hyperactivity disorder?
- 14-3:** How is our understanding of disorders affected by whether we use a medical model or a biopsychosocial approach?
- 14-4:** How and why do clinicians classify psychological disorders, and why do some psychologists criticize the use of diagnostic labels?

Anxiety Disorders

- 14-5:** What are the main anxiety disorders, and how do they differ from the ordinary worries and fears we all experience?
- 14-6:** How do conditioning, cognition, and biology contribute to the feelings and thoughts that mark anxiety disorders?

Mood Disorders

- 14-7:** What are mood disorders? How does major depressive disorder differ from bipolar disorder?
- 14-8:** How do the biological and social-cognitive perspectives explain mood disorders?
- 14-9:** What factors affect suicide and self-injuring, and what are some of the important warning signs to watch for in suicide prevention efforts?



Schizophrenia

- 14-10:** What are the schizophrenia subtypes, and what patterns of thinking, perceiving, feeling, and behaving characterize schizophrenia?
- 14-11:** How do chronic and acute schizophrenia differ?
- 14-12:** What brain abnormalities are associated with schizophrenia?
- 14-13:** What prenatal events are associated with increased risk of developing schizophrenia?
- 14-14:** How do genes influence schizophrenia?

Other Disorders

- 14-15:** What are dissociative disorders, and why are they controversial?
- 14-16:** What are the three main eating disorders, and how do biological, psychological, and social-cultural influences make people more vulnerable to these disorders?
- 14-17:** What are the three clusters of personality disorders? What behaviors and brain activity characterize the antisocial personality?

Rates of Psychological Disorders

- 14-18:** How many people currently have, or have had, a psychological disorder? Is poverty a risk factor?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

psychological disorder, p. 506

attention-deficit hyperactivity disorder (ADHD), p. 507

medical model, p. 507

DSM-IV-TR, p. 509

anxiety disorders, p. 513

generalized anxiety disorder, p. 513

panic disorder, p. 513

phobia, p. 513

obsessive-compulsive disorder (OCD), p. 514

post-traumatic stress disorder (PTSD), p. 515

mood disorders, p. 519

major depressive disorder, p. 520

bipolar disorder, p. 520

mania, p. 520

schizophrenia, p. 528

psychosis, p. 528

delusions, p. 528

dissociative disorders, p. 534

dissociative identity disorder (DID), p. 534

anorexia nervosa, p. 536

bulimia nervosa, p. 536

binge-eating disorder, p. 536

personality disorders, p. 537

antisocial personality disorder, p. 538

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Anna is embarrassed that it takes her several minutes to parallel-park her car. She usually gets out of the car once or twice to inspect her distance both from the curb and from the nearby cars. Should she worry about having a psychological disorder?
- Although some psychological disorders are culture-bound, others are universal. For example, in every known culture some people have
 - bulimia nervosa.
 - anorexia nervosa.
 - schizophrenia.
 - susto*.
- A therapist says that psychological disorders are sicknesses and people with these disorders should be treated as patients in a hospital. This therapist believes in the _____ model.
- Many psychologists reject the “disorders-as-illness” view and instead contend that other factors may also be involved—for example, the person's bad habits and poor social skills. This view represents the _____ approach.
 - medical
 - evil spirits
 - biopsychosocial
 - diagnostic labels
- Most psychologists and psychiatrists have used _____ to classify psychological disorders.
 - the DSM-IV-TR
 - in-depth patient histories
 - input from patients' family and friends
 - the theories of Pinel, Rosenhan, and others
- One study found that psychologists using DSM-IV agreed on a diagnosis for more than 80 percent of patients. The DSM-IV's reliability stems in part from its reliance on
 - structured-interview procedures.
 - in-depth patient histories.

- c. input from patients' family and friends.
d. the theories of Pinel, Freud, and others.
7. Anxiety that takes the form of an irrational and maladaptive fear of a specific object, activity, or situation is called a _____.
8. An episode of intense dread, accompanied by trembling, dizziness, chest pains, or choking sensations and by feelings of terror, is called
a. a specific phobia. c. a panic attack.
b. compulsion. d. an obsessive fear.
9. Marina became consumed with the need to clean the entire house and refused to participate in any other activities. Her family consulted a therapist, who diagnosed her as having _____ - _____ disorder.
10. The learning perspective proposes that phobias are
a. the result of individual genetic makeup.
b. a way of repressing unacceptable impulses.
c. conditioned fears.
d. a symptom of having been abused as a child.
11. Two disorders are found worldwide. One is schizophrenia, and the other is _____.
12. Although bipolar disorder is as maladaptive as depression, it is much less common and it affects
a. more women than men.
b. more men than women.
c. women and men equally.
d. primarily scientists and doctors.
13. The rate of depression is _____ (increasing/decreasing) among young people.
14. Depression can often be alleviated by drugs that increase supplies of the neurotransmitters _____ and _____.
15. Psychologists who emphasize the importance of negative perceptions, beliefs, and thoughts in depression are working within the _____ - _____ perspective.
16. A person with positive symptoms of schizophrenia is most likely to experience
a. catatonia. c. withdrawal.
b. delusions. d. flat emotion.
17. People with schizophrenia may hear voices urging self-destruction, an example of a(n) _____.
18. Victor exclaimed, "The weather has been so schizophrenic lately: It's hot one day and freezing the next!" Is this an accurate comparison? Why or why not?
19. Chances for recovery from schizophrenia are best when
a. onset is sudden, in response to stress.
b. deterioration occurs gradually, during childhood.
c. no environmental causes can be identified.
d. there is a detectable brain abnormality.
20. Dissociative identity disorder is controversial because
a. dissociation is actually quite rare.
b. it was reported frequently in the 1920s but rarely today.
c. it is almost never reported outside North America.
d. its symptoms are nearly identical to those of obsessive-compulsive disorder.
21. Which of the following statements is true of bulimia nervosa?
a. People with bulimia continue to want to lose weight even when they are underweight.
b. Bulimia is marked by weight fluctuations within or above normal ranges.
c. Bulimia patients often come from middle-class families that are competitive, high achieving, and protective.
d. If one twin is diagnosed with bulimia, the chances of the other twin's sharing the disorder are greater if they are fraternal rather than identical twins.
22. A personality disorder, such as antisocial personality, is characterized by
a. depression.
b. hallucinations.
c. enduring and inflexible behavior patterns that impair social functioning.
d. an elevated level of autonomic nervous system arousal.
23. PET scans of murderers' brains have revealed
a. higher-than-normal activation in the frontal lobes.
b. lower-than-normal activation in the frontal lobes.
c. more frontal lobe tissue than normal.
d. no differences in brain structures or activity.
24. One predictor of psychiatric disorders that crosses ethnic and gender lines is _____.
25. The symptoms of _____ appear around age 10; _____ tends to appear later, around age 25.
a. schizophrenia; bipolar disorder
b. bipolar disorder; schizophrenia
c. major depression; phobias
d. phobias; major depression

Find answers to these questions in Appendix E, in the back of the book.

TREATING PSYCHOLOGICAL DISORDERS

THE PSYCHOLOGICAL THERAPIES

Psychoanalysis and Psychodynamic Therapy
Humanistic Therapies
Behavior Therapies
Cognitive Therapies
Group and Family Therapies

EVALUATING PSYCHOTHERAPIES

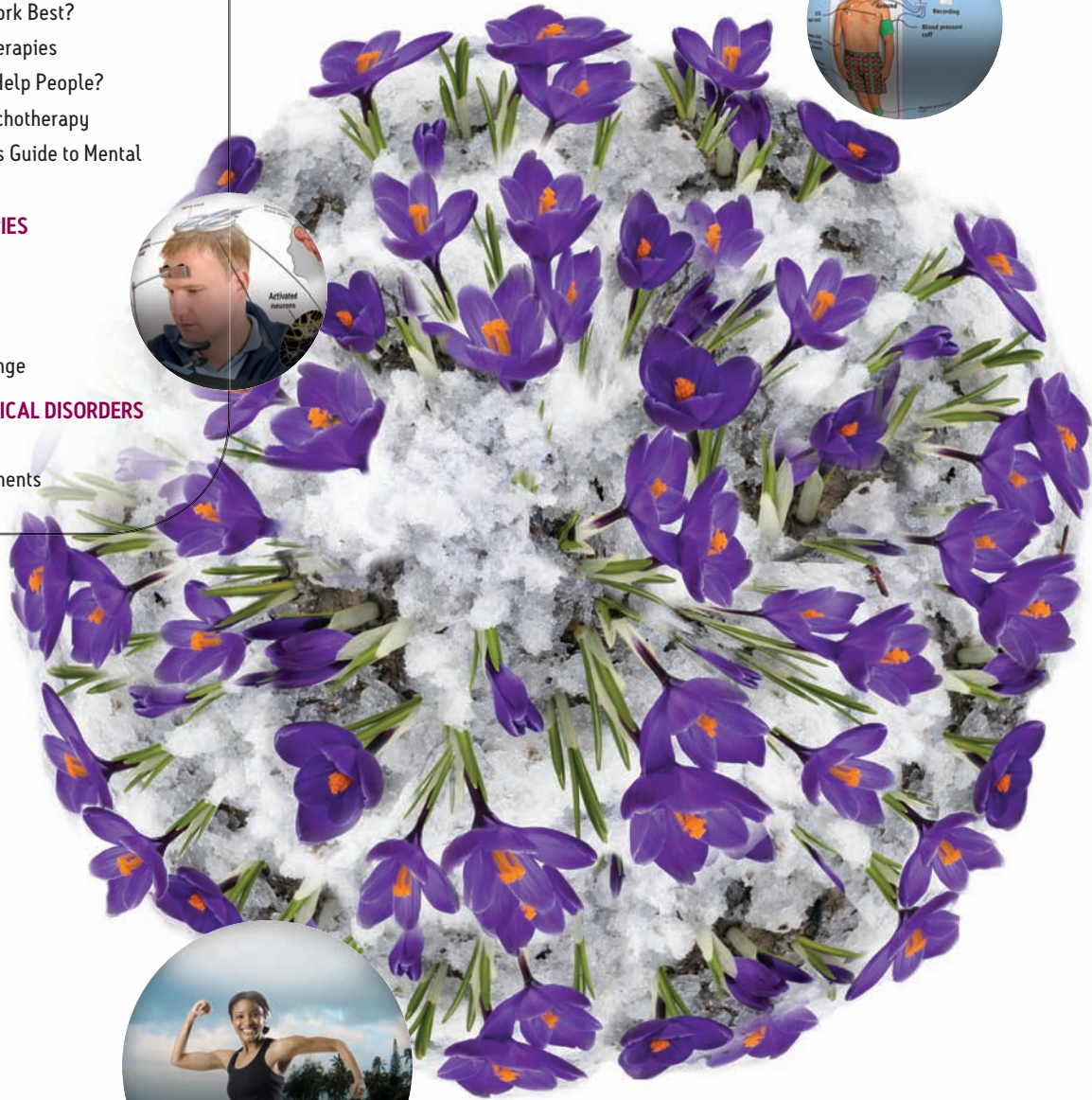
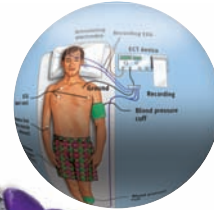
Is Psychotherapy Effective?
Which Psychotherapies Work Best?
Evaluating Alternative Therapies
How Do Psychotherapies Help People?
Culture and Values in Psychotherapy
CLOSE-UP: A Consumer's Guide to Mental Health Professionals

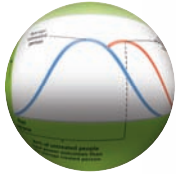
THE BIOMEDICAL THERAPIES

Drug Therapies
Brain Stimulation
Psychosurgery
Therapeutic Lifestyle Change

PREVENTING PSYCHOLOGICAL DISORDERS

Resilience
Creating Healthy Environments





Therapy



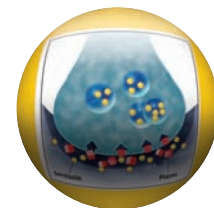
Kay Redfield Jamison, an award-winning clinical psychologist and world expert on the emotional extremes of bipolar disorder, knows her subject firsthand. “For as long as I can remember,” she recalled in *An Unquiet Mind*, “I was frighteningly, although often wonderfully, beholden to moods. Intensely emotional as a child, mercurial as a young girl, first severely depressed as an adolescent, and then unrelentingly caught up in the cycles of manic-depressive illness by the time I began my professional life, I became, both by necessity and intellectual inclination, a student of moods” (1995, pp. 4–5). Her life was blessed with times of intense sensitivity and passionate energy. But like her father’s, it was also at times plagued by reckless spending, racing conversation, and sleeplessness, alternating with swings into “the blackest caves of the mind.”

Then, “in the midst of utter confusion,” she made a sane and profoundly helpful decision. Risking professional embarrassment she made an appointment with a therapist, a psychiatrist she would visit weekly for years to come:

He kept me alive a thousand times over. He saw me through madness, despair, wonderful and terrible love affairs, disillusionments and triumphs, recurrences of illness, an almost fatal suicide attempt, the death of a man I greatly loved, and the enormous pleasures and aggravations of my professional life. . . . He was very tough, as well as very kind, and even though he understood more than anyone how much I felt I was losing—in energy, vivacity, and originality—by taking medication, he never was seduced into losing sight of the overall perspective of how costly, damaging, and life threatening my illness was. . . . Although I went to him to be treated for an illness, he taught me . . . the total beholdenness of brain to mind and mind to brain (pp. 87–88).

“Psychotherapy heals,” Jamison reports. “It makes some sense of the confusion, reins in the terrifying thoughts and feelings, returns some control and hope and possibility from it all.”

In this chapter, we consider some of the healing options available to therapists and the people who seek their help.



psychotherapy treatment involving psychological techniques; consists of interactions between a trained therapist and someone seeking to overcome psychological difficulties or achieve personal growth.

biomedical therapy prescribed medications or procedures that act directly on the person's physiology.

eclectic approach an approach to psychotherapy that, depending on the client's problems, uses techniques from various forms of therapy.

Dorothea Dix (1802-1887)

"I . . . call your attention to the state of the Insane Persons confined within this Commonwealth, in cages."

Culver Pictures



Treating Psychological Disorders



15-1: How do psychotherapy, biomedical therapy, and an eclectic approach to therapy differ?

The long history of efforts to treat psychological disorders has included a bewildering mix of harsh and gentle methods. Well-meaning individuals have cut holes in people's heads and restrained, bled, or "beat the devil" out of them. They have administered drugs and electric shocks. But they also have given warm baths and massages and placed people in sunny, serene environments. And they have talked with their patients about childhood experiences, current feelings, and maladaptive thoughts and behaviors.

Reformers Philippe Pinel, Dorothea Dix, and others pushed for gentler, more humane treatments and for constructing mental hospitals. Since the 1950s, the introduction of effective drug therapies and community-based treatment programs have emptied most of those hospitals.

Today's therapies can be classified into two main categories. The therapist's training and expertise, as well as the disorder itself, influence the choice of treatment. In **psychotherapy**, a trained therapist uses psychological techniques to assist someone seeking to overcome difficulties or achieve personal growth. **Biomedical therapy** offers medication or other biological treatments.

Some therapists combine techniques. Jamison received psychotherapy in her meetings with her psychiatrist, and she took medications to control her wild mood swings. Indeed, half of all psychotherapists describe themselves as taking an integrative, **eclectic approach**, using a blend of therapies. Many patients receive psychotherapy combined with medication.

Let's look first at the psychotherapy options for those treated with "talk therapies."

The history of treatment Visitors to eighteenth-century mental hospitals paid to gawk at patients, as though they were viewing zoo animals. William Hogarth's (1697-1764) painting (left) captured one of these visits to London's St. Mary of Bethlehem hospital (commonly called Bedlam). Benjamin Rush (1746-1813), a founder of the movement for more humane treatment of the mentally ill, designed the chair on the right "for the benefit of maniacal patients." He believed the restraints would help them regain their sanity.

The Granger Collection



The Psychological Therapies

Among the dozens of types of psychotherapy, we will look at the most influential. Each is built on one or more of psychology's major theories: psychodynamic, humanistic, behavioral, and cognitive. Most of these techniques can be used one-on-one or in groups.

Psychoanalysis and Psychodynamic Therapy



15-2: What are the goals and techniques of psychoanalysis, and how have they been adapted in psychodynamic therapy?

Sigmund Freud's **psychoanalysis** was the first of the psychological therapies. Few clinicians today practice therapy as Freud did, but his work deserves discussion as part of the foundation for treating psychological disorders.

The Goals of Psychoanalysis

Psychoanalytic theory presumes that healthier, less anxious living becomes possible when people release the energy they had previously devoted to id-ego-superego conflicts (see Chapter 12). Freud assumed that we do not fully know ourselves. There are threatening things that we seem to want not to know—that we disavow or deny.

Freud's therapy aimed to bring patients' repressed or disowned feelings into conscious awareness. By helping them reclaim their unconscious thoughts and feelings and giving them *insight* into the origins of their disorders, he aimed to help them reduce growth-impeding inner conflicts.

The Techniques of Psychoanalysis

Psychoanalysis is historical reconstruction. Psychoanalytic theory emphasizes the formative power of childhood experiences and their ability to mold the adult. Thus, it aims to excavate the past in hope of loosening its bonds on the present. After discarding hypnosis as an unreliable excavator, Freud turned to *free association*.

Imagine yourself as a patient using free association. First, you relax, perhaps by lying on a couch. As the psychoanalyst sits out of your line of vision, you say aloud whatever comes to mind. At one moment, you're relating a childhood memory. At another, you're describing a dream or recent experience. It sounds easy, but soon you notice how often you edit your thoughts as you speak. You pause for a second before uttering an embarrassing thought. You omit what seems trivial, irrelevant, or shameful. Sometimes your mind goes blank or you clutch up, unable to remember important details. You may joke or change the subject to something less threatening.

To the analyst, these mental blocks indicate **resistance**. They hint that anxiety lurks and you are defending against sensitive material. The analyst will note your resistances and then provide insight into their meaning. If offered at the right moment, this **interpretation**—of, say, your not wanting to talk about your mother—may illuminate the underlying wishes, feelings, and conflicts you are avoiding. The analyst may also offer an explanation of how this resistance fits with other pieces of your psychological puzzle, including those based on analysis of your dream content.

Over many such sessions, your relationship patterns surface in your interactions, which may include strong positive or negative feelings for your analyst. The analyst may suggest you are **transferring** feelings, such as dependency or mingled love and anger, that you experienced in earlier relationships with family members or other important people. By exposing such feelings, you may gain insight into your current relationships.

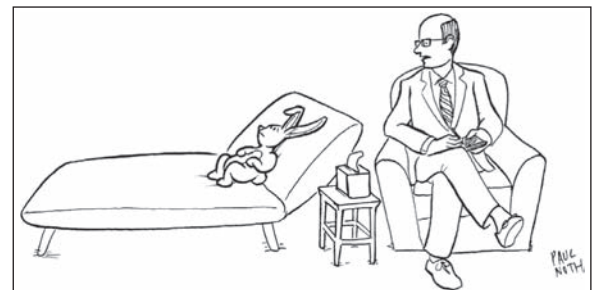
Relatively few U.S. therapists now offer traditional psychoanalysis. Much of its underlying theory is not supported by scientific research (Chapter 12). Analysts' interpretations cannot be proven or disproven. And psychoanalysis takes considerable time and money, often years of several expensive sessions each week. Some of these problems have been addressed in the modern *psychodynamic perspective* that has evolved from psychoanalysis.

psychoanalysis Sigmund Freud's therapeutic technique. Freud believed the patient's free associations, resistances, dreams, and transferences—and the therapist's interpretations of them—released previously repressed feelings, allowing the patient to gain self-insight.

resistance in psychoanalysis, the blocking from consciousness of anxiety-laden material.

interpretation in psychoanalysis, the analyst's noting supposed dream meanings, resistances, and other significant behaviors and events in order to promote insight.

transference in psychoanalysis, the patient's transfer to the analyst of emotions linked with other relationships (such as love or hatred for a parent).



"I'm more interested in hearing about the eggs you're hiding from yourself."

The New Yorker Collection, 2009, Paul Wirth, from cartoonbank.com. All Rights Reserved.

"I haven't seen my analyst in 200 years. He was a strict Freudian. If I'd been going all this time, I'd probably almost be cured by now."

Woody Allen, after awakening from suspended animation in the movie *Sleeper*

psychodynamic therapy therapy deriving from the psychoanalytic tradition; views individuals as responding to unconscious forces and childhood experiences, and seeks to enhance self-insight.

insight therapies a variety of therapies that aim to improve psychological functioning by increasing a person's awareness of underlying motives and defenses.

Face-to-face therapy In contemporary psychodynamic therapy, the couch has disappeared. But the influence of psychoanalytic theory continues in some areas, as the therapist seeks information from the client's childhood and helps the person bring unconscious feelings into conscious awareness.



Véronique Burger/Photo Researchers Inc

RETRIEVE IT

- In psychoanalysis, patients may experience strong feelings for their analyst, which is called _____. Patients are said to demonstrate anxiety when they put up mental blocks around sensitive memories—showing _____. The analyst will attempt to offer insight into the underlying anxiety by offering a(n) _____ of the mental blocks.

ANSWERS: transference; resistance; interpretation

Psychodynamic Therapy

Psychodynamic therapists don't talk much about id, ego, and superego. Instead they try to help people understand their current symptoms by focusing on themes across important relationships, including childhood experiences and the therapist relationship. "We can have loving feelings and hateful feelings toward the same person," and "we can desire something and also fear it," notes psychodynamic therapist Jonathan Shedler (2009). Client-therapist meetings take place once or twice a week (rather than several times per week), and often for only a few weeks or months (rather than several years). Rather than lying on a couch, out of the therapist's line of vision, patients meet with their therapist face to face as they explore and gain perspective into their defended-against thoughts and feelings.

Therapist David Shapiro (1999, p. 8) illustrates with the case of a young man who had told women that he loved them, when he knew full well that he didn't. They expected it, so he said it. But then with his wife, who wished he would say that he loved her, he found he *couldn't* do that—"I don't know why, but I can't."

THERAPIST: *Do you mean, then, that if you could, you would like to?*

PATIENT: *Well, I don't know. . . . Maybe I can't say it because I'm not sure it's true. Maybe I don't love her.*

Further interactions revealed that he could not express real love because it would feel "mushy" and "soft" and therefore unmanly. Shapiro noted that this young man was "in conflict with himself, and he [was] cut off from the nature of that conflict." With such patients, who are estranged from themselves, psychodynamic therapists "are in a position to introduce them to themselves," Shapiro added. "We can restore their awareness of their own wishes and feelings, and their awareness, as well, of their reactions against those wishes and feelings."

Exploring past relationship troubles may help clients understand the origin of their current difficulties. Shedler (2010a) recalled "Jeffrey's" complaints of difficulty getting along with his colleagues and wife, who saw him as hypercritical. Jeffrey then "began responding to me as if I were an unpredictable, angry adversary." Shedler seized this opportunity to help Jeffrey recognize the relationship pattern, and its roots in the attacks and humiliation he experienced from his alcohol-dependent father. He was then able to work through and let go of this defensive style of responding to people. Without embracing all aspects of Freud's theory, psychodynamic therapists aim to help people gain insight into their childhood experiences and unconscious dynamics.

Humanistic Therapies



15-3: What are the basic themes of humanistic therapy, and what are the specific goals and techniques of Rogers' client-centered approach?

The humanistic perspective (Chapter 12) has emphasized people's inherent potential for self-fulfillment. Not surprisingly, humanistic therapies attempt to reduce the inner conflicts that interfere with natural development and growth. To achieve this goal, humanistic therapists try to give clients new insights. Indeed, because they share this goal, the psychodynamic and humanistic therapies are often referred to as **insight therapies**.

But humanistic therapists differ from psychodynamic therapists in many other ways:

- *Humanistic therapists aim to boost people's self-fulfillment by helping them grow in self-awareness and self-acceptance.*
- *Promoting this growth, not curing illness, is the focus of therapy.* Thus, those in therapy became “clients” or just “persons” rather than “patients” (a change many other therapists have adopted).
- *The path to growth is taking immediate responsibility for one's feelings and actions, rather than uncovering hidden causes.*
- *Conscious thoughts are more important than the unconscious.*
- *The present and future are more important than the past.* Therapy thus focuses on exploring feelings as they occur, rather than achieving insights into the childhood origins of the feelings.

All these themes are present in the widely used humanistic technique that Carl Rogers (1902–1987) developed and called **client-centered therapy**. This therapy, now often called *person-centered therapy*, focuses on the person's conscious self-perceptions. It is *nondirective*—the therapist listens, without judging or interpreting, and refrains from directing the client toward certain insights.

Rogers (1961, 1980) believed that most people already possess the resources for growth. He encouraged therapists to foster that growth by exhibiting *genuineness, acceptance, and empathy*. By being *genuine*, therapists will express their true feelings. By being *accepting*, therapists may help clients feel freer and more open to change. By showing *empathy*, by sensing and reflecting their clients' feelings, therapists can help clients experience a deeper self-understanding and self-acceptance (Hill & Nakayama, 2000). As Rogers (1980, p. 10) explained:

Hearing has consequences. When I truly hear a person and the meanings that are important to him at that moment, hearing not simply his words, but him, and when I let him know that I have heard his own private personal meanings, many things happen. There is first of all a grateful look. He feels released. He wants to tell me more about his world. He surges forth in a new sense of freedom. He becomes more open to the process of change.

I have often noticed that the more deeply I hear the meanings of the person, the more there is that happens. Almost always, when a person realizes he has been deeply heard, his eyes moisten. I think in some real sense he is weeping for joy. It is as though he were saying, “Thank God, somebody heard me. Someone knows what it's like to be me.”

To Rogers, “hearing” was **active listening**. The therapist echoes, restates, and clarifies what the client expresses (verbally or nonverbally). The therapist also acknowledges those expressed feelings. Active listening is now an accepted part of counseling practices in many schools, colleges, and clinics. Counselors listen attentively. They interrupt only to restate and confirm feelings, to accept what was said, or to check their understanding of something. In the following brief excerpt, note how Rogers tried to provide a psychological mirror that would help the client see himself more clearly:

ROGERS: *Feeling that now, hm? That you're just no good to yourself, no good to anybody.*

Never will be any good to anybody. Just that you're completely worthless, huh?—Those really are lousy feelings. Just feel that you're no good at all, hm?

CLIENT: *Yeah. (Muttering in low, discouraged voice) That's what this guy I went to town with just the other day told me.*

ROGERS: *This guy that you went to town with really told you that you were no good? Is that what you're saying? Did I get that right?*

CLIENT: *M-hm.*

ROGERS: *I guess the meaning of that if I get it right is that here's somebody that meant something to you and what does he think of you? Why, he's told you that he thinks you're no good at all. And that just really knocks the props out from under you. (Client weeps quietly.) It just brings the tears. (Silence of 20 seconds)*

client-centered therapy a humanistic therapy, developed by Carl Rogers, in which the therapist uses techniques such as active listening within a genuine, accepting, empathic environment to facilitate clients' growth. (Also called *person-centered therapy*.)

active listening empathic listening in which the listener echoes, restates, and clarifies. A feature of Rogers' client-centered therapy.

“We have two ears and one mouth that we may listen the more and talk the less.”

Zeno, 335–263 B.C.E.,
Diogenes Laertius

unconditional positive regard a caring, accepting, nonjudgmental attitude, which Carl Rogers believed would help clients develop self-awareness and self-acceptance.

behavior therapy therapy that applies learning principles to the elimination of unwanted behaviors.

Active listening Carl Rogers (right) empathized with a client during this group therapy session.

CLIENT: (Rather defiantly) *I don't care though.*

ROGERS: *You tell yourself you don't care at all, but somehow I guess some part of you cares because some part of you weeps over it.*

(Meador & Rogers, 1984, p. 167)

Can a therapist be a perfect mirror, critics have asked, without selecting and interpreting what is reflected? Rogers conceded that no one can be *totally* nondirective. Nevertheless, he said, the therapist's most important contribution is to accept and understand the client. Given a nonjudgmental, grace-filled environment that provides **unconditional positive regard**, people may accept even their worst traits and feel valued and whole.

How can we develop our own communication strengths by listening more actively in our own relationships? Three Rogerian hints may help:

1. **Paraphrase.** Rather than saying "I know how you feel," check your understandings by summarizing the person's words in your own words.
2. **Invite clarification.** "What might be an example of that?" may encourage the person to say more.
3. **Reflect feelings.** "It sounds frustrating" might mirror what you're sensing from the person's body language and intensity.



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Behavior Therapies



15-4: How does the basic assumption of behavior therapy differ from the assumptions of psychodynamic and humanistic therapies? What techniques are used in exposure therapies and aversive conditioning?



The insight therapies assume that self-awareness and psychological well-being go hand in hand. Psychodynamic therapists expect people's problems to diminish as they gain insight into their unresolved and unconscious tensions. Humanistic therapists expect people's problems to diminish as they get in touch with their feelings. **Behavior therapists**, however, doubt the healing power of self-awareness. (You can become aware of why you are highly anxious during exams and still be anxious.) Rather than delving deeply below the surface looking for inner causes, they assume that problem behaviors *are* the problems. They view learning principles as useful tools for eliminating unwanted behaviors. They see phobias or sexual disorders, for example, as learned behaviors. If so, why not replace them with new, constructive behaviors learned through classical or operant conditioning?

Classical Conditioning Techniques

One cluster of behavior therapies derives from principles developed in Ivan Pavlov's conditioning experiments (Chapter 7). As Pavlov and others showed, we learn various behaviors and emotions through classical conditioning. If we're attacked by a dog, we may thereafter have a conditioned fear response when other dogs approach. (Our fear generalizes, and all dogs become conditioned stimuli.)

Could maladaptive symptoms be examples of conditioned responses? If so, might reconditioning be a solution? Learning theorist O. H. Mowrer thought so. He developed a successful conditioning therapy for chronic bed-wetters, using a liquid-sensitive pad connected to an alarm. If the sleeping child wets the bed pad, moisture triggers the alarm, waking the child. With sufficient repetition, this association of bladder relaxation with waking stops the bed-wetting. The treatment has been effective in three out of four cases and the success provides a boost to the child's self-image (Christophersen & Edwards, 1992; Houts et al., 1994).

Can we unlearn fear responses through new conditioning? Many people have. One example: The fear of riding in an elevator is often a learned fear response to the stimulus of being in a confined space. **Counterconditioning** pairs the trigger stimulus (the enclosed space of the elevator) with a new response (relaxation) that cannot coexist with fear. Behavior therapists have successfully counterconditioned many people with a fear of confined spaces. *Exposure therapies* and *aversive conditioning* illustrate counterconditioning. The goal of both techniques is replacing unwanted responses with new responses.

Exposure Therapies Picture this scene: Behavioral psychologist Mary Cover Jones is working with 3-year-old Peter, who is petrified of rabbits and other furry objects. To rid Peter of his fear, Jones plans to associate the fear-evoking rabbit with the pleasurable, relaxed response associated with eating. As Peter begins his midafternoon snack, she introduces a caged rabbit on the other side of the huge room. Peter, eagerly munching away on his crackers and drinking his milk, hardly notices. On succeeding days, she gradually moves the rabbit closer and closer. Within two months, Peter is holding the rabbit in his lap, even stroking it while he eats. Moreover, his fear of other furry objects has also gone away, having been *countered*, or replaced, by a relaxed state that cannot coexist with fear (Fisher, 1984; Jones, 1924).



Kim Reinick/
Shutterstock

Unfortunately for many who might have been helped by Jones' procedures, her story of Peter and the rabbit did not enter psychology's lore when it was reported in 1924. It was more than 30 years before psychiatrist Joseph Wolpe (1958; Wolpe & Plaud, 1997) refined Jones' counterconditioning technique into the **exposure therapies** used today. These therapies, in a variety of ways, try to change people's reactions by repeatedly exposing them to stimuli that trigger unwanted reactions. With repeated exposure to what they normally avoid or escape (behaviors that get reinforced by reduced anxiety), people adapt. We all experience this process in everyday life. A person moving to a new apartment may be annoyed by nearby loud traffic noise, but only for a while. With repeated exposure, the person adapts. So, too, with people who have fear reactions to specific events. Exposed repeatedly to the situation that once petrified them, they can learn to react less anxiously (Rosa-Alcázar et al., 2008; Wolitzky-Taylor et al., 2008).

One form of exposure therapy widely used to treat phobias is **systematic desensitization**. You cannot simultaneously be anxious and relaxed. Therefore, if you can repeatedly relax when facing anxiety-provoking stimuli, you can gradually eliminate your anxiety. The trick is to proceed gradually. If you feared public speaking, a behavior therapist might first ask you to make a list of anxiety-triggering speaking situations. Your list would range from situations that cause you to feel mildly anxious (perhaps speaking up in a small group of friends) to those that provoke panic (having to address a large audience).

counterconditioning behavior therapy procedures that use classical conditioning to evoke new responses to stimuli that are triggering unwanted behaviors; include *exposure therapies* and *aversive conditioning*.

exposure therapies behavioral techniques, such as *systematic desensitization* and *virtual reality exposure therapy*, that treat anxieties by exposing people (in imagination or actual situations) to the things they fear and avoid.

systematic desensitization a type of exposure therapy that associates a pleasant relaxed state with gradually increasing anxiety-triggering stimuli. Commonly used to treat phobias.

virtual reality exposure therapy an anxiety treatment that progressively exposes people to electronic simulations of their greatest fears, such as airplane flying, spiders, or public speaking.

aversive conditioning a type of counter-conditioning that associates an unpleasant state (such as nausea) with an unwanted behavior (such as drinking alcohol).

In the next step, the therapist would train you in *progressive relaxation*. You would learn to relax one muscle group after another, until you achieved a comfortable, complete relaxation. Then the therapist might ask you to imagine, with your eyes closed, a mildly anxiety-arousing situation: You are having coffee with a group of friends and are trying to decide whether to speak up. If you feel any anxiety while imagining the scene, you will signal by raising your finger. Seeing the signal, the therapist will instruct you to switch off the mental image and go back to deep relaxation. This imagined scene is repeatedly paired with relaxation until you feel no trace of anxiety.

The therapist will then move to the next item on your list, again using relaxation techniques to desensitize you to each imagined situation. After several sessions, you will move to actual situations and practice what you had only imagined before. You will begin with relatively easy tasks and gradually move to more anxiety-filled ones. Conquering your anxiety in an actual situation, not just in your imagination, will raise your self-confidence (Foa & Kozak, 1986; Williams, 1987). Eventually, you may even become a confident public speaker.

If an anxiety-arousing situation is too expensive, difficult, or embarrassing to recreate, the therapist may recommend **virtual reality exposure therapy**. You would don a head-mounted display unit that projects a three-dimensional virtual world in front of your eyes. The lifelike scenes, which shift as your head turns, would be tailored to your particular fear. Experimentally treated fears include flying, heights, particular animals, and public speaking (Parsons & Rizzo, 2008). If you fear flying, you could peer out a virtual window of a simulated plane. You would feel the engine's vibrations and hear it roar as the plane taxis down the runway and takes off. In controlled studies, people participating in virtual reality exposure therapy have experienced significant relief from real-life fear (Hoffman, 2004; Meyerbroöker & Emmelkamp, 2010).

Aversive Conditioning Exposure therapies substitute a relaxed, positive response for a negative response to a *harmless* stimulus. **Aversive conditioning** substitutes a negative (aversive) response for a positive response to a *harmful* stimulus (such as alcohol). Exposure therapies help you accept what you *should* do. Aversive conditioning helps you to learn what you *should not* do.

The aversive conditioning procedure is simple: It associates the unwanted behavior with unpleasant feelings. To treat nail biting, one can paint the fingernails with a nasty-tasting nail polish (Baskind, 1997). To treat alcohol dependence, an aversion therapist offers the client appealing drinks laced with a drug that produces severe nausea. By linking alcohol with violent nausea (recall the taste-aversion experiments with rats and coyotes in Chapter 7), the therapist seeks to transform the person's reaction to alcohol from positive to negative (**FIGURE 15.1**).

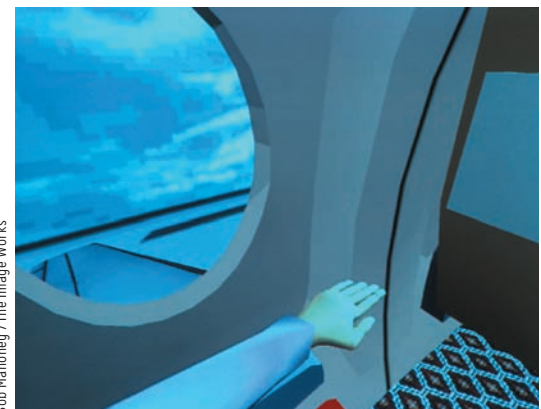
Does aversive conditioning work? In the short run it may. In one classic study, 685 patients with alcohol dependence completed an aversion therapy program at a hospital (Wiens & Menustik, 1983). Over the next year, they returned for several booster

Virtual reality exposure therapy

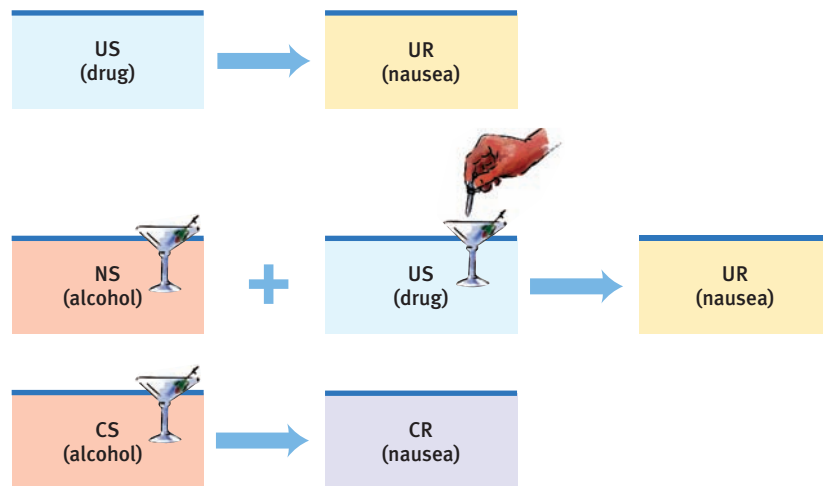
Within the confines of a room, virtual reality technology exposes people to vivid simulations of feared stimuli, such as a plane's takeoff.



Bob Mahoney / The Image Works



Bob Mahoney / The Image Works

**FIGURE 15.1**

Aversion therapy for alcohol dependence After repeatedly imbibing an alcoholic drink mixed with a drug that produces severe nausea, some people with a history of alcohol abuse develop at least a temporary conditioned aversion to alcohol.

RETRIEVE IT

- Define US, UR, NS, CS, and CR.

ANSWER: US is unconditioned stimulus, UR is unconditioned response, NS is neutral stimulus, CS is conditioned stimulus, and CR is conditioned response.

treatments in which alcohol was paired with sickness. At the end of that year, 63 percent were still successfully abstaining. But after three years, only 33 percent had remained abstinent.

The problem, as we saw in Chapter 7, is that cognition influences conditioning. People know that outside the therapist's office they can drink without fear of nausea. Their ability to discriminate between the aversive conditioning situation and all other situations can limit the treatment's effectiveness. Thus, therapists often use aversive conditioning in combination with other treatments.

Operant Conditioning



15-5: What is the basic idea of operant conditioning therapy, and what arguments have been used for and against it?

A basic concept in operant conditioning (Chapter 7) is that our voluntary behaviors are strongly influenced by their consequences. Knowing this, behavior therapists can practice *behavior modification*. They reinforce behaviors they consider desirable. And they fail to reinforce—or sometimes punish—behaviors they consider undesirable.

Using operant conditioning to solve specific behavior problems has raised hopes for some seemingly hopeless cases. Children with intellectual disabilities have been taught to care for themselves. Socially withdrawn children with autism have learned to interact. People with schizophrenia have been helped to behave more rationally in their hospital ward. In such cases, therapists used positive reinforcers to *shape* behavior. In a step-by-step manner, they rewarded behaviors that came closer and closer to the desired behavior.

In extreme cases, treatment must be intensive. One study worked with 19 withdrawn, uncommunicative 3-year-olds with autism. For two years, 40 hours each week, the children's parents attempted to shape their behavior (Lovaas, 1987). They positively reinforced desired behaviors and ignored or punished aggressive and self-abusive behaviors. The combination worked wonders for some children. By first grade, 9 of the 19 were functioning successfully in school and exhibiting normal intelligence. In a group of 40 comparable children not undergoing this treatment, only 1 showed similar improvement. (Later studies focused on the effective aspect—positive reinforcement.)

The rewards used to modify behavior vary because people differ in what they find reinforcing. For some, the reinforcing power of attention or praise is enough. Others require concrete rewards, such as food. In institutional settings, therapists may create a **token economy**. When people display desired behavior, such as getting out of bed, washing, dressing, eating, talking meaningfully, cleaning their rooms, or playing cooperatively, they receive a token or plastic coin. Later, they can exchange a number of these

token economy an operant conditioning procedure in which people earn a token of some sort for exhibiting a desired behavior and can later exchange the tokens for various privileges or treats.

cognitive therapy therapy that teaches people new, more adaptive ways of thinking; based on the assumption that thoughts intervene between events and our emotional reactions.

tokens for rewards, such as candy, TV time, day trips, or better living quarters. Token economies have been used successfully in various settings (homes, classrooms, hospitals, institutions for the delinquent) and among members of various populations (including disturbed children and people with schizophrenia and other mental disabilities).

Behavior modification critics express two concerns. The first is practical: *How durable are the behaviors?* Will people become so dependent on extrinsic rewards that the desired behaviors will stop when the reinforcers stop? Behavior modification advocates believe the behaviors will endure if therapists wean people from the tokens by shifting them toward other, real-life rewards, such as social approval. Further, they point out that the desired behaviors themselves can be rewarding. As people become more socially competent, the intrinsic satisfactions of social interaction may help them maintain the desired behaviors.

The second concern is ethical: *Is it right for one human to control another's behavior?* Those who set up token economies deprive people of something they desire and decide which behaviors to reinforce. To critics, this whole process has an authoritarian taint. Advocates reply that control already exists; reinforcers and punishers are already maintaining destructive behavior patterns. Isn't using positive rewards to reinforce adaptive behavior more humane than institutionalizing or punishing people? Advocates also argue that the right to effective treatment and an improved life justifies temporary deprivation.

RETRIEVE IT

- How do the *insight therapies* differ from behavior therapies?

ANSWER: The *insight therapies*—psychodynamic and humanistic therapies—seek to relieve problems by providing an understanding of their origins. Behavior therapies assume the problem behavior is the problem and treat it directly.

- Some maladaptive behaviors are learned. What hope does this fact provide?

ANSWER: If a behavior can be learned, it can be *unlearned*, and replaced by other more adaptive responses.

- Exposure therapies and aversive conditioning are applications of _____ conditioning. Token economies are an application of _____ conditioning.

ANSWERS: classical; operant

Cognitive Therapies

Cognitive therapy for eating disorders aided by journaling Cognitive therapists guide people toward new ways of explaining their good and bad experiences. By recording positive events and how she has enabled them, this woman may become more mindful of her self-control and more optimistic.

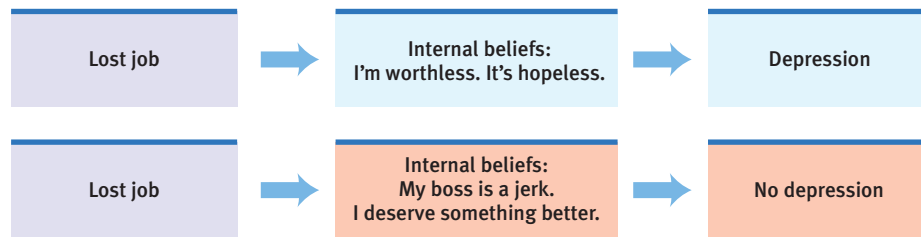


15-6: What are the goals and techniques of the cognitive therapies and of cognitive-behavioral therapy?

People with specific fears and problem behaviors respond to behavior therapy. But how would you modify the wide assortment of behaviors that accompany major depression? And how would you treat generalized anxiety disorders, where unfocused anxiety doesn't lend itself to a neat list of anxiety-triggering situations? The *cognitive revolution* that has influenced other areas of psychology during the last half-century influenced therapy as well.

The **cognitive therapies** assume that our thinking colors our feelings (**FIGURE 15.2**). Between the event and our response lies the mind. Self-blaming and overgeneralized explanations of bad events are often an important part of the vicious cycle of depression (see Chapter 14). If depressed, we may interpret a suggestion as criticism, disagreement as dislike, praise as flattery, friendliness as pity. Dwelling on such thoughts sustains negative thinking. Cognitive therapists aim to help people change their minds with new, more constructive ways of thinking.



**FIGURE 15.2**

A cognitive perspective on psychological disorders The person's emotional reactions are produced not directly by the event but by the person's thoughts in response to the event.

Beck's Therapy for Depression

Cognitive therapist Aaron Beck's original training was in Freudian techniques, including dream analysis. Depressed people, he found, often reported dreams with negative themes of loss, rejection, and abandonment. These thoughts extended into their waking thoughts, even into therapy, as clients recalled and rehearsed their failings and worst impulses (Kelly, 2000). Beck and his colleagues (1979) wondered: How could they reverse their clients' negativity about themselves, their situations, and their futures? Beck's answer was the approach we now call cognitive therapy. Gentle questioning seeks to reveal irrational thinking and then to persuade people to remove the dark glasses through which they view life (Beck et al., 1979, pp. 145–146):

CLIENT: *I agree with the descriptions of me but I guess I don't agree that the way I think makes me depressed.*

BECK: *How do you understand it?*

CLIENT: *I get depressed when things go wrong. Like when I fail a test.*

BECK: *How can failing a test make you depressed?*

CLIENT: *Well, if I fail I'll never get into law school.*

BECK: *So failing the test means a lot to you. But if failing a test could drive people into clinical depression, wouldn't you expect everyone who failed the test to have a depression? . . . Did everyone who failed get depressed enough to require treatment?*

CLIENT: *No, but it depends on how important the test was to the person.*

BECK: *Right, and who decides the importance?*

CLIENT: *I do.*

BECK: *And so, what we have to examine is your way of viewing the test (or the way that you think about the test) and how it affects your chances of getting into law school. Do you agree?*

CLIENT: *Right.*

BECK: *Do you agree that the way you interpret the results of the test will affect you? You might feel depressed, you might have trouble sleeping, not feel like eating, and you might even wonder if you should drop out of the course.*

CLIENT: *I have been thinking that I wasn't going to make it. Yes, I agree.*

BECK: *Now what did failing mean?*

CLIENT: *(tearful) That I couldn't get into law school.*

BECK: *And what does that mean to you?*

CLIENT: *That I'm just not smart enough.*

BECK: *Anything else?*

CLIENT: *That I can never be happy.*

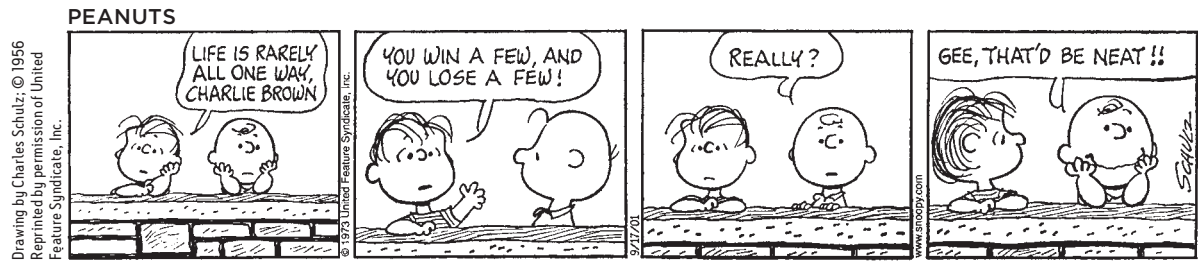
BECK: *And how do these thoughts make you feel?*

CLIENT: *Very unhappy.*

BECK: *So it is the meaning of failing a test that makes you very unhappy. In fact, believing that you can never be happy is a powerful factor in producing unhappiness. So, you get yourself into a trap—by definition, failure to get into law school equals "I can never be happy."*

"Life does not consist mainly, or even largely, of facts and happenings. It consists mainly of the storm of thoughts that are forever blowing through one's mind."

Mark Twain, 1835–1910



We often think in words. Therefore, getting people to change what they say to themselves is an effective way to change their thinking. Perhaps you can identify with the anxious students who, before an exam, make matters worse with self-defeating thoughts: “This exam’s probably going to be impossible. All these other students seem so relaxed and confident. I wish I were better prepared. Anyhow, I’m so nervous I’ll forget everything.” Psychologists call this sort of relentless, overgeneralized, self-blaming behavior *catastrophizing*.

To change such negative self-talk, therapists teach people to restructure their thinking in stressful situations (Meichenbaum, 1977, 1985). Sometimes it may be enough simply to say more positive things to yourself: “Relax. The exam may be hard, but it will be hard for everyone else, too. I studied harder than most people. Besides, I don’t need a perfect score to get a good grade.” Training people to “talk back” to negative thoughts can be effective. With such training, depression-prone children and college students have shown a halved rate of future depression (Brunwasser et al., 2009; Seligman, 2002; Stice et al., 2009). To a great extent, it is the thought that counts. **TABLE 15.1** provides a sampling of techniques commonly used in cognitive therapy.



Table 15.1
Selected Cognitive Therapy Techniques

Aim of Technique	Technique	Therapists' Directives
Reveal beliefs	Question your interpretations	Explore your beliefs, revealing faulty assumptions such as “I must be liked by everyone.”
	Rank thoughts and emotions	Gain perspective by ranking your thoughts and emotions from mildly to extremely upsetting.
Test beliefs	Examine consequences	Explore difficult situations, assessing possible consequences and challenging faulty reasoning.
	Decatastrophize thinking	Work through the actual worst-case consequences of the situation you face (it is often not as bad as imagined). Then determine how to cope with the real situation you face.
Change beliefs	Take appropriate responsibility	Challenge total self-blame and negative thinking, noting aspects for which you may be truly responsible, as well as aspects that aren't your responsibility.
	Resist extremes	Develop new ways of thinking and feeling to replace maladaptive habits. For example, change from thinking “I am a total failure” to “I got a failing grade on that paper, and I can make these changes to succeed next time.”

Cognitive-Behavioral Therapy

“The trouble with most therapy,” said therapist Albert Ellis (1913–2007), “is that it helps you to feel better. But you don’t get better. You have to back it up with action, action, action.” **Cognitive-behavioral therapy** takes a double-barreled approach to depression and other disorders. This widely practiced integrative approach aims not only to alter the way people *think* but also to alter the way they *act*. Like other cognitive therapies, it seeks to make people aware of their irrational negative thinking and to replace it with new ways of thinking. Like other behavior therapies, it trains people to practice the more positive approach in everyday settings.

Cognitive-behavioral therapy has helped people with the disruptive emotions of anxiety and mood disorders (Aldao & Nolen-Hoeksema, 2010). In therapy, people learn

cognitive-behavioral therapy a popular integrative therapy that combines cognitive therapy (changing self-defeating thinking) with behavior therapy (changing behavior).

to replace catastrophizing with more realistic appraisals and, as homework, to practice behaviors that counter their problem (Kazantzis et al., 2010a,b; Moses & Barlow, 2006). A person with depression might keep a log of daily situations associated with negative and positive emotions and attempt to engage more in activities that lead to feeling good. Those who fear social situations might practice approaching people.

In one study, people with obsessive-compulsive behaviors learned to relabel their compulsive thoughts (Schwartz et al., 1996). Feeling the urge to wash their hands again, they would tell themselves, “I’m having a compulsive urge.” They would explain to themselves that the hand-washing urge was a result of their brain’s abnormal activity, which they had previously viewed in PET scans. Then, instead of giving in, they would spend 15 minutes in an enjoyable, alternative behavior, such as practicing an instrument, taking a walk, or gardening. This helped “unstick” the brain by shifting attention and engaging other brain areas. For two or three months, the weekly therapy sessions continued, with relabeling and refocusing practice at home. By the study’s end, most participants’ symptoms had diminished, and their PET scans revealed normalized brain activity. Many other studies confirm cognitive-behavioral therapy’s effectiveness for those with anxiety, depression, or anorexia nervosa (Covin et al., 2008; Mitte, 2005; Norton & Price, 2007). Studies have also found that cognitive-behavioral skills can be effectively taught and therapy conducted over the Internet (Barak et al., 2008; Kessler et al., 2009; Marks & Cavanaugh, 2009; Stross, 2011).

RETRIEVE IT

- How do the humanistic and cognitive therapies differ?

ANSWER: By reflecting clients’ feelings in a nondirective setting, the humanistic therapies attempt to foster personal growth by helping clients become more self-aware and self-accepting. By making clients aware of self-defeating patterns of thinking, cognitive therapies guide people toward more adaptive ways of thinking about themselves and their world.

- What is cognitive-behavioral therapy, and what sorts of problems does this therapy address?

ANSWER: This popular integrative therapy helps people change self-defeating thinking and behavior. It has been shown to be effective for those with obsessive-compulsive disorder, mood disorders, anxiety, and anorexia nervosa.

Group and Family Therapies



15-7: What are the aims and benefits of group and family therapy?

Group Therapy

Except for traditional psychoanalysis, most therapies may also occur in small groups. **Group therapy** does not provide the same degree of therapist involvement with each client. However, it offers benefits:

- *It saves therapists’ time and clients’ money*, often with no less effectiveness than individual therapy (Fuhriman & Burlingame, 1994).
- *It offers a social laboratory for exploring social behaviors and developing social skills.* Therapists frequently suggest group therapy for people experiencing frequent conflicts or for those whose behavior distresses others. For up to 90 minutes weekly, the therapist guides people’s interactions as they discuss issues and try out new behaviors.
- *It enables people to see that others share their problems.* It can be a relief to discover that you are not alone—to learn that others, despite their composure, experience some of the same troublesome feelings and behaviors.
- *It provides feedback as clients try out new ways of behaving.* Hearing that you look poised, even though you feel anxious and self-conscious, can be reassuring.

group therapy therapy conducted with groups rather than individuals, permitting therapeutic benefits from group interaction.

family therapy therapy that treats the family as a system. Views an individual's unwanted behaviors as influenced by, or directed at, other family members.

Family therapy This type of therapy often acts as a preventive mental health strategy. The therapist helps family members understand how their ways of relating to one another create problems. The emphasis is not on changing the individuals but on changing their relationships and interactions.

Family Therapy

One special type of group interaction, **family therapy**, assumes that no person is an island. We live and grow in relation to others, especially our families, yet we also work to find an identity outside of our family. These two opposing tendencies can create stress for the individual and the family.

Unlike most psychotherapy, which focuses on what happens inside the person's own skin, family therapists work with multiple family members to heal relationships and to mobilize family resources. They tend to view the family as a system in which each person's actions trigger reactions from others, and they help family members discover their role within their family's social system. A child's rebellion, for example, affects and is affected by other family tensions. Therapists also attempt—usually with some success, research suggests—to open up communication within the family or to help family members discover new ways of preventing or resolving conflicts (Hazelrigg et al., 1987; Shadish et al., 1993).



Michael Newman/PhotoEdit

Self-Help Groups

More than 100 million Americans belong to small religious, interest, or self-help groups that meet regularly—and 9 in 10 report that group members “support each other emotionally” (Gallup, 1994). One analysis of online support groups and more than 14,000 self-help groups reported that most support groups focus on stigmatized or hard-to-discuss illnesses (Davison et al., 2000). AIDS patients were 250 times more likely than hypertension patients to be in support groups. People with anorexia and alcohol dependence often join groups; those with migraines and ulcers usually do not.

The grandparent of support groups, Alcoholics Anonymous (AA), reports having more than 2 million members in 114,000 groups worldwide. Its famous 12-step program, emulated by many other self-help groups, asks members to admit their powerlessness, to seek help from a higher power and from one another, and (the twelfth step) to take the message to others in need of it. Studies of 12-step programs such as AA have found that they help reduce alcohol dependence at rates comparable to other treatment interventions (Ferri et al., 2006; Moos & Moos, 2005). In one eight-year, \$27 million investigation, AA participants reduced their drinking sharply, as did those assigned to cognitive-behavioral therapy or to “motivational therapy” (Project Match, 1997). In one study of 2300 veterans who sought treatment for alcohol dependence, a high level of AA involvement was followed by diminished alcohol problems (McKellar

With more than 2 million members worldwide, AA is said to be “the largest organization on Earth that nobody wanted to join” (Finlay, 2000).

et al., 2003). The more meetings members attend, the greater their alcohol abstinence (Moos & Moos, 2006).

In an individualist age, with more and more people living alone or feeling isolated, the popularity of support groups—for the addicted, the bereaved, the divorced, or simply those seeking fellowship and growth—may reflect a longing for community and connectedness.

For a synopsis of these modern psychotherapies, see **TABLE 15.2**.

Table 15.2
Comparing Modern Psychotherapies

Therapy	Presumed Problem	Therapy Aim	Therapy Technique
<i>Psychodynamic</i>	Unconscious conflicts from childhood experiences	Reduce anxiety through self-insight.	Interpret patients' memories and feelings.
<i>Client-centered</i>	Barriers to self-understanding and self-acceptance	Enable growth via unconditional positive regard, genuineness, and empathy.	Listen actively and reflect client's feelings.
<i>Behavior</i>	Dysfunctional behaviors	Relearn adaptive behaviors; extinguish problem ones.	Use classical conditioning (via exposure or aversion therapy) or operant conditioning (as in token economies).
<i>Cognitive</i>	Negative, self-defeating thinking	Promote healthier thinking and self-talk.	Train people to dispute negative thoughts and attributions.
<i>Cognitive-behavioral</i>	Self-harmful thoughts and behaviors	Promote healthier thinking and adaptive behaviors.	Train people to counter self-harmful thoughts and to act out their new ways of thinking.
<i>Group and family</i>	Stressful relationships	Heal relationships.	Develop an understanding of family and other social systems, explore roles, and improve communication.

RETRIEVE IT

- Which therapeutic technique focuses more on the present and future than the past, and involves unconditional positive regard and active listening?

ANSWER: humanistic therapy—specifically Carl Rogers' client-centered therapy

- Which of the following is NOT a benefit of group therapy?

- more focused attention from the therapist
- less expensive
- social feedback
- reassurance that others share troubles

ANSWER: a

Evaluating Psychotherapies

Many Americans have great confidence in psychotherapy's effectiveness. "Seek counseling" or "Ask your mate to find a therapist," advice columnists often advise. Before 1950, psychiatrists were the primary providers of mental health care. Today, psychotherapy is mostly offered by clinical and counseling psychologists; clinical social workers; pastoral, marital, abuse, and school counselors; and psychiatric nurses.

Is the faith that millions of people worldwide place in these therapists justified? The question, though simply put, is not simple to answer.

Is Psychotherapy Effective?



15-8: Does psychotherapy work? Who decides?

Measuring therapy's effectiveness is not like taking your body's temperature to see if your fever has gone away. If you and I were to undergo psychotherapy, how would we assess its effectiveness? By how we feel about our progress? By how our therapist feels about it? By how our friends and family feel about it? By how our behavior has changed?

Clients' Perceptions

If clients' testimonials were the only measuring stick, we could strongly assert that psychotherapy is effective. Consider the 2900 *Consumer Reports* readers who reported on their experiences with mental health professionals (1995; Kotkin et al., 1996; Seligman, 1995). How many were at least "fairly well satisfied"? Almost 90 percent (as was Kay Redfield Jamison, as we saw at this chapter's beginning). Among those who recalled feeling *fair* or *very poor* when beginning therapy, 9 in 10 now were feeling *very good*, *good*, or at least *so-so*. We have their word for it—and who should know better?

But client testimonials don't persuade everyone. Critics note reasons for skepticism:

- *Clients may need to justify their investment of effort and time.*
- *Clients generally speak kindly of their therapists.* Even if the problems remain, clients "work hard to find something positive to say. The therapist had been very understanding, the client had gained a new perspective, he learned to communicate better, his mind was eased, anything at all so as not to have to say treatment was a failure" (Zilbergeld, 1983, p. 117).
- *People often enter therapy in crisis.* When, with the normal ebb and flow of events, the crisis passes, people may assume their improvement was a result of the therapy.

Clinicians' Perceptions

If clinicians' perceptions were proof of therapy's effectiveness, we would have even more reason to celebrate. Case studies of successful treatment abound. Furthermore, therapists are like the rest of us. They treasure compliments from clients saying good-bye or later expressing their gratitude. The problem is that clients justify entering psychotherapy by emphasizing their unhappiness. They justify leaving by emphasizing their well-being. And they stay in touch only if they are satisfied. Thus, therapists are most aware of the failures of *other* therapists—those whose clients, having experienced only temporary relief, are now seeking a new therapist for their recurring problems. The same person, with the same recurring anxieties, depression, or marital difficulty, may be a "success" story in several therapists' files.

Outcome Research

How, then, can we objectively assess psychotherapy's effectiveness? What *outcomes* can we expect—what types of people and problems are best helped, and by what type of psychotherapy?

In search of answers, psychologists have turned to controlled research. This is a well-traveled path. In the 1800s, skeptical medical doctors began to realize that many patients got better on their own and that many fashionable treatments (bleeding, purging) might be doing no good. Sorting fact from superstition required following patients and recording outcomes with and without a particular treatment. Typhoid fever patients, for example, often improved after being bled, convincing most physicians that the treatment worked. Then came the shock. A control group was given mere bed rest, and after five weeks of fever, 70 percent improved, showing that the bleeding was worthless (Thomas, 1992).

In the twentieth century, psychology, with its many different therapy options, faced a similar challenge. British psychologist Hans Eysenck (1952) launched a spirited debate when he summarized 24 studies of psychotherapy outcomes. He found that two-thirds of those receiving psychotherapy for disorders not involving hallucinations or delusions improved markedly. To this day, no one disputes that optimistic estimate.

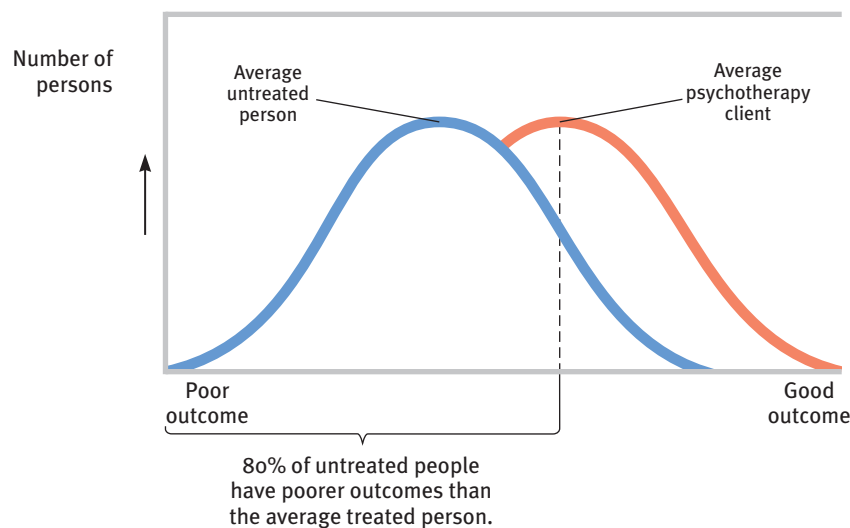
Why, then, are we still debating psychotherapy's effectiveness? Because Eysenck also reported similar improvement among *untreated* persons, such as those who were on waiting lists for treatment. With or without psychotherapy, he said, roughly two-thirds improved noticeably. Time was a great healer.

An avalanche of criticism greeted Eysenck's conclusions. Some pointed out errors in his analyses. Others noted that he based his ideas on only 24 studies. Now, more than a half-century later, there are hundreds of studies. The best of these are *randomized clinical trials*: Researchers randomly assign people on a waiting list to therapy or to no therapy. Later, they evaluate everyone and compare the outcomes, with assessments by others who don't know whether therapy was given. Simply said, *meta-analyses* (statistical digests of the results of many studies) give us the bottom-line results.

Psychotherapists welcomed the first meta-analysis of some 475 psychotherapy outcome studies (Smith et al., 1980). It showed that the average therapy client ends up better off than 80 percent of the untreated individuals on waiting lists (**FIGURE 15.3**). The claim is modest—by definition, about 50 percent of untreated people also are better off than the average untreated person. Dozens of subsequent summaries have now examined this question. Their verdict echoes the results of the earlier outcome studies: *Those not undergoing therapy often improve, but those undergoing therapy are more likely to improve and with less risk of relapse.*

Is psychotherapy also cost-effective? Again, the answer is *Yes*. Studies show that when people seek psychological treatment, their search for other medical treatment drops—by 16 percent in one digest of 91 studies (Chiles et al., 1999). Given the staggering annual cost of psychological disorders and substance abuse—including crime, accidents, lost work, and treatment—psychotherapy is a good investment, much like money spent on prenatal and well-baby care. Both reduce long-term costs. Boosting employees' psychological well-being can lower medical costs, improve work efficiency, and diminish absenteeism.

But note that the claim—that psychotherapy, *on average*, is somewhat effective—refers to no one therapy in particular. It is like reassuring lung-cancer patients that medical treatment of health problems is, “on average,” somewhat effective. What people want to know is whether a *particular* treatment is effective for their specific problem.



Trauma These women are mourning the tragic loss of lives and homes in the 2010 earthquake in China. Those who suffer through such trauma may benefit from counseling, though many people recover on their own, or with the help of supportive relationships with family and friends. “Life itself still remains a very effective therapist,” noted psychodynamic therapist Karen Horney (*Our Inner Conflicts*, 1945).

Feng Li/Getty Images

FIGURE 15.3

Treatment versus no treatment These two normal distribution curves based on data from 475 studies show the improvement of untreated people and psychotherapy clients. The outcome for the average therapy client surpassed that for 80 percent of the untreated people. (Adapted from Smith et al., 1980.)

Which Psychotherapies Work Best?



15-9: Are some psychotherapies more effective than others for specific disorders?

“Whatever differences in treatment efficacy exist, they appear to be extremely small, at best.”

Bruce Wampold et al. (1997)

“Different sores have different salves.”

English proverb

The early statistical summaries and surveys did not find that any one type of psychotherapy is generally better than others (Smith et al., 1977, 1980). Newer studies have similarly found little connection between clients’ outcomes and their clinicians’ experience, training, supervision, and licensing (Luborsky et al., 2002; Wampold, 2007). A *Consumer Reports’* survey illustrates: Were clients treated by a psychiatrist, psychologist, or social worker? Were they seen in a group or individual context? Did the therapist have extensive or relatively limited training and experience? It didn’t matter. Clients seemed equally satisfied (Seligman, 1995).

So, was the dodo bird in *Alice in Wonderland* right: “Everyone has won and all must have prizes”? Not quite. Some forms of therapy get prizes for effectively treating *particular* problems. Behavioral conditioning therapies have had especially good results with specific behavior problems, such as bed-wetting, phobias, compulsions, marital problems, and sexual disorders (Baker et al., 2008; Hunsley & DiGiulio, 2002; Shadish & Baldwin, 2005). Psychodynamic therapy has had success with depression and anxiety (Driessen et al., 2010; Leichsenring & Rabung, 2008; Shedler, 2010b). And many studies confirm cognitive and cognitive-behavioral therapy’s effectiveness (some say superiority) in coping with anxiety, post-traumatic stress disorder, and depression (Baker et al., 2008; De Los Reyes & Kazdin, 2009; Stewart & Chambless, 2009; Tolin, 2010).

Moreover, we can say that therapy is most effective when the problem is clear-cut (Singer, 1981; Westen & Morrison, 2001). Those who experience phobias or panic, who are unassertive, or who are frustrated by sexual performance problems can hope for improvement. Those with less-focused problems, such as depression and anxiety, usually benefit in the short term but often relapse later. And those with the negative symptoms of chronic schizophrenia or a desire to change their entire personality are unlikely to benefit from psychotherapy alone (Pfammatter et al., 2006; Zilbergeld, 1983). The more specific the problem, the greater the hope.

But no prizes—and little or no scientific support—go to certain other therapies (Arkowitz & Lilienfeld, 2006). We would all therefore be wise to avoid energy therapies that propose to manipulate people’s invisible energy fields, recovered-memory therapies that aim to unearth “repressed memories” of early child abuse (Chapter 8), and rebirthing therapies that engage people in reenacting the supposed trauma of their birth.

As with some medical treatments, it’s possible for psychological treatments not only to be ineffective but harmful—by making people worse or preventing their getting better (Barlow, 2010; Castonguay et al., 2010; Dimidjian & Hollon, 2010). The National Science and Technology Council cites the Scared Straight program (seeking to deter children and youth from crime) as an example of well-intentioned programs that have proved ineffective or even harmful.

The evaluation question—which therapies get prizes and which do not?—lies at the heart of what some call psychology’s civil war. To what extent should science guide both clinical practice and the willingness of health care providers and insurers to pay for psychotherapy? On one side are research psychologists using scientific methods to extend the list of well-defined and validated therapies for various disorders. They decry clinicians who “give more weight to their personal experiences” (Baker et al., 2008). On the other side are nonscientist therapists who view their practice as more art than science, something that cannot be described in a manual or tested in an experiment. People are too complex and psychotherapy is too intuitive for such an approach, many therapists say.

Between these two factions stand the science-oriented clinicians calling for **evidence-based practice**, which has been endorsed by the American Psychological Association, the Institute of Medicine, and others (2006; Baker et al., 2008; Levant &

evidence-based practice clinical decision making that integrates the best available research with clinical expertise and patient characteristics and preferences.

Hasan, 2008). Therapists using this approach integrate the best available research with clinical expertise and with patient preferences and characteristics (FIGURE 15.4). After rigorous evaluation, available therapies would be applied by clinicians who are mindful of their skills and of each patient's unique situation. Increasingly, insurer and government support for mental health services requires evidence-based practice.

RETRIEVE IT

- Therapy is more likely to be helpful in those with the _____ (most/least) clearly defined problems.
- What is evidence-based practice?

ANSWER: most

ANSWER: Using this approach, therapists make decisions about treatment based on research evidence, clinical expertise, and knowledge of the client.

Evaluating Alternative Therapies



15-10: How do alternative therapies fare under scientific scrutiny?

Two tendencies create fertile soil for pseudotherapies:

- Many abnormal states of mind return to normal without treatment.
- Just *thinking* you are receiving an effective treatment can boost your spirits, relax your body, and offer relief. This *placebo effect* is well documented in reducing pain, depression, and anxiety (Kirsch & Sapirstein, 1998).

Alternative therapies are newer, nontraditional therapies, which often claim healing powers for varied ailments. Bolstered by anecdotes, heralded by the media, and broadcast on the Internet, alternative therapies have spread like wildfire. In one national survey, 57 percent of those with a history of anxiety attacks and 54 percent of those with a history of depression had used alternative treatments, such as herbal medicine, massage, and spiritual healing (Kessler et al., 2001).

Proponents of alternative therapies often feel that their personal testimonials are evidence enough. But how well do these therapies stand up to scientific scrutiny? There is little evidence for or against most of them. Some, however, have been the subject of controlled research. Let's consider two of them. As we do, remember that sifting sense from nonsense requires the scientific attitude: being skeptical but not cynical, open to surprises but not gullible.

Eye Movement Desensitization and Reprocessing (EMDR)

EMDR (eye movement desensitization and reprocessing) is a therapy adored by thousands and dismissed by thousands more as a sham—"an excellent vehicle for illustrating the differences between scientific and pseudoscientific therapy techniques," suggested James Herbert and seven others (2000).

Francine Shapiro (1989, 2007) developed EMDR while walking in a park and observing that anxious thoughts vanished as her eyes spontaneously darted about. Offering her novel anxiety treatment to others, she had people imagine traumatic scenes while she triggered eye movements by waving her finger in front of their eyes, supposedly enabling them to unlock and reprocess previously frozen memories. Tens of thousands of mental health professionals from more than 75 countries have since undergone training (EMDR, 2011). No new therapy has attracted so many devotees so quickly since Franz Anton Mesmer introduced hypnosis (then called *animal magnetism*) more than two centuries ago (also after feeling inspired by an outdoor experience).

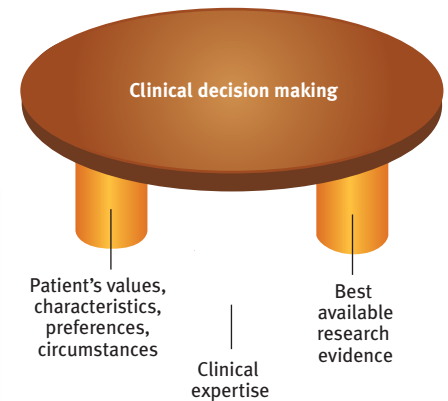


FIGURE 15.4

Evidence-based practice The ideal clinical decision making is a three-legged stool, upheld by research evidence, clinical expertise, and knowledge of the patient.

Does EMDR work? Shapiro believes it does, and she cites four studies in which it worked for 84 to 100 percent of single-trauma victims (Shapiro, 1999, 2002). Moreover, the treatment need take no more than three 90-minute sessions. The Society of Clinical Psychology task force on empirically validated treatments has acknowledged that EMDR is “probably efficacious” for the treatment of nonmilitary post-traumatic stress disorder (Chambless et al., 1997; see also Bisson & Andrew, 2007; Rodenburg et al., 2009; Seidler & Wagner, 2006).

Why, wonder the skeptics, would rapidly moving one’s eyes while recalling traumas be therapeutic? Some argue that the eye movements relax or distract patients, thus allowing memory-associated emotions to extinguish (Gunter & Bodner, 2008). Others believe the eye movements in themselves are *not* the therapeutic ingredient. Trials in which people imagined traumatic scenes and tapped a finger, or just stared straight ahead while the therapist’s finger wagged, have also produced therapeutic results (Deville, 2003). EMDR does work better than doing nothing, acknowledge the skeptics (Lilienfeld & Arkowitz, 2007), but many suspect that what is therapeutic is the combination of exposure therapy—repeatedly associating traumatic memories with a safe and reassuring context that provides some emotional distance from the experience—and a robust placebo effect. Had Mesmer’s pseudotherapy been compared with no treatment at all, it, too (thanks to the healing power of positive belief), might have been found “probably efficacious,” observed Richard McNally (1999).

“Studies indicate that EMDR is just as effective with fixed eyes. If that conclusion is right, what’s useful in the therapy (chiefly behavioral desensitization) is not new, and what’s new is superfluous.”

Harvard Mental Health Letter, 2002

Light Exposure Therapy

Have you ever found yourself oversleeping, gaining weight, and feeling lethargic during the dark mornings and overcast days of winter? Slowing down and conserving energy during the dark days of winter likely gave our distant ancestors a survival advantage. For people today, however, especially for women and those living far from the equator, the wintertime blahs can constitute *seasonal affective disorder*, a form of depression with the appropriate acronym *SAD*. To counteract these dark spirits, National Institute of Mental Health researchers in the early 1980s had an idea: Give SAD people a timed daily dose of intense light. Sure enough, people reported they felt better.

Was this a bright idea, or another dim-witted example of the placebo effect? Recent studies shed some light. One exposed some people with SAD to 90 minutes of bright light and others to a sham placebo treatment—a hissing “negative ion generator” about which the staff expressed similar enthusiasm (but which was generating nothing). After four weeks, 61 percent of those exposed to morning light had greatly improved, as had 50 percent of those exposed to evening light and 32 percent of those exposed to the placebo (Eastman et al., 1998). Other studies have found that 30 minutes of exposure to 10,000-lux white fluorescent light produced relief for more than half the people receiving morning light therapy (Flory et al., 2010; Terman et al., 1998, 2001).

From 20 carefully controlled trials we have a verdict (Golden et al., 2005; Wirz-Justice, 2009): Morning bright light *does* dim SAD symptoms for many people. Moreover, it does so as effectively as taking antidepressant drugs or undergoing cognitive-behavioral therapy (Lam et al., 2006; Rohan et al., 2007). The effects are clear in brain scans; light therapy sparks activity in a brain region that influences the body’s arousal and hormones (Ishida et al., 2005).

Light therapy To counteract winter depression, some people spend time each morning exposed to intense light that mimics natural outdoor light. These Norwegian high school students receive regular light therapy at school during the winter months. In the United States, light boxes to counteract SAD are available from health supply and lighting stores.



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RETRIEVE IT

- What are EMDR and light exposure therapy, and what have we learned from controlled research about the value of these therapies?

ANSWER: Some therapists use *eye movement desensitization and reprocessing* to treat anxiety sufferers—triggering eye movements in their clients as the client envisions traumatic memories in an effort to reprocess the negative events. Light exposure therapy treats those suffering from depression with prescribed time in front of very bright artificial light in the mornings. Research suggests that light therapy is as effective as drugs or cognitive-behavioral therapy for depression. EMDR has shown some effectiveness—not from the eye movement but rather from the exposure therapy nature of the treatments (and the placebo effect).

- What two tendencies can bias appraisals of the effectiveness of alternative therapies?

ANSWER: (a) There is a natural tendency for extraordinary happenings to return to a normal state. Clients may attribute their improvement to successful treatment. (b) The *placebo effect* is the healing power of *belief* in a treatment. Clients who expect a treatment to be effective may believe it was.



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How Do Psychotherapies Help People?



15-11: What three elements are shared by all forms of psychotherapy?

How can it be that therapists' training and experience do not seem to influence clients' outcomes? The answer seems to be that all psychotherapies offer three basic benefits (Frank, 1982; Goldfried & Padawer, 1982; Strupp, 1986; Wampold 2001, 2007). These benefits are *hope for demoralized people*; *a new perspective on oneself and the world*; and *an empathic, trusting, caring relationship*.

Hope for Demoralized People People seeking therapy typically feel anxious, depressed, self-disapproving, and incapable of turning things around. What any psychotherapy offers is the expectation that, with commitment from the therapy seeker, things can and will get better. This belief, apart from any therapy technique, may improve morale, create feelings of self-efficacy, and reduce symptoms (Prioleau et al., 1983).

A New Perspective Every psychotherapy also offers people an explanation of their symptoms. Therapy is a new experience that can help people change their behaviors and their views of themselves. Armed with a believable fresh perspective, they may approach life with new energy.

An Empathic, Trusting, Caring Relationship No matter what technique they use, effective psychotherapists are empathic. They seek to understand people's experience. They communicate care and concern. And they earn trust through respectful listening, reassurance, and advice. These qualities were clear in recorded therapy sessions from 36 recognized master therapists (Goldfried et al., 1998). Some were cognitive-behavioral therapists. Others were psychodynamic therapists. Regardless, they were trikingly similar during the most significant parts of their sessions. At key moments, the empathic therapists of both types would help clients evaluate themselves, link one aspect of their life with another, and gain insight into their interactions with others. The emotional bond between psychotherapist and client—the *therapeutic alliance*—is a key aspect of effective psychotherapy (Klein et al., 2003; Wampold, 2001). One U.S. National Institute of Mental Health depression-treatment study confirmed that the most effective therapists were those who were perceived as most empathic and caring and who established the closest therapeutic bonds with their clients (Blatt et al., 1996).

A caring relationship Effective therapists form a bond of trust with their clients.



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That all psychotherapies offer hope through a fresh perspective offered by a caring person is what also enables paraprofessionals (briefly trained caregivers) to assist so many troubled people so effectively (Christensen & Jacobson, 1994). These three common elements are also part of what the growing numbers of self-help and support groups offer their members. And they are part of what traditional healers have offered (Jackson, 1992). Healers everywhere—special people to whom others disclose their suffering, whether psychiatrists, witch doctors, or shamans—have listened in order to understand and to empathize, reassure, advise, console, interpret, or explain (Torrey, 1986). Such qualities may also explain why people who feel supported by close relationships—who enjoy the fellowship and friendship of caring people—have been less likely to need or seek therapy (Frank, 1982; O'Connor & Brown, 1984).

To recap, people who seek help usually improve. So do many of those who do not undergo psychotherapy, and that is a tribute to our human resourcefulness and our capacity to care for one another. Nevertheless, though the therapist's orientation and experience appear not to matter much, people who receive some psychotherapy usually improve more than those who do not. People with clear-cut, specific problems tend to improve the most.

RETRIEVE IT

- Those who undergo psychotherapy are _____ (more/less) likely to show improvement than those who do not undergo psychotherapy.

ANSWER: more

Culture and Values in Psychotherapy



15-12: How do culture and values influence the therapist-client relationship?

All psychotherapies offer hope. Nearly all psychotherapists attempt to enhance their clients' sensitivity, openness, personal responsibility, and sense of purpose (Jensen & Bergin, 1988). But in matters of diversity, therapists differ from one another and may differ from their clients (Delaney et al., 2007; Kelly, 1990).

These differences can create a mismatch when a therapist from one culture interacts with a client from another. In North America, Europe, and Australia, for example, many therapists reflect the majority culture's *individualism*, which often gives priority to personal desires and identity. Clients with a *collectivist* perspective, as with many from Asian cultures, may assume people will be more mindful of others' expectations. These clients may have trouble relating to therapies that require them to think only of their own well-being.

Such differences help explain minority populations' reluctance to use mental health services and tendency to prematurely terminate therapy (Chen et al., 2009; Sue, 2006). In one experiment, Asian-American clients matched with counselors who shared their cultural values (rather than mismatched with those who did not) perceived more counselor empathy and felt a stronger alliance with the counselor (Kim et al., 2005). Recognizing that therapists and clients may differ in their values, communication styles, and language, American Psychological Association-accredited therapy-training programs provide training in cultural sensitivity and recruit members of underrepresented cultural groups.

Therapist and client may also have differing religious perspectives. Highly religious people may prefer and benefit from religiously similar therapists (Masters, 2010; Smith et al., 2007; Wade et al., 2006). They may have trouble establishing an emotional bond with a therapist who does not share their values.

Albert Ellis, who advocated *rational-emotive behavior therapy (REBT)*, and Allen Bergin, who was co-editor of the *Handbook of Psychotherapy and Behavior Change*, illustrated how sharply psychotherapists can differ, and how those differences can affect their view of a healthy person. Ellis (1980) assumed that “no one and nothing is supreme,” that “self-gratification” should be encouraged, and that “unequivocal love, commitment, service, and . . . fidelity to any interpersonal commitment, especially marriage, leads to harmful consequences.” Bergin (1980) assumed the opposite—that “because God is supreme, humility and the acceptance of divine authority are virtues,” that “self-control and committed love and self-sacrifice are to be encouraged,” and that “infidelity to any interpersonal commitment, especially marriage, leads to harmful consequences.”

Bergin’s and Ellis’ values differed radically. However, they agreed that *psychotherapists’ personal beliefs and values influence their practice*. Clients tend to adopt their therapists’ values (Worthington et al., 1996). For that reason, some psychologists believe therapists should express those values more openly. (For therapy options, see *Close-Up: A Consumer’s Guide to Mental Health Professionals*.)

CLOSE UP:

A Consumer’s Guide to Mental Health Professionals



15-13: What should a person look for when selecting a therapist?

Life for everyone is marked by a mix of serenity and stress, blessing and bereavement, good moods and bad. So, when should we seek a mental health professional’s help? The American Psychological Association offers these common trouble signals:

- Feelings of hopelessness
- Deep and lasting depression
- Self-destructive behavior, such as alcohol and drug abuse
- Disruptive fears
- Sudden mood shifts
- Thoughts of suicide
- Compulsive rituals, such as hand washing
- Sexual difficulties
- Hearing voices or seeing things that others don’t experience

In looking for a psychotherapist, you may want to have a preliminary consultation with

two or three. College health centers are generally good starting points, and they may offer some free services. In your consultations, you can describe your problem and learn each therapist’s treatment approach. You can ask questions about the therapist’s values, credentials (**TABLE 15.3**), state license, and fees. And you can assess your own feelings about each of them. The emotional bond between therapist and client is perhaps the most important factor in effective therapy.



Table 15.3
Therapists and Their Training

Type	Description
<i>Clinical psychologists</i>	Most are psychologists with a Ph.D. (includes research training) or Psy.D. (focuses on therapy) supplemented by a supervised internship and, often, postdoctoral training. About half work in agencies and institutions, half in private practice.
<i>Psychiatrists</i>	Psychiatrists are physicians who specialize in the treatment of psychological disorders. Not all psychiatrists have had extensive training in psychotherapy, but as M.D.s or D.O.s they can prescribe medications. Thus, they tend to see those with the most serious problems. Many have their own private practice.
<i>Clinical or psychiatric social workers</i>	A two-year master of social work graduate program plus postgraduate supervision prepares some social workers to offer psychotherapy, mostly to people with everyday personal and family problems. About half have earned the National Association of Social Workers’ designation of clinical social worker.
<i>Counselors</i>	Marriage and family counselors specialize in family relations problems. Clergy provide counseling to countless people. Abuse counselors work with substance abusers and with spouse and child abusers and their victims. Mental health and other counselors may be required to have a two-year master’s degree.

The Biomedical Therapies

Psychotherapy is one way to treat psychological disorders. The other, often used with serious disorders, is *biomedical therapy*. This changes the brain's functioning by altering its chemistry with drugs, or affecting its circuitry with electrical stimulation, magnetic impulses, or psychosurgery.

Drug Therapies

Drug or placebo effect? For many people, depression lifts while taking an antidepressant drug. But people given a placebo may experience the same effect. Double-blind clinical trials suggest that, especially for those with severe depression, antidepressant drugs do have at least a modest clinical effect.



15-14: What are the drug therapies? How do double-blind studies help researchers evaluate a drug's effectiveness?

By far the most widely used biomedical treatments today are the drug therapies. Since the 1950s, discoveries in **psychopharmacology** (the study of drug effects on mind and behavior) have revolutionized the treatment of people with severe disorders. Thanks to drug therapies and support from community mental health programs, the resident population of U.S. state and county mental hospitals has dropped to a small fraction of what it was a half-century ago. Efforts to minimize involuntary hospitalization have liberated hundreds of thousands of people from hospital confinement. For some unable to care for themselves, however, release from hospitals has meant homelessness.

Many new treatments, including drug therapy, are greeted by an initial wave of enthusiasm as many people apparently improve. But that enthusiasm often diminishes on closer examination. To judge the effectiveness of a new treatment, we also need to know the rates of

- normal recovery among untreated persons.
- recovery due to the *placebo effect*, which arises from the positive expectations of patients and mental health workers alike.

To control for these influences when testing a new drug, researchers give half the patients the drug, and the other half a similar-appearing placebo. Because neither the staff nor the patients know who gets which, this is called a *double-blind procedure*. The good news: In double-blind studies, several types of drugs have proven useful in treating psychological disorders.

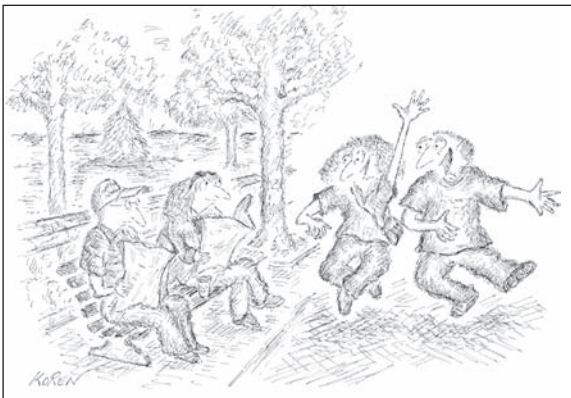
Antipsychotic Drugs

An accidental discovery launched a treatment revolution for people with *psychosis*. The discovery was that some drugs used for other medical purposes calmed the hallucinations or delusions that are part of the split from reality for these patients. **Antipsychotic drugs**, such as chlorpromazine (sold as Thorazine), reduce patients' overreactions to irrelevant stimuli. Thus, they provide the most help to people experiencing positive symptoms of schizophrenia, such as auditory hallucinations and paranoia (Lehman et al., 1998; Lenzenweger et al., 1989).

The molecules of most conventional antipsychotic drugs are similar enough to molecules of the neurotransmitter dopamine to occupy its receptor sites and block its activity. This finding reinforces the idea that an overactive dopamine system contributes to schizophrenia.

Antipsychotics also have powerful side effects. Some produce sluggishness, tremors, and twitches similar to those of Parkinson's disease (Kaplan & Saddock, 1989). Long-term use of antipsychotics can produce *tardive dyskinesia*, with involuntary movements of the facial muscles (such as grimacing), tongue, and limbs. Although not more effective in controlling schizophrenia symptoms, many of the newer-generation antipsychotics, such as risperidone (Risperdal) and olanzapine (Zyprexa), have fewer of these effects. These drugs may, however, increase the risk of obesity and diabetes (Buchanan et al., 2010; Tiihonen et al., 2009).

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"Our psychopharmacologist is a genius."

Perhaps you can guess an occasional side effect of L-dopa, a drug that raises dopamine levels for Parkinson's patients: hallucinations.

Despite their drawbacks, antipsychotics, combined with life-skills programs and family support, have given new hope to many people with schizophrenia (Guo, 2010). Hundreds of thousands of patients have left the wards of mental hospitals and returned to work and to near-normal lives (Leucht et al., 2003).

Antianxiety Drugs

Like alcohol, **antianxiety drugs**, such as Xanax or Ativan, depress central nervous system activity (and so should not be used in combination with alcohol). Antianxiety drugs are often used in combination with psychological therapy. One antianxiety drug, the antibiotic D-cycloserine, acts upon a receptor that, in combination with behavioral treatments, facilitates the extinction of learned fears. Experiments indicate that the drug enhances the benefits of exposure therapy and helps relieve the symptoms of post-traumatic stress disorder and obsessive-compulsive disorder (Davis, 2005; Kushner et al., 2007).

One criticism made of antianxiety drugs is that they may reduce symptoms without resolving underlying problems, especially if used as an ongoing treatment. “Popping a Xanax” at the first sign of tension can produce psychological dependence; the immediate relief reinforces a person’s tendency to take drugs when anxious. Heavy use can also lead to physical dependence. Regular users who stop taking antianxiety drugs may experience increased anxiety, insomnia, and other withdrawal symptoms.

Over the dozen years at the end of the twentieth century, the rate of outpatient treatment for anxiety disorders nearly doubled. The proportion of psychiatric patients receiving medication during that time increased from 52 to 70 percent (Olfson et al., 2004). And the new standard drug treatment for anxiety disorders? Antidepressants.

Antidepressant Drugs

The **antidepressant drugs** were named for their ability to lift people up from a state of depression. Until recently, this was their main use. These drugs are now increasingly used to treat anxiety disorders, such as obsessive-compulsive disorder. They work by increasing the availability of norepinephrine or serotonin. These neurotransmitters elevate arousal and mood and are scarce during depression.

Fluoxetine, which tens of millions of users worldwide have known as Prozac, partially blocks the normal reuptake of excess serotonin from synapses (**FIGURE 15.5**). Prozac and its cousins Zoloft and Paxil are called *selective serotonin reuptake inhibitors (SSRIs)* because they slow (inhibit) the synaptic vacuuming up (reuptake) of serotonin. (Given their use

psychopharmacology the study of the effects of drugs on mind and behavior.

antipsychotic drugs drugs used to treat schizophrenia and other forms of severe thought disorder.

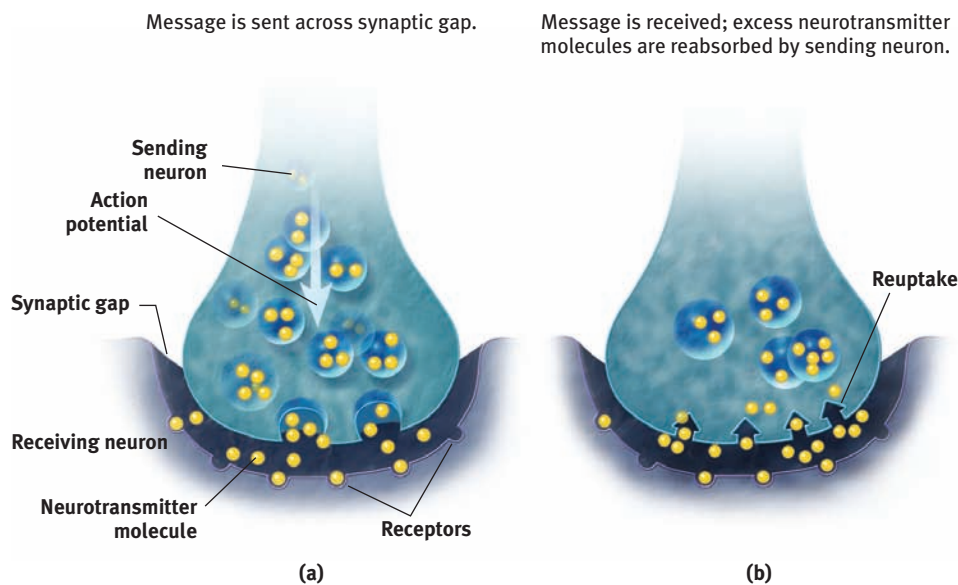
antianxiety drugs drugs used to control anxiety and agitation.

antidepressant drugs drugs used to treat depression and some anxiety disorders. Different types work by altering the availability of various neurotransmitters.

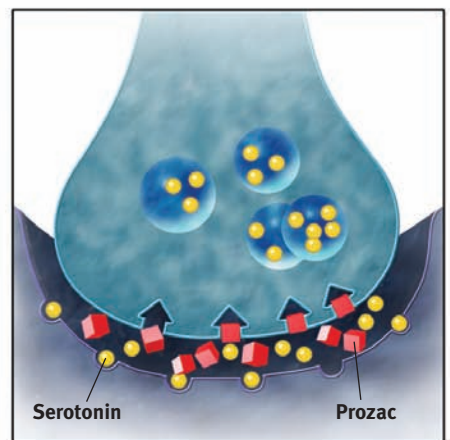


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FIGURE 15.5
Biology of antidepressants Shown here is the action of Prozac, which partially blocks the reuptake of serotonin.



Prozac partially blocks normal reuptake of the neurotransmitter serotonin; excess serotonin in synapse enhances its mood-lifting effect.



in treating other disorders, from anxiety to strokes, some professionals refer to *SSRI drugs* rather than *antidepressants* [Kramer, 2011].)

Other antidepressant drugs work by blocking the reabsorption or breakdown of both norepinephrine and serotonin. Though effective, these dual-action drugs have more potential side effects, such as dry mouth, weight gain, hypertension, or dizzy spells (Anderson, 2000; Mulrow, 1999). Administering them by means of a patch, bypassing the intestines and liver, helps reduce such side effects (Bodkin & Amsterdam, 2002).

After the introduction of SSRI drugs, the percentage of patients receiving medication for depression jumped dramatically, from 70 percent in 1987, the year before SSRIs were introduced, to 89 percent in 2001 (Olfson et al., 2003; Stafford et al., 2001). From 1996 to 2005, the number of Americans prescribed antidepressant drugs doubled, from 13 to 27 million (Olfson & Marcus, 2009). In Australia, antidepressant drug use increased 41 percent between 2002 and 2007 (Hollingworth et al., 2010).

Be advised: Patients with depression who begin taking antidepressants do not wake up the next day singing “Oh, what a beautiful morning!” Although the drugs begin to influence neurotransmission within hours, their full psychological effect often requires four weeks (and may involve a side effect of diminished sexual desire). One possible reason for the delay is that increased serotonin promotes *neurogenesis*—the birth of new brain cells, perhaps reversing stress-induced loss of neurons (Becker & Wojtowicz, 2007; Jacobs, 2004).

Antidepressant drugs are not the only way to give the body a lift. Aerobic exercise, which calms people who feel anxious and energizes those who feel depressed, does about as much good for most people with mild to moderate depression, and has additional positive side effects (more on this topic later in this chapter). Cognitive therapy, which helps people reverse their habits of thinking negatively, can boost the drug-aided relief from depression and reduce post-treatment relapses (Hollon et al., 2002; Keller et al., 2000; Vittengl et al., 2007). Antidepressant drugs work from the bottom up to affect the emotion-forming limbic system. Cognitive-behavioral therapy works from the top down to alter frontal lobe activity and change thought processes. Together, they can attack depression (and anxiety) from both below and above (Cuijpers et al., 2010; Walkup et al., 2008).

Everyone agrees that people with depression often improve after a month on antidepressant drugs. But after allowing for natural recovery and the placebo effect, how big is the drug effect? Not big, report some researchers (Kirsch et al., 1998, 2002, 2010). In double-blind clinical trials, placebos produced improvement comparable to about 75 percent of the active drug’s effect. In a follow-up review that included unpublished clinical trials, the antidepressant drug effect was again modest (Kirsch et al., 2008). The placebo effect was less for those with severe depression, which made the added benefit of the drug somewhat greater for them. “Given these results, there seems little reason to prescribe antidepressant medication to any but the most severely depressed patients, unless alternative treatments have failed,” Irving Kirsch concluded (BBC, 2008). A newer analysis confirms that the antidepressant benefit compared to placebos is “minimal or nonexistent, on average, in patients with mild or moderate symptoms.” For those folks, aerobic exercise or psychotherapy is often effective. But among patients with “very severe” depression, the medication advantage becomes “substantial” (Fournier et al., 2010).



“If this doesn’t help you don’t worry, it’s a placebo.”

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“No twisted thought without a twisted molecule.”

Attributed to psychologist
Ralph Gerard

Mood-Stabilizing Medications

In addition to antipsychotic, antianxiety, and antidepressant drugs, psychiatrists have *mood-stabilizing drugs* in their arsenal. One of them, Depakote, was originally used to treat epilepsy. It was also found effective in controlling the manic episodes associated with bipolar disorder. Another, the simple salt *lithium*, effectively levels the emotional highs and lows of this disorder. Kay Redfield Jamison (1995, pp. 88–89) described the effect: “Lithium prevents my seductive but disastrous highs, diminishes my depressions, clears out the wool and webbing from my disordered thinking, slows me down, gentles

me out, keeps me from ruining my career and relationships, keeps me out of a hospital, alive, and makes psychotherapy possible.”

Australian physician John Cade discovered the benefits of lithium in the 1940s when he administered it to a patient with severe mania and the patient became perfectly well in less than a week (Snyder, 1986). Although we do not understand why, lithium works. About 7 in 10 people with bipolar disorder benefit from a long-term daily dose of this cheap salt (Solomon et al., 1995).

Their risk of suicide is but one-sixth that of people with bipolar disorder not taking lithium (Tondo et al., 1997). Lithium amounts in drinking water have correlated with lower suicide rates (across 18 Japanese cities and towns) and lower crime rates (across 27 Texas counties) (Ohgami et al., 2009; Schrauzer & Shrestha, 1990, 2010; Terao et al., 2010). Lithium also protects neural health, thus reducing bipolar patients’ vulnerability to future dementia (Kessing et al., 2010).



“First of all I think you should know that last quarter’s sales figures are interfering with my mood-stabilizing drugs.”

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RETRIEVE IT

- How do researchers evaluate the effectiveness of particular drug therapies?

ANSWER: Researchers assign people to treatment and no-treatment conditions to see if those who receive the drug therapy improve more than those who don't. Double-blind controlled studies are most effective. If neither the therapist nor the client knows which participants have received the drug treatment, then any difference between the treated and untreated groups will reflect the drug treatment's actual effect.

- The drugs given most often to treat depression are called _____. The drugs that are now most commonly given to treat anxiety disorders are called _____. Schizophrenia is often treated with _____ drugs.

ANSWERS: antidepressants; antidepressants (The antidepressants have been shown to be effective at treating both depression and anxiety); antipsychotic

Brain Stimulation



15-15: How are brain stimulation and psychosurgery used in treating specific disorders?

Electroconvulsive Therapy

Another biomedical treatment, **electroconvulsive therapy (ECT)**, manipulates the brain by shocking it. When ECT was first introduced in 1938, the wide-awake patient was strapped to a table and jolted with roughly 100 volts of electricity to the brain. The procedure, which produced racking convulsions and brief unconsciousness, gained a barbaric image. Although that image lingers, ECT has changed. Today, the patient receives a general anesthetic and a muscle relaxant to prevent convulsions. A psychiatrist then delivers to the patient’s brain 30 to 60 seconds of electric current in briefer pulses, sometimes only to the brain’s right side (**FIGURE 15.6** on the next page). Within 30 minutes, the patient awakens and remembers nothing of the treatment or of the preceding hours.

Study after study confirms that ECT can effectively treat severe depression in “treatment-resistant” patients who have not responded to drug therapy (Bailine et al., 2010; Fink, 2009; UK ECT Review Group, 2003). After three such sessions each week for two to four weeks, 80 percent or more of those receiving ECT improve markedly. They show some memory loss for the treatment period but no apparent brain damage. Modern ECT causes less memory disruption than earlier versions did (HMHL, 2007).

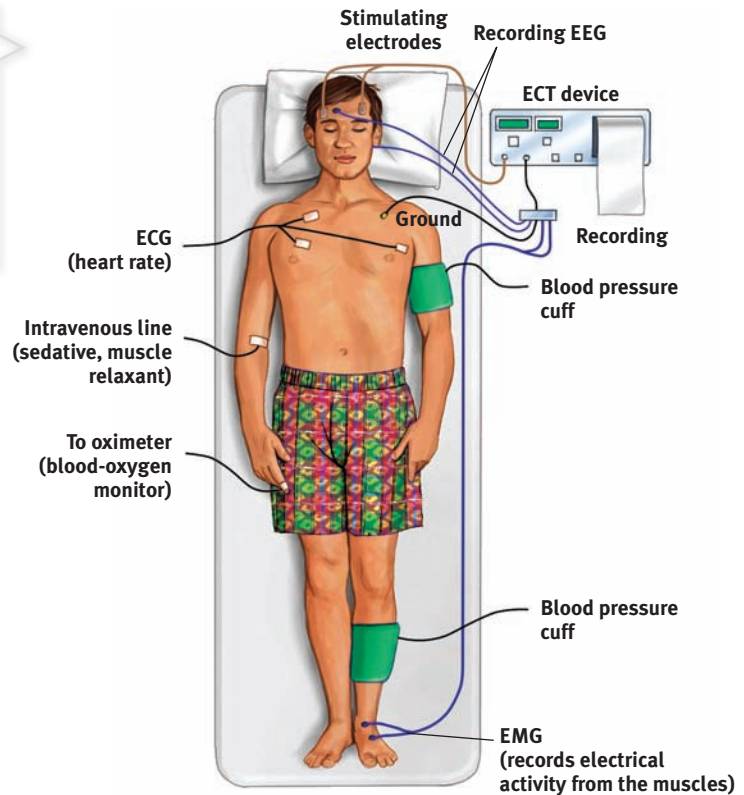
A *Journal of the American Medical Association* editorial concluded that “the results of ECT in treating severe depression are among the most positive treatment effects in all of medicine” (Glass, 2001). ECT reduces suicidal thoughts and has been credited with saving many from suicide (Kellner et al., 2005).

The medical use of electricity is an ancient practice. Physicians treated the Roman Emperor Claudius (10 B.C.E.–54 C.E.) for headaches by pressing electric eels to his temples.

electroconvulsive therapy (ECT) a biomedical therapy for severely depressed patients in which a brief electric current is sent through the brain of an anesthetized patient.

FIGURE 15.6

Electroconvulsive therapy Although controversial, ECT is often an effective treatment for depression that does not respond to drug therapy. “Electroconvulsive” is no longer accurate because patients are now given a drug that prevents convulsions.



How does ECT relieve severe depression? After more than 70 years, no one knows for sure. One patient likened ECT to the smallpox vaccine, which was saving lives before we knew how it worked. Perhaps the brief electric current calms neural centers where overactivity produces depression. ECT, like antidepressant drugs and exercise, also appears to boost the production of new brain cells (Bolwig & Madsen, 2007).

Skeptics have offered another possible explanation: ECT may trigger a placebo effect. Most ECT studies have failed to include a control group of patients who were randomly assigned to receive the same general anesthesia and to undergo simulated ECT, but without the shock. When patients are given this placebo treatment, their expectation of positive results is therapeutic without the shock (Read & Bentall, 2010). Nevertheless, a U.S. Food and Drug Administration (2011) research review concluded that ECT is more effective than a placebo, especially in the short run.

No matter how impressive the results, the idea of electrically shocking people still strikes many as barbaric, especially given our ignorance about why ECT works. Moreover, about 4 in 10 people treated with ECT relapse into depression within six months (Kellner et al., 2006). Nevertheless, in the minds of many psychiatrists and patients, ECT is a lesser evil than severe depression's misery, anguish, and risk of suicide. As research psychologist Norman Endler (1982) reported after ECT alleviated his deep depression, “A miracle had happened in two weeks.”

Alternative Neurostimulation Therapies

Hopes are now rising for alternatives that jump-start neural circuits in the depressed brain. *Vagus nerve stimulation* stimulates a nerve deep in the neck, via an electrical device implanted in the chest. The device periodically sends signals to the brain's mood-related limbic system (Daskalakis et al., 2008).

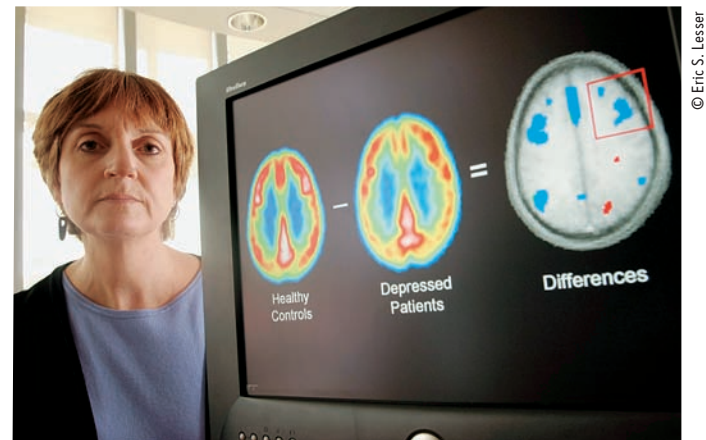
Another new experimental procedure, *deep-brain stimulation*, is administered by a pacemaker that controls implanted electrodes (Lozano et al., 2008; Mayberg et al., 2005).

repetitive transcranial magnetic stimulation (rTMS) the application of repeated pulses of magnetic energy to the brain; used to stimulate or suppress brain activity.

The stimulation inhibits activity in a brain area that feeds negative emotions and thinking. With deep stimulation, some patients whose depression did not respond to drugs or ECT have found their depression lifting. To experimentally excite neurons that inhibit the brain area's negative emotion-feeding activity, neuroscientist Helen Mayberg and her colleagues (2005, 2006, 2007, 2009) drew upon the deep-brain stimulation technology sometimes used to treat Parkinson's tremors. Among an initial 20 patients receiving implanted electrodes and a pacemaker stimulator, 12 experienced relief, which was sustained over three to six years of follow-up (Kennedy et al., 2011). Some felt suddenly more aware and became more talkative and engaged; others improved only slightly if at all. Future research will explore whether Mayberg has discovered a switch that can lift depression. Other researchers are following up on reports that deep-brain stimulation can offer relief to people with obsessive-compulsive disorder (Rabins et al., 2009).

Depressed moods also seem to improve when repeated pulses of magnetic energy are applied to a person's brain. In a painless procedure called **repetitive transcranial magnetic stimulation (rTMS)**, a coiled wire sends a magnetic field through the skull to the brain (FIGURE 15.7). Unlike deep-brain stimulation, the magnetic energy penetrates only to the brain's surface. Unlike ECT, the rTMS procedure produces no memory loss or other serious side effects. (Headaches can result.) Wide-awake patients receive this treatment daily for several weeks.

Initial studies have found "modest" positive benefits of rTMS (Daskalakis et al., 2008; George et al., 2010; López-Ibor et al., 2008). How it works is unclear. One possible explanation is that the stimulation energizes the brain's left frontal lobe, which is relatively inactive during depression (Helmuth, 2001). Repeated stimulation may cause nerve cells to form new functioning circuits through the process of long-term potentiation. (See Chapter 8 for more details on LTP.)



A depression switch? By comparing the brains of patients with and without depression, researcher Helen Mayberg identified a brain area that appears active in people who are depressed or sad, and whose activity may be calmed by deep-brain stimulation.

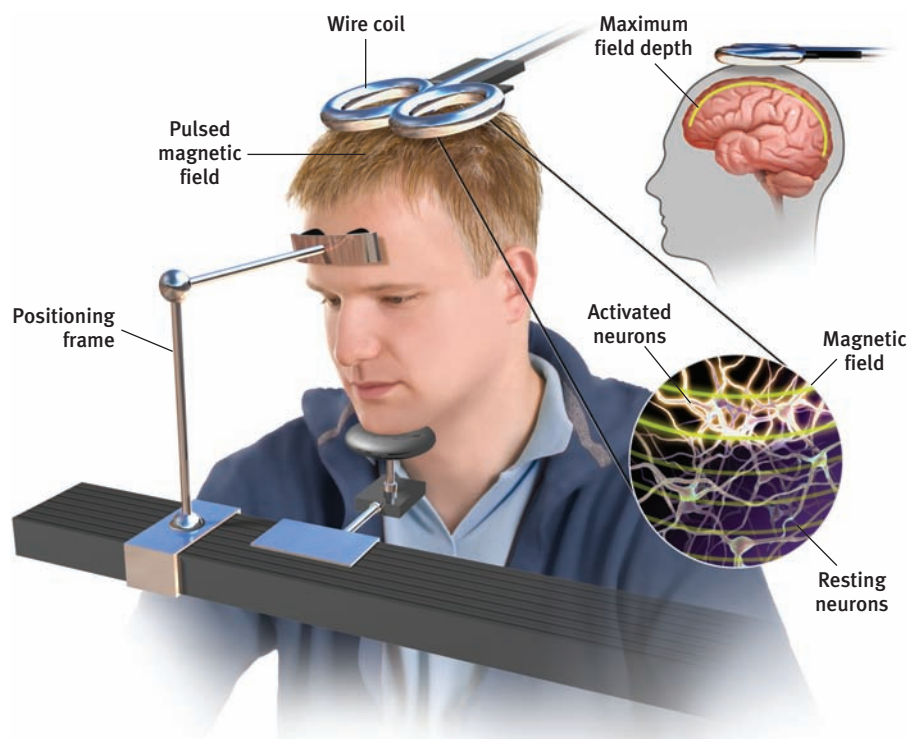


FIGURE 15.7

Magnets for the mind Repetitive transcranial magnetic stimulation (rTMS) sends a painless magnetic field through the skull to the surface of the cortex. Pulses can stimulate or dampen activity in various cortical areas. (From George, 2003.)

RETRIEVE IT

- Severe depression that has not responded to other therapy may be treated with _____, which can cause memory loss. More moderate neural stimulation techniques designed to help alleviate depression include _____ stimulation, _____ stimulation, and _____ magnetic stimulation.

ANSWERS: electroconvulsive therapy (ECT); vagus nerve; deep-brain; repetitive transcranial

New York Times Co./Getty Images



Failed lobotomy This 1940 photo shows Rosemary Kennedy (center) at age 22 with brother (and future U.S. president) John and sister Jean. A year later her father, on medical advice, approved a lobotomy that was promised to control her reportedly violent mood swings. The procedure left her confined to a hospital with an infantile mentality until her death in 2005 at age 86.

psychosurgery surgery that removes or destroys brain tissue in an effort to change behavior.

lobotomy a psychosurgical procedure once used to calm uncontrollably emotional or violent patients. The procedure cut the nerves connecting the frontal lobes to the emotion-controlling centers of the inner brain.

Psychosurgery

Because its effects are irreversible, **psychosurgery**—surgery that removes or destroys brain tissue—is the most drastic and the least-used biomedical intervention for changing thoughts and behavior. In the 1930s, Portuguese physician Egas Moniz developed what would become the best-known psychosurgical operation: the **lobotomy**. Moniz cut nerves connecting the frontal lobes with the emotion-controlling centers of the inner brain. His crude but easy and inexpensive procedure took only about 10 minutes. After shocking the patient into a coma, he (and later other neurosurgeons) would hammer an instrument shaped like an ice pick through each eye socket, driving it into the brain. He then wiggled the instrument to sever connections running up to the frontal lobes. Tens of thousands of severely disturbed people were given lobotomies between 1936 and 1954 (Valenstein, 1986).

Although the intention was simply to disconnect emotion from thought, the effect was often more drastic. A lobotomy usually decreased the person's misery or tension. But it also produced a permanently listless, immature, uncreative personality. During the 1950s, after some 35,000 people had been lobotomized in the United States alone, calming drugs became available and psychosurgery was largely abandoned. Today, lobotomies are history. More precise, microscale psychosurgery is sometimes used in extreme cases. For example, if a patient has uncontrollable seizures, surgeons can destroy the specific nerve clusters that cause or transmit the convulsions. MRI-guided precision surgery is also occasionally done to cut the circuits involved in severe obsessive-compulsive disorder (Carey, 2009, 2011; Sachdev & Sachdev, 1997). Because these procedures are irreversible, neurosurgeons perform them only as a last resort.

Therapeutic Lifestyle Change



15-16: How, by adopting a healthier lifestyle, might people find some relief from depression, and how does this reflect our being biopsychosocial systems?

The effectiveness of the biomedical therapies reminds us of a fundamental lesson: *We find it convenient to talk of separate psychological and biological influences, but everything psychological is also biological.* Every thought and feeling depends on the functioning brain. Every creative idea, every moment of joy or anger, every period of depression emerges from the electrochemical activity of the living brain. The influence is two-way: When psychotherapy relieves obsessive-compulsive behavior, PET scans reveal a calmer brain (Schwartz et al., 1996).

For years, we have trusted our bodies to physicians and our minds to psychiatrists and psychologists. That neat separation no longer seems valid. Stress affects body chemistry and health. And chemical imbalances, whatever their cause, can produce psychological disorders. Anxiety disorders, major depression, bipolar disorder, and schizophrenia are all biological events. As we have seen over and over again, *a human being is an integrated biopsychosocial system.*

That lesson has been applied by Stephen Ilardi (2009) and his colleagues in training seminars promoting *therapeutic lifestyle change*. Human brains and bodies were designed for physical activity and social engagement, they note. Our ancestors hunted, gathered, and built in groups, with little evidence of disabling depression. Indeed, those whose way of life entails strenuous physical activity, strong community ties, sunlight exposure, and plenty of sleep (think of foraging bands in Papua New Guinea, or Amish farming communities in North America) rarely experience depression. For both children and adults, outdoor activity in natural environments—perhaps a walk in the woods—reduces stress and promotes health (NEEF, 2011; Phillips, 2011). “Humans were never designed for the poorly nourished, sedentary, sleep-deprived, socially isolated, frenzied pace of twenty-first-century indoor life,” says Ilardi (2009, p. viii).



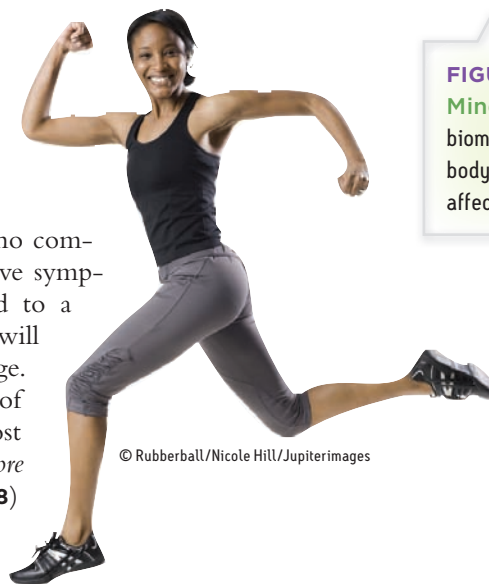
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The Ilardi team was also impressed by research showing that regular aerobic exercise rivals the healing power of antidepressant drugs, and that a complete night’s sleep boosts mood and energy. So they invited small groups of people with depression to undergo a 12-week training program with the following goals:

- *Aerobic exercise*, 30 minutes a day, at least three times weekly (increases fitness and vitality, stimulates endorphins)
- *Adequate sleep*, with a goal of 7 to 8 hours a night (increases energy and alertness, boosts immunity)
- *Light exposure*, at least 30 minutes each morning with a light box (amplifies arousal, influences hormones)
- *Social connection*, with less alone time and at least two meaningful social engagements weekly (helps satisfy the human need to belong)
- *Anti-rumination*, by identifying and redirecting negative thoughts (enhances positive thinking)
- *Nutritional supplements*, including a daily fish oil supplement with omega-3 fatty acids (supports healthy brain functioning)

In one study of 74 people, 77 percent of those who completed the program experienced relief from depressive symptoms, compared with 19 percent in those assigned to a treatment-as-usual control condition. Future research will seek to replicate this striking result of lifestyle change. Researchers will also try to identify which parts of the treatment produce the therapeutic effect. For most people, the Latin adage has wisdom: *Mens sana in corpore sano*: “A healthy mind in a healthy body.” (FIGURE 15.8)

TABLE 15.4 on the next page summarizes the biomedical therapies.



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“Forest bathing” In several small studies, Japanese researchers have found that walks in the woods help lower stress hormone and blood pressure levels (Phillips, 2011).

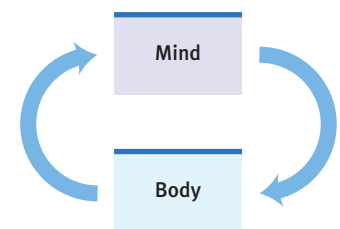


FIGURE 15.8

Mind-body interaction The biomedical therapies assume that mind and body are a unit: Affect one and you will affect the other.

Table 15.4
Comparing Biomedical Therapies

Therapy	Presumed Problem	Therapy Aim	Therapy Technique
<i>Drug therapies</i>	Neurotransmitter malfunction	Control symptoms of psychological disorders.	Alter brain chemistry through drugs.
<i>Brain stimulation</i>	Severe, “treatment-resistant” depression	Alleviate depression that is unresponsive to drug therapy.	Stimulate brain through electroconvulsive shock, vagus nerve stimulation, deep-brain stimulation, or magnetic impulses.
<i>Psychosurgery</i>	Brain malfunction	Relieve severe disorders.	Remove or destroy brain tissue.
<i>Therapeutic lifestyle change</i>	Stress and unhealthy lifestyle	Restore healthy biological state.	Alter lifestyle through adequate exercise, sleep, and other changes.

RETRIEVE IT

- What are some examples of lifestyle changes we can make to enhance our mental health?

ANSWER: Exercise regularly, get enough sleep, get more exposure to light, nurture important relationships, redirect negative thinking, and eat a diet rich in omega-3 fatty acids.

Preventing Psychological Disorders



15-17: What is the rationale for preventive mental health programs?

We have seen that lifestyle change can help *reverse* some of the symptoms of psychological disorders. Might such change also *prevent* some disorders by building individuals’ **resilience**—an ability to cope with stress and recover from adversity?

Resilience

Faced with unforeseen trauma, most adults exhibit resilience. This was true of New Yorkers in the aftermath of 9/11, especially those who enjoyed supportive close relationships and who had not recently experienced other stressful events (Bonanno et al., 2007). More than 9 in 10 New Yorkers, although stunned and grief-stricken by 9/11, did not have a dysfunctional stress reaction. By the following January, the stress symptoms of those who did were mostly gone (Person et al., 2006). Even in groups of combat-stressed veterans and political rebels who have survived dozens of episodes of torture, most do not later exhibit PTSD (Mineka & Zinbarg, 1996).

Psychologist Peter Suedfeld (1998, 2000) documented this resilience among Holocaust survivors, most of whom went on to live productive lives. “It is not always true that ‘What doesn’t kill you makes you stronger,’ but it is often true,” Suedfeld reported. “What doesn’t kill you may reveal to you just how strong you really are.” He speaks from experience. As a boy, Suedfeld survived the Holocaust, though his mother did not. Fellow survivor Ervin Staub has described “altruism born of suffering” (Staub & Vollhardt, 2008). Although nothing justifies terror and victimization, those who have suffered, he reports, often develop a greater-than-usual sensitivity to suffering. They have a greater empathy for others who suffer, an increased sense of responsibility, and an enlarged capacity for caring. Staub is a living example of his own work. He was spared from being sent to the Auschwitz death camps, thanks to a heroic intervention. Since that time, his lifelong mission has been to understand why some people perpetrate evil, some stand by, and some help.

resilience the personal strength that helps most people cope with stress and recover from adversity and even trauma.

Struggling with challenging crises can also lead to *post-traumatic growth* (Tedeschi & Calhoun, 2004). Many cancer survivors have reported a greater appreciation for life,

more meaningful relationships, increased personal strength, changed priorities, and a richer spiritual life. Out of even our worst experiences some good can come. Suffering can lead to new sensitivity and strength.

Creating Healthy Environments

We have seen that psychotherapies and biomedical therapies tend to locate the cause of psychological disorders within the person with the disorder. These therapies try to treat people by giving them insight into their problems, by changing their thinking, by helping them gain control with drugs. Yet according to the preventive view, it is not just the person who needs treatment, but also the person's social context.

Many psychological disorders are understandable responses to a disturbing and stressful society. Better to prevent a problem by reforming a sick situation and by developing people's coping competencies than to wait for a problem to arise and then treat it.

A story about the rescue of a drowning person from a rushing river illustrates the importance of prevention: Having successfully administered first aid to the first victim, the rescuer spots another struggling person and pulls her out, too. After a half-dozen repetitions, the rescuer suddenly turns and starts running away while the river sweeps yet another floundering person into view. "Aren't you going to rescue that fellow?" asks a bystander. "Heck no," the rescuer replies. "I'm going upstream to find out what's pushing all these people in."

Preventive mental health is upstream work. It seeks to prevent psychological casualties by identifying and wiping out the conditions that cause them. Poverty, meaningless work, constant criticism, unemployment, racism, sexism, and heterosexism can undermine people's sense of competence, personal control, and self-esteem. Such stresses increase their risk of depression, alcohol dependence, and suicide.

To prevent psychological casualties, said George Albee (1986), caring people should therefore support programs that control or eliminate these stressful situations. We eliminated smallpox not by treating the afflicted but by vaccinating the healthy. We conquered yellow fever by controlling mosquitoes. Preventing psychological problems means empowering those who have learned an attitude of helplessness, changing environments that breed loneliness, renewing the disintegrating family, promoting communication training for couples, and bolstering parents' and teachers' skills. "Everything aimed at improving the human condition, at making life more fulfilling and meaningful, may be considered part of primary prevention of mental or emotional disturbance" (Kessler & Albee, 1975, p. 557).

Prevention includes the cognitive training that promotes positive thinking in children at risk for depression (Brunwasser et al., 2009; Gillham et al., 2006; Stice et al., 2009). A 2009 National Research Council and Institute of Medicine report—*Preventing Mental, Emotional, and Behavioral Disorders Among Young People*—offers encouragement. It documents that intervention efforts often based on cognitive-behavioral therapy principles significantly boost child and adolescent flourishing. Through such preventive efforts and healthy lifestyles, fewer of us will fall into the rushing river of psychological disorders.

Among the upstream prevention workers mindful of how people interact with their environments are the *community psychologists*. Through their focus on creating environments that support psychological health, their research, and their social action, community psychologists aim to empower people and to enhance their competence, health, and well-being.

"It is better to prevent than to cure."

Peruvian folk wisdom

RETRIEVE IT

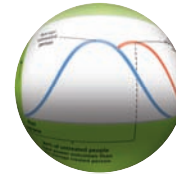
- What is the difference between preventive mental health and psychological or biomedical therapy?

ANSWER: Psychological and biomedical therapies attempt to relieve people's suffering from psychological disorders. Preventive mental health attempts to prevent suffering by identifying and eliminating the conditions that cause disorders.

If you just finished reading this book, your introduction to psychological science is completed. Our tour of psychological science has taught me much—and you, too?—about our moods and memories, about the reach of our unconscious, about how we flourish and struggle, about how we perceive our physical and social worlds, and about how our biology and culture in turn shape us. My hope, as your guide on this tour, is that you have shared some of my fascination, grown in your understanding and compassion, and sharpened your critical thinking. I also hope you enjoyed the ride.

With every good wish in your future endeavors,

David G. Myers
www.davidmyers.org



CHAPTER REVIEW

Therapy

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the chapter). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Treating Psychological Disorders

15-1: How do psychotherapy, biomedical therapy, and an eclectic approach to therapy differ?

The Psychological Therapies

15-2: What are the goals and techniques of psychoanalysis, and how have they been adapted in psychodynamic therapy?

15-3: What are the basic themes of humanistic therapy, and what are the specific goals and techniques of Rogers' client-centered approach?

15-4: How do the basic assumption of behavior therapy differ from the assumptions of psychodynamic and humanistic therapies? What techniques are used in exposure therapies and aversive conditioning?

15-5: What is the basic idea of operant conditioning therapy, and what arguments have been used for and against it?

15-6: What are the goals and techniques of the cognitive therapies and of cognitive-behavioral therapy?

15-7: What are the aims and benefits of group and family therapy?

Evaluating Psychotherapies

15-8: Does psychotherapy work? Who decides?

15-9: Are some psychotherapies more effective than others for specific disorders?

15-10: How do alternative therapies fare under scientific scrutiny?

15-11: What three elements are shared by all forms of psychotherapy?

15-12: How do culture and values influence the therapist-client relationship?

15-13: What should a person look for when selecting a therapist?

The Biomedical Therapies

15-14: What are the drug therapies? How do double-blind studies help researchers evaluate a drug's effectiveness?

15-15: How are brain stimulation and psychosurgery used in treating specific disorders?

15-16: How, by adopting a healthier lifestyle, might people find some relief from depression, and how does this reflect our being biopsychosocial systems?

Preventing Psychological Disorders

15-17: What is the rationale for preventive mental health programs?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition in your own words before flipping back to the referenced page to check your answer.

psychotherapy, p. 546

biomedical therapy, p. 546

eclectic approach, p. 546

psychoanalysis, p. 547

resistance, p. 547

interpretation, p. 547

transference, p. 547

psychodynamic therapy, p. 548

insight therapies, p. 548

client-centered therapy, p. 549

active listening, p. 549

unconditional positive regard, p. 550

behavior therapy, p. 550

counterconditioning, p. 551

exposure therapies, p. 551

systematic desensitization, p. 551

virtual reality exposure therapy, p. 552

aversive conditioning, p. 552

token economy, p. 553

cognitive therapy, p. 554

cognitive-behavioral therapy, p. 556

group therapy, p. 557

family therapy, p. 558

evidence-based practice, p. 562

psychopharmacology, p. 568

antipsychotic drugs, p. 568

antianxiety drugs, p. 569

antidepressant drugs, p. 569

electroconvulsive therapy (ECT), p. 571

repetitive transcranial magnetic stimulation (rTMS), p. 573

psychosurgery, p. 574

lobotomy, p. 574

resilience, p. 576

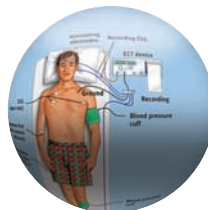
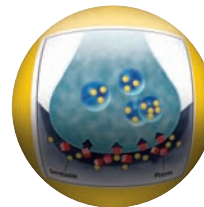
EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- A therapist who helps patients search for the unconscious roots of their problem and offers interpretations of their behaviors, feelings, and dreams, is drawing from
 - psychoanalysis.
 - humanistic therapies.
 - client-centered therapy.
 - behavior therapy.
- _____ therapies are designed to help individuals discover the thoughts and feelings that guide their motivation and behavior.
- Compared with psychoanalysts, humanistic therapists are more likely to emphasize
 - hidden or repressed feelings.
 - childhood experiences.
 - psychological disorders.
 - self-fulfillment and growth.
- A therapist who restates and clarifies the client's statements is practicing _____.
- The goal of behavior therapy is to
 - identify and treat the underlying causes of the problem.
 - improve learning and insight.
 - eliminate the unwanted behavior.
 - improve communication and social sensitivity.
- Behavior therapists often use _____ techniques such as systematic desensitization and aversive conditioning to encourage clients to produce new responses to old stimuli.
- The technique of _____ teaches people to relax in the presence of progressively more anxiety-provoking stimuli.
- After a near-fatal car accident, Rico developed such an intense fear of driving on the freeway that he takes lengthy alternative routes to work each day. Which psychological therapy might best help Rico overcome his phobia, and why?

9. At a treatment center, people who display a desired behavior receive coins that they can later exchange for other rewards. This is an example of a(n) _____.
10. Cognitive therapy has been especially effective in treating
- nail biting.
 - phobias.
 - alcohol dependence.
 - depression.
11. _____ - _____ therapists help people to change their self-defeating ways of thinking and to act out those changes in their daily behavior.
12. In family therapy, the therapist assumes that
- only one family member needs to change.
 - each person's actions trigger reactions from other family members.
 - dysfunctional families must improve their interactions or give up their children.
 - All of the above.
13. The most enthusiastic or optimistic view of the effectiveness of psychotherapy comes from
- outcome research.
 - randomized clinical trials.
 - reports of clinicians and clients.
 - a government study of treatment for depression.
14. Studies show that _____ therapy is the most effective treatment for most psychological disorders.
- behavior
 - humanistic
 - psychodynamic
 - no one type of
15. What are the three components of evidence-based practice?
16. How does the placebo effect bias patients' attitudes about the effectiveness of drug therapies?
17. Some antipsychotic drugs, used to calm people with schizophrenia, can have unpleasant side effects, most notably
- hyperactivity.
 - convulsions and momentary memory loss.
 - sluggishness, tremors, and twitches.
 - paranoia.
18. Drugs like Xanax and Ativan, which depress central nervous system activity, can lead to psychological and physical dependency when used as ongoing treatment. These drugs are referred to as _____ drugs.
19. A simple salt that often brings relief to patients suffering the highs and lows of bipolar disorder is _____.
20. When drug therapies have not been effective, electroconvulsive therapy (ECT) may be used as treatment, largely for people with
- severe obsessive-compulsive disorder.
 - severe depression.
 - schizophrenia.
 - anxiety disorders.
21. An approach that seeks to identify and alleviate conditions that put people at high risk for developing psychological disorders is called
- deep-brain stimulation.
 - the mood-stabilizing perspective.
 - spontaneous recovery.
 - biomedical therapy.

Find answers to these questions in Appendix E, in the back of the book.



Experience
more of the
TESTING
EFFECT

Multiple-format self-tests and more
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www.worthpublishers.com/myers.

Statistical Reasoning in Everyday Life

In descriptive, correlational, and experimental research, statistics are tools that help us see and interpret what the unaided eye might miss. Sometimes the unaided eye misses badly, as it did when researchers asked 5522 Americans to estimate (as a percentage) the portion of the country’s wealth possessed by the richest 20 percent of the population (Norton & Ariely, 2011). The average person’s guess—58 percent—“dramatically underestimated” the actual figure. (The wealthiest 20 percent possess 84 percent of the wealth.)

Accurate statistical understanding benefits everyone. To be an educated person today is to be able to apply simple statistical principles to everyday reasoning. We needn’t memorize complicated formulas to think more clearly and critically about data.

Off-the-top-of-the-head estimates often misread reality and then mislead the public. Someone throws out a big, round number. Others echo it, and before long the big, round number becomes public misinformation. A few examples:

- *Ten percent of people are lesbians or gay men.* Or is it 2 to 3 percent, as suggested by various national surveys (Chapter 5)?
- *We ordinarily use but 10 percent of our brain.* Or is it closer to 100 percent (Chapter 2)?
- *The human brain has 100 billion nerve cells.* Or is it more like 40 billion, as suggested by one extrapolation from sample counts (Chapter 2)?

The point to remember: Doubt big, round, undocumented numbers.

Statistical illiteracy also feeds needless health scares (Gigerenzer et al., 2008, 2009, 2010). In the 1990s, the British press reported a study showing that women taking a particular contraceptive pill had a 100 percent increased risk of blood clots that could produce strokes. This caused thousands of women to stop taking the pill, leading to a wave of unwanted pregnancies and an estimated 13,000 additional abortions (which also are associated with increased blood clot risk). And what did the study find? A 100 percent increased risk, indeed—but only from 1 in 7000 to 2 in 7000. Such false alarms underscore the need to teach statistical reasoning and to present statistical information more transparently.

Describing Data



A-1: How can we describe data with measures of central tendency and variation?

Once researchers have gathered their data, they must organize them in some meaningful way. One way to do this is to convert the data into a simple *bar graph*, as in **FIGURE A.1** on the next page, which displays a distribution of different brands of trucks still on the road after a decade. When reading statistical graphs such as this, take care. It’s easy to design a graph to make a difference look big (Figure A.1a) or small (Figure A.1b). The secret lies in how you label the vertical scale (the *y-axis*).

DESCRIBING DATA

Measures of Central Tendency

Measures of Variation

Correlation: A Measure of Relationships

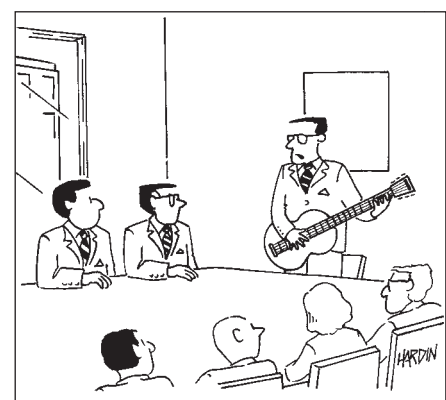
SIGNIFICANT DIFFERENCES

When Is an Observed Difference Reliable?

Close-Up: Cross-Sectional and Longitudinal Studies

When Is an Observed Difference “Significant”?

Asked about the *ideal* wealth distribution in America, Democrats and Republicans were surprisingly similar. In the Democrats’ ideal world, the richest 20 percent would possess 30 percent of the wealth. Republicans preferred a similar 35 percent (Norton & Ariely, 2011).



“Figures can be misleading—so I’ve written a song which I think expresses the real story of the firm’s performance this quarter.”

©Patrick Harbin

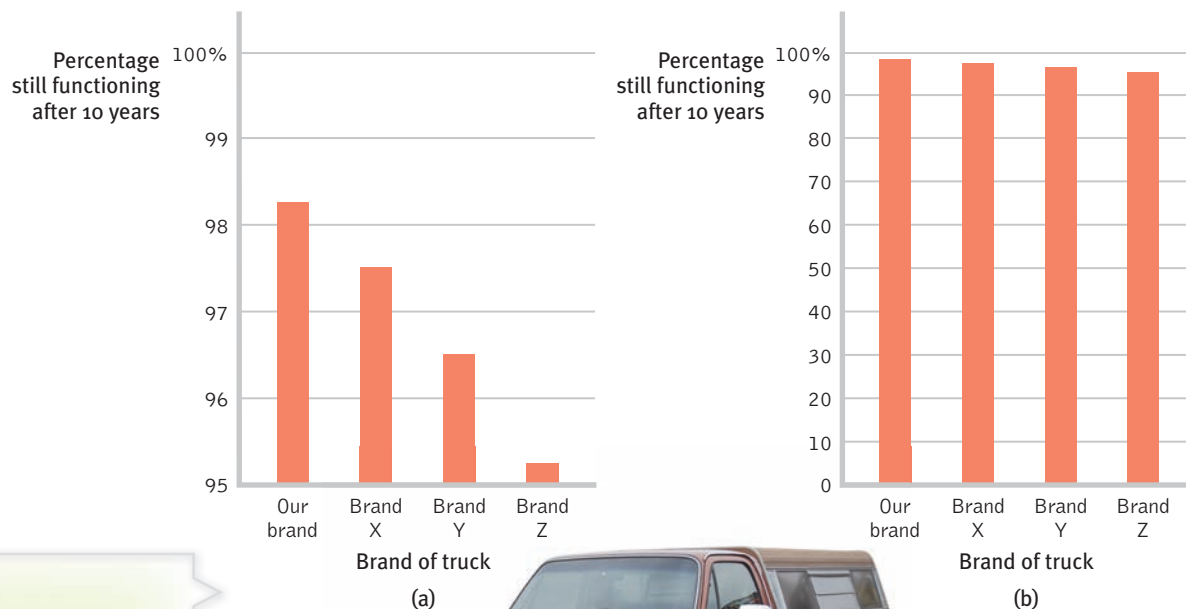


FIGURE A.1
Read the scale labels

RETRIEVE IT

- An American truck manufacturer offered graph (a)—with actual brand names included—to suggest the much greater durability of its trucks. What does graph (b) make clear about the varying durability, and how is this accomplished?

ANSWER: Note how the y-axis of each graph is labeled. The range for the y-axis label in graph a is only from 95 to 100. The range for graph b is from 0 to 100. All the trucks rank as 95% and up, so almost all are still functioning after 10 years, which graph b makes clear.



© Rick Sargeant/istockphoto

The point to remember: Think smart. When viewing figures in magazines, on TV, or online, read the scale labels and note their range.

Measures of Central Tendency

The next step is to summarize the data using some *measure of central tendency*, a single score that represents a whole set of scores. The simplest measure is the **mode**, the most frequently occurring score or scores. The most familiar is the **mean**, or arithmetic average—the total sum of all the scores divided by the number of scores. The midpoint—the 50th percentile—is the **median**. On a divided highway, the median is the middle. So, too, with data: If you arrange all the scores in order from the highest to the lowest, half will be above the median and half will be below it.

Measures of central tendency neatly summarize data. But consider what happens to the mean when a distribution is lopsided, or *skewed* by a few way-out scores. With income data, for example, the mode, median, and mean often tell very different stories (**FIGURE A.2**). This happens because the mean is biased by a few extreme scores. When Microsoft co-founder Bill Gates sits down in an intimate café, its average (mean) customer instantly becomes a billionaire. But the median customers' wealth remains unchanged. Understanding this, you can see how a British newspaper could accurately run the headline “Income for 62% Is Below Average” (Waterhouse, 1993). Because the bottom *half* of British income earners received only a *quarter* of the national income cake, most British people, like most people everywhere, made less than the mean. Mean and median tell different true stories.

The point to remember: Always note which measure of central tendency is reported. If it is a mean, consider whether a few atypical scores could be distorting it.

The average person has one ovary and one testicle.

mode the most frequently occurring score(s) in a distribution.

mean the arithmetic average of a distribution, obtained by adding the scores and then dividing by the number of scores.

median the middle score in a distribution; half the scores are above it and half are below it.

range the difference between the highest and lowest scores in a distribution.

standard deviation a computed measure of how much scores vary around the mean score.

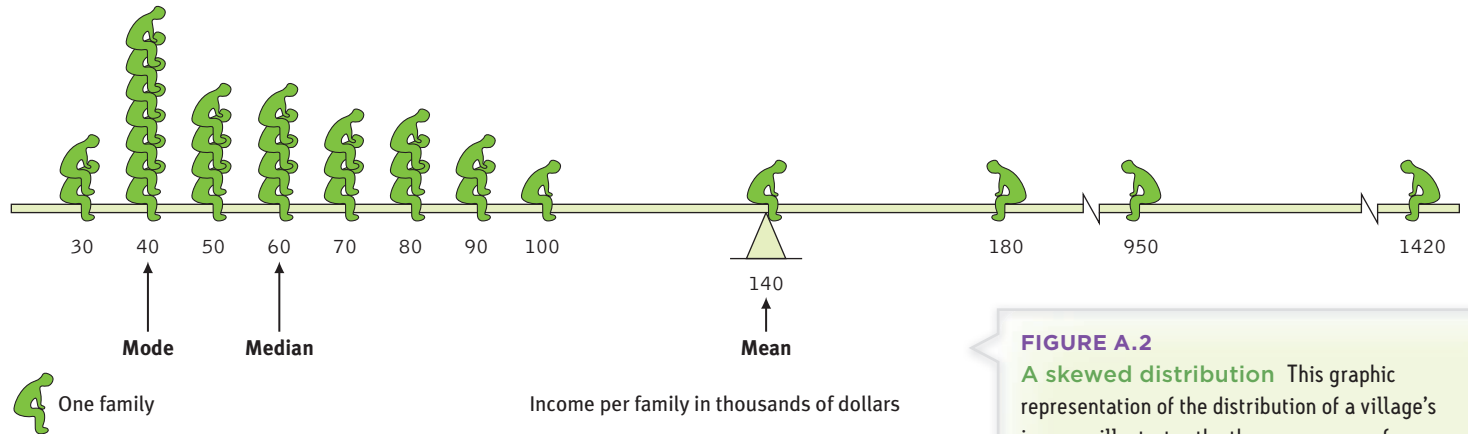


FIGURE A.2
A skewed distribution This graphic representation of the distribution of a village’s incomes illustrates the three measures of central tendency—mode, median, and mean. Note how just a few high incomes make the mean—the fulcrum point that balances the incomes above and below—deceptively high.

Measures of Variation

Knowing the value of an appropriate measure of central tendency can tell us a great deal. But the single number omits other information. It helps to know something about the amount of *variation* in the data—how similar or diverse the scores are. Averages derived from scores with low variability are more reliable than averages based on scores with high variability. Consider a basketball player who scored between 13 and 17 points in each of the season’s first 10 games. Knowing this, we would be more confident that she would score near 15 points in her next game than if her scores had varied from 5 to 25 points.

The **range** of scores—the gap between the lowest and highest—provides only a crude estimate of variation. A couple of extreme scores in an otherwise uniform group, such as the \$950,000 and \$1,420,000 incomes in Figure A.2, will create a deceptively large range.

The more useful standard for measuring how much scores deviate from one another is the **standard deviation**. It better gauges whether scores are packed together or dispersed, because it uses information from each score. The computation (see **TABLE A.1**) assembles information about how much individual scores differ from

Table A.1
Standard Deviation is Much More Informative Than Mean Alone

Test Scores in Class A			Test Scores in Class B		
Score	Deviation from the Mean	Squared Deviation	Score	Deviation from the Mean	Squared Deviation
72	-8	64	60	-20	400
74	-6	36	60	-20	400
77	-3	9	70	-10	100
79	-1	1	70	-10	100
82	+2	4	90	+10	100
84	+4	16	90	+10	100
85	+5	25	100	+20	400
87	+7	49	100	+20	400
Total = 640		Sum of (deviations) ² = 204	Total = 640		Sum of (deviations) ² = 2000
Mean = 640 ÷ 8 = 80			Mean = 640 ÷ 8 = 80		
Standard deviation =			Standard deviation =		
$\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{204}{8}} = 5.0$			$\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{2000}{8}} = 15.8$		

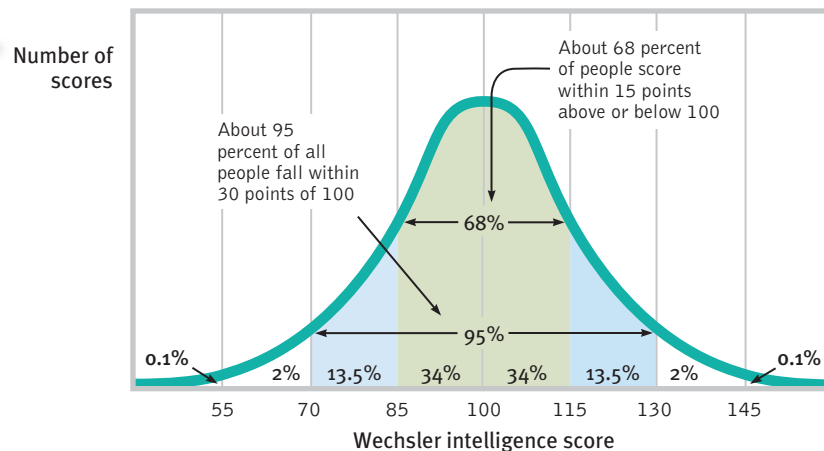
the mean. Note that the test scores in Class A and Class B have the same mean (80), but very different standard deviations, which tell us more about how the students in each class are really faring. If your college or university attracts students of a certain ability level, their intelligence scores will have a relatively small standard deviation compared with the more diverse community population outside your school.

You can grasp the meaning of the standard deviation if you consider how scores tend to be distributed in nature. Large numbers of data—heights, weights, intelligence scores, grades (though not incomes)—often form a symmetrical, *bell-shaped* distribution. Most cases fall near the mean, and fewer cases fall near either extreme. This bell-shaped distribution is so typical that we call the curve it forms the **normal curve**.

As **FIGURE A.3** shows, a useful property of the normal curve is that roughly 68 percent of the cases fall within one standard deviation on either side of the mean. About 95 percent of cases fall within two standard deviations. Thus, as Chapter 9 notes, about 68 percent of people taking an intelligence test will score within ± 15 points of 100. About 95 percent will score within ± 30 points.

FIGURE A.3

The normal curve Scores on aptitude tests tend to form a normal, or bell-shaped, curve. For example, the Wechsler Adult Intelligence Scale calls the average score 100.



RETRIEVE IT

- The average of a distribution of scores is the _____. The score that shows up most often is the _____. The score right in the middle of a distribution (half the scores above it; half below) is the _____. We determine how much scores vary around the average in a way that includes information about the variability of scores (difference between highest and lowest) by calculating the _____.

ANSWERS: mean; mode; median; standard deviation

normal curve (*normal distribution*) a symmetrical, bell-shaped curve that describes the distribution of many types of data; most scores fall near the mean (about 68 percent fall within one standard deviation of it) and fewer and fewer near the extremes.

correlation coefficient a statistical index of the relationship between two things (from -1 to $+1$).

scatterplot a graphed cluster of dots, each of which represents the values of two variables. The slope of the points suggests the direction of the relationship between the two variables. The amount of scatter suggests the strength of the correlation (little scatter indicates high correlation).

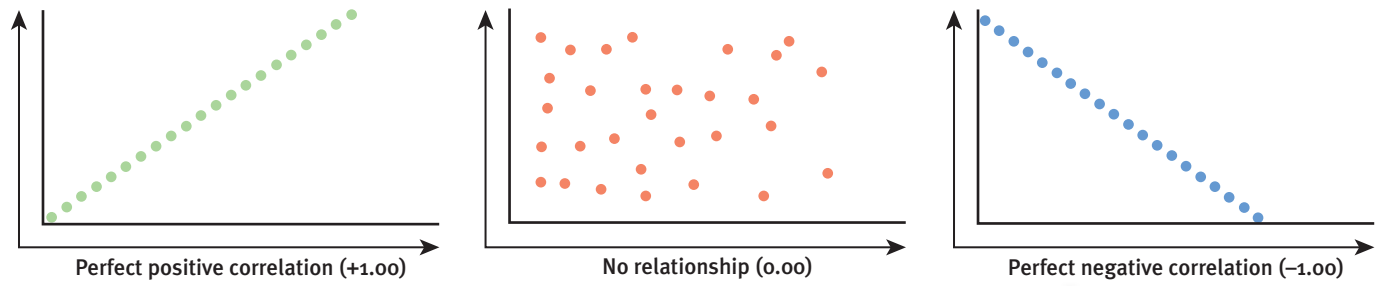
Correlation: A Measure of Relationships



A-2: What does it mean when we say two things are correlated?

Throughout this book we often ask how strongly two things are related: For example, how closely related are the personality scores of identical twins? How well do intelligence test scores predict vocational achievement? How closely is stress related to disease?

As we saw in Chapter 1, describing behavior is a first step toward predicting it. When naturalistic observation and surveys reveal that one trait or behavior accompanies another, we say the two *correlate*. A **correlation coefficient** is a statistical measure of relationship. In such cases, **scatterplots** can be very revealing.



Each dot in a scatterplot represents the values of two variables. The three scatterplots in **FIGURE A.4** illustrate the range of possible correlations from a perfect positive to a perfect negative. (Perfect correlations rarely occur in the “real world.”) A correlation is positive if two sets of scores, such as height and weight, tend to rise or fall together.

Saying that a correlation is “negative” says nothing about its strength or weakness. A correlation is negative if two sets of scores relate inversely, one set going up as the other goes down.

Statistics can help us see what the naked eye sometimes misses. To demonstrate this for yourself, try an imaginary project. Wondering if tall men are more or less easygoing, you collect two sets of scores: men’s heights and men’s temperaments. You measure the heights of 20 men, and you have someone else independently assess their temperaments (from zero for extremely calm to 100 for highly reactive).

With all the relevant data right in front of you (**TABLE A.2**), can you tell whether the correlation between height and reactive temperament is positive, negative, or close to zero?

Comparing the columns in Table A.2, most people detect very little relationship between height and temperament. In fact, the correlation in this imaginary example is positive, +0.63, as we can see if we display the data as a scatterplot. In **FIGURE A.5** (on the next page) moving from left to right, the upward, oval-shaped slope of the cluster of points shows that our two imaginary sets of scores (height and temperament) tend to rise together.

If we fail to see a relationship when data are presented as systematically as in Table A.2, how much less likely are we to notice them in everyday life? To see what is right in front of us, we sometimes need statistical illumination. We can easily see evidence of gender discrimination when given statistically summarized information about job level, seniority, performance, gender, and salary. But we often see no discrimination when the same information dribbles in, case by case (Twiss et al., 1989).

The point to remember: Correlation coefficients tell us nothing about cause and effect, but they can help us see the world more clearly by revealing the extent to which two things relate.

Regression Toward the Mean



A-3: What is regression toward the mean?

Correlations not only make visible the relationships we might otherwise miss, they also restrain our “seeing” nonexistent relationships. When we believe there is a relationship between two things, we are likely to notice and recall instances that confirm our belief. If we believe that dreams are forecasts of actual events, we may notice and recall confirming instances more than disconfirming instances. The result is an *illusory correlation*.

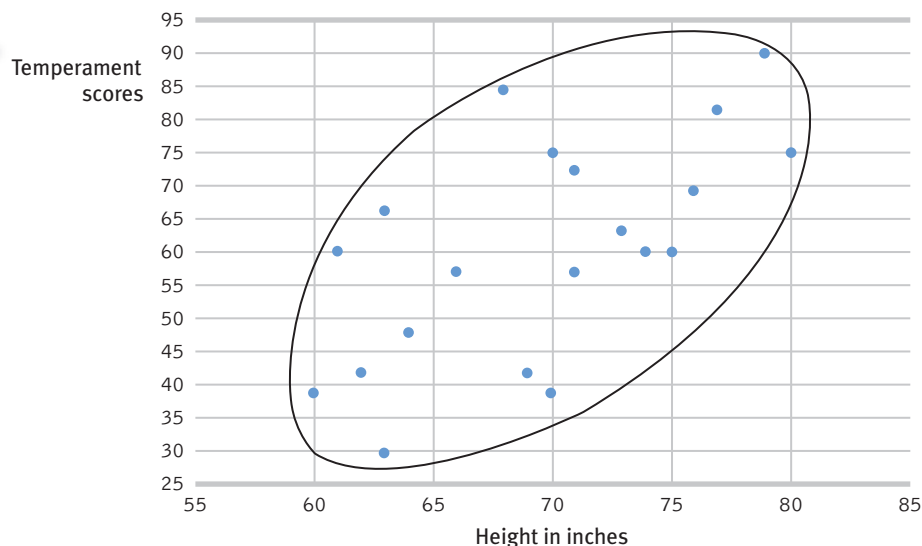
FIGURE A.4
Scatterplots, showing patterns of correlation. Correlations can range from +1.00 (scores on one measure increase in direct proportion to scores on another) to -1.00 (scores on one measure decrease precisely as scores rise on the other).

Table A.2
Height and Temperamental Reactivity of 20 Men

Person	Height in Inches	Temperament
1	80	75
2	63	66
3	61	60
4	79	90
5	74	60
6	69	42
7	62	42
8	75	60
9	77	81
10	60	39
11	64	48
12	76	69
13	71	72
14	66	57
15	73	63
16	70	75
17	63	30
18	71	57
19	68	84
20	70	39

FIGURE A.5

Scatterplot for height and reactive temperament This display of data from 20 imagined people (each represented by a data point) reveals an upward slope, indicating a positive correlation. The considerable scatter of the data indicates the correlation is much lower than +1.0.



Illusory correlations feed an illusion of control—that chance events are subject to our personal control. Gamblers, remembering their lucky rolls, may come to believe they can influence the roll of the dice by again throwing gently for low numbers and hard for high numbers. The illusion that uncontrollable events correlate with our actions is also fed by a statistical phenomenon called **regression toward the mean**. Average results are more typical than extreme results. Thus, after an unusual event, things tend to return toward their average level; extraordinary happenings tend to be followed by more ordinary ones.

The point may seem obvious, yet we regularly miss it: We sometimes attribute what may be a normal regression (the expected return to normal) to something we have done. Consider two examples:

- Students who score much lower or higher on an exam than they usually do are likely, when retested, to return to their average.
- Unusual ESP subjects who defy chance when first tested nearly always lose their “psychic powers” when retested (a phenomenon parapsychologists have called the *decline effect*).

Failure to recognize regression is the source of many superstitions and of some ineffective practices as well. When day-to-day behavior has a large element of chance fluctuation, we may notice that others’ behavior improves (regresses toward average) after we criticize them for very bad performance, and that it worsens (regresses toward average) after we warmly praise them for an exceptionally fine performance. Ironically, then, regression toward the average can mislead us into feeling rewarded for having criticized others and into feeling punished for having praised them (Tversky & Kahneman, 1974).

The point to remember: When a fluctuating behavior returns to normal, there is no need to invent fancy explanations for why it does so. Regression toward the mean is probably at work.

“Once you become sensitized to it, you see regression everywhere.”

Psychologist Daniel Kahneman (1985)

RETRIEVE IT

- You hear the school basketball coach telling her friend that she rescued her team’s winning streak by yelling at them after they played unusually badly in the first half of the game. What is another explanation of why the team’s performance improved?

ANSWER: The team’s poor performance was not their typical behavior. Their return to their normal—their winning streak—may just have been a case of regression toward the mean.

regression toward the mean the tendency for extreme or unusual scores or events to fall back (regress) toward the average.

Significant Differences



A-4: How do we know whether an observed difference can be generalized to other populations?

Data are “noisy.” The average score in one group could conceivably differ from the average score in another group not because of any real difference but merely because of chance fluctuations in the people sampled. How confidently, then, can we infer that an observed difference is not just a fluke—a chance result from the research sample? For guidance, we can ask whether the observed difference between the two groups is reliable and significant.

When Is an Observed Difference Reliable?

In deciding when it is safe to generalize from a sample, we should keep three principles in mind:

1. **Representative samples are better than biased (unrepresentative) samples.** The best basis for generalizing is from a representative sample of cases, not from the exceptional and memorable cases one finds at the extremes. Research never randomly samples the whole human population. Thus, it pays to keep in mind what population a study has sampled. (To see how an unrepresentative sample can lead you astray, see Close-Up: Cross-Sectional and Longitudinal Studies.)

CLOSE UP:

Cross-Sectional and Longitudinal Studies



A-5: What are cross-sectional studies and longitudinal studies, and why is it important to know which method was used?

When interpreting research results, smart thinkers consider how researchers arrived at their conclusions. One way studies vary is in the time period for gathering data.

In **cross-sectional studies**, researchers compare different groups at the same time. When researchers compare intelligence test scores among people in differing age groups, older adults, on average, give fewer correct answers than do younger adults. This could suggest that mental ability declines with age, and indeed, that was the conclusion drawn from many early cross-sectional studies of intelligence.

In **longitudinal studies**, researchers study and restudy the same group at different times in their life span. Around 1920, colleges began giving intelligence tests to entering students, and several psychologists saw their chance to study intelligence

longitudinally. What they expected to find was a decrease in intelligence after about age 30 (Schaie & Geiwitz, 1982). What they actually found was a surprise: Until late in life, intelligence remained stable. On some tests, it even increased.

Why did these new results differ from the earlier cross-sectional findings? In retrospect, researchers realized that cross-sectional studies that compared 70-year-olds and 30-year-olds were comparing people not only of two different ages but also of two different eras. They were comparing

- generally less-educated people (born, say, in the early 1900s) with better-educated people (born after 1950).
- people raised in large families with people raised in smaller families.

- people from less-affluent families with people from more-affluent families.

Others have since pointed out that longitudinal studies have their own pitfalls. Participants who survive to the end of longitudinal studies may be the healthiest (and brightest) people. When researchers adjust for the loss of participants, as did one study following more than 2000 people over age 75 in Cambridge, England, they find a steeper intelligence decline, especially as people age after 85 (Brayne et al., 1999).

The point to remember: When interpreting research results, pay attention to the methodology used, such as whether it was a longitudinal or cross-sectional study.

.....
cross-sectional study research in which people of different ages are compared with one another.

longitudinal study research in which the same people are restudied and retested over a long period of time.

statistical significance a statistical statement of how likely it is that an obtained result occurred by chance.

2. **Less-variable observations are more reliable than those that are more variable.** As we noted earlier, in the example of the basketball player whose game-to-game points were consistent, an average is more reliable when it comes from scores with low variability.
3. **More cases are better than fewer cases.** An eager prospective student visits two university campuses, each for a day. At the first, the student randomly attends two classes and discovers both instructors to be witty and engaging. At the next campus, the two sampled instructors seem dull and uninspiring. Returning home, the student (discounting the small sample size of only two teachers at each institution) tells friends about the “great teachers” at the first school, and the “bores” at the second. Again, we know it but we ignore it: *Averages based on many cases are more reliable* (less variable) than averages based on only a few cases.

The point to remember: Smart thinkers are not overly impressed by a few anecdotes. Generalizations based on a few unrepresentative cases are unreliable.

When Is an Observed Difference “Significant”?

Perhaps you’ve compared men’s and women’s scores on a laboratory test of aggression, and you’ve found a gender difference. But individuals differ. How likely is it that the difference you observed was just a fluke? Statistical testing can estimate the probability of the result occurring by chance.

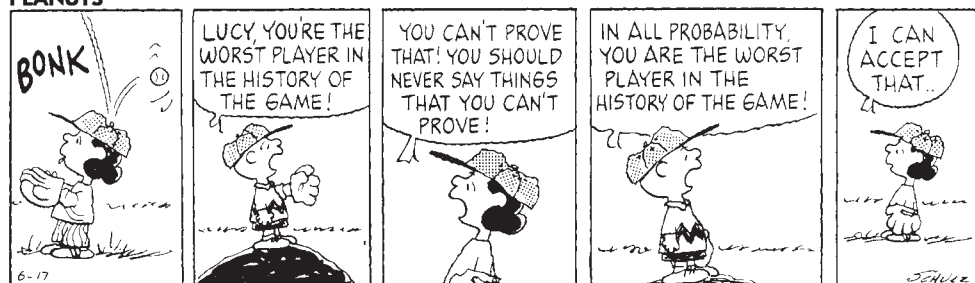
Here is the underlying logic: When averages from two samples are each reliable measures of their respective populations (as when each is based on many observations that have small variability), then their *difference* is likely to be reliable as well. (Example: The less the variability in women’s and in men’s aggression scores, the more confidence we would have that any observed gender difference is reliable.) And when the difference between the sample averages is *large*, we have even more confidence that the difference between them reflects a real difference in their populations.

In short, when sample averages are reliable, and when the difference between them is relatively large, we say the difference has **statistical significance**. This means that the observed difference is probably not due to chance variation between the samples.

In judging statistical significance, psychologists are conservative. They are like juries who must presume innocence until guilt is proven. For most psychologists, proof beyond a reasonable doubt means not making much of a finding unless the odds of its occurring by chance, if no real effect exists, are less than 5 percent.

When reading about research, you should remember that, given large enough or homogeneous enough samples, a difference between them may be “statistically significant” yet have little practical significance. For example, comparisons of intelligence test scores among hundreds of thousands of first-born and later-born individuals indicate a highly significant tendency for first-born individuals to have higher average scores than their later-born siblings (Kristensen & Bjerkedal, 2007; Zajonc & Markus, 1975). But because the scores differ by only one to three points, the difference has little practical importance.

PEANUTS



The point to remember: Statistical significance indicates the *likelihood* that a result will happen by chance. But this does not say anything about the *importance* of the result.

RETRIEVE IT

Can you solve this puzzle?

The registrar's office at the University of Michigan has found that usually about 100 students in Arts and Sciences have perfect marks at the end of their first term at the university. However, only about 10 to 15 students graduate with perfect marks. What do you think is the most likely explanation for the fact that there are more perfect marks after one term than at graduation (Jepson et al., 1983)?

ANSWER: Averages based on fewer courses are more variable, which guarantees a greater number of extremely low and high marks at the end of the first term.

APPENDIX REVIEW

Statistical Reasoning in Everyday Life

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the Appendix). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

Describing Data

A-1: How can we describe data with measures of central tendency and variation?

A-2: What does it mean when we say two things are correlated?

A-3: What is regression toward the mean?

Significant Differences

A-4: How do we know whether an observed difference can be generalized to other populations?

A-5: What are cross-sectional studies and longitudinal studies, and why is it important to know which method was used?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition before flipping back to the referenced page to check your answer.

mode, p. A-2

mean, p. A-2

median, p. A-2

range, p. A-3

standard deviation, p. A-3

normal curve, p. A-4

correlation coefficient, p. A-4

scatterplot, p. A-4

regression toward the mean, p. A-6

cross-sectional study, p. A-7

longitudinal study, p. A-7

statistical significance, p. A-8

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

- Which of the three measures of central tendency is most easily distorted by a few very large or very small scores?
 - The mode
 - The mean
 - The median
 - They are all equally vulnerable to distortion from atypical scores.
- The standard deviation is the most useful measure of variation in a set of data because it tells us
 - the difference between the highest and lowest scores in the set.
 - the extent to which the sample being used deviates from the bigger population it represents.
 - how much individual scores differ from the mode.
 - how much individual scores differ from the mean.
- Another name for a bell-shaped distribution, in which most scores fall near the middle and fewer scores fall at each extreme, is a _____.
- In a _____ correlation, the scores rise and fall together; in a(n) _____ correlation, one score falls as the other rises.
 - positive; negative
 - positive; illusory
 - negative; inverse
 - strong; weak
- If a study revealed that tall people were less intelligent than short people, this would suggest that the correlation between height and intelligence is _____ (positive/negative).
- A _____ provides a visual representation of the direction and the strength of a relationship between two variables.
- What is regression toward the mean, and how can it influence our interpretation of events?
- In _____-_____ studies, a characteristic is assessed across different age groups at the same time.
- When sample averages are _____ and the difference between them is _____, we can say the difference has statistical significance.
 - reliable; large
 - reliable; small
 - due to chance; large
 - due to chance; small

Find answers to these questions in Appendix E, in the back of the book.

Experience
more of the
**TESTING
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Psychology at Work



B-1: What is “flow,” and what are the three subfields of industrial-organizational psychology?

For most of us, work is life’s biggest single waking activity. To live is to work. Work helps satisfy several levels of need identified in Abraham Maslow’s (1970) hierarchy of needs (see Chapter 10). Work supports us. Work connects us. Work defines us. Meeting someone for the first time and wondering “Who are you?” we may ask, “So, what do you do?”

Individuals across various occupations vary in their attitudes toward their work. Some view their work as a *job*, an unfulfilling but necessary way to make money. Others view their work as a *career*, an opportunity to advance from one position to a better position. The rest—those who view their work as a *calling*, a fulfilling and socially useful activity—report the highest satisfaction with their work and with their lives (Wrzesniewski et al., 1997, 2001).

This finding would not surprise Mihaly Csikszentmihalyi [chick-SENT-me-hi] (1990, 1999). He has observed that people’s quality of life increases when they are purposefully engaged. Between the anxiety of being overwhelmed and stressed, and the apathy of being underwhelmed and bored, lies a zone in which people experience **flow**. Can you recall being in a zoned-out flow state while texting or playing a video game? If so, then perhaps you can sympathize with the two Northwest Airlines pilots who in 2009 were so focused on their laptops that they missed Earth-to-pilot messages from their control tower. The pilots flew 150 miles past their Minneapolis destination—and lost their jobs.

Csikszentmihalyi formulated the flow concept after studying artists who spent hour after hour painting or sculpting with enormous concentration. Immersed in a project, they worked as if nothing else mattered, and then, when finished, they promptly forgot about it. The artists seemed driven less by the external rewards of producing art—money, praise, promotion—than by the intrinsic rewards of creating the work.

Csikszentmihalyi’s later observations—of dancers, chess players, surgeons, writers, parents, mountain climbers, sailors, and farmers; of Australians, North Americans, Koreans, Japanese, and Italians; of people from their teens to their golden years—confirmed an overriding principle: It’s exhilarating to flow with

PERSONNEL PSYCHOLOGY

- Close-Up: I/O Psychology at Work
- Harnessing Strengths
- Close-Up: Discovering Your Strengths
- Appraising Performance

ORGANIZATIONAL PSYCHOLOGY

- Satisfaction and Engagement
- Close-Up: Doing Well While Doing Good—“The Great Experiment”
- Managing Well

THE HUMAN FACTOR

Sometimes, Gene Weingarten noted (2002), a humor writer knows “when to just get out of the way.” Here are some sample job titles from the U.S. Department of Labor *Dictionary of Occupational Titles*: animal impersonator, human projectile, banana ripening-room supervisor, impregnator, impregnator helper, dope sprayer, finger waver, rug scratcher, egg smeller, bottom buffer, cookie breaker, brain picker, hand pouncer, bosom presser, and mother repairer.

Have you ever noticed that when you are immersed in an activity, time flies? And that when you are watching the clock, it seems to move more slowly? French researchers confirmed that the more people attend to an event’s duration, the longer it seems to last (Couli et al., 2004).



Hill Street Studios/Matthew Palmer/Jupiterimages

Disrupted flow Internet-related distractions can disrupt flow. It takes time to refocus mental concentration after the distraction of an e-mail or a text.

flow a completely involved, focused state of consciousness, with diminished awareness of self and time, resulting from optimal engagement of one’s skills.

an activity that fully engages our skills. Flow experiences boost our sense of self-esteem, competence, and well-being. Idleness may sound like bliss, but purposeful work enriches our lives. Busy people are happier (Hsee et al., 2010; Robinson & Martin, 2008). One research team interrupted people on about a quarter-million occasions (using an iPhone application), and found people's minds wandering 47 percent of the time. They were, on average, happier when *not* mind-wandering (Killingsworth & Gilbert, 2010).

The modern workforce

The editorial team that supports the creation of this book and its teaching package works both in-house and from far-flung places. Clockwise from top left are Nancy Fleming in Massachusetts, Kevin Feyen in New York, Betty Probert and Don Probert in Florida, Christine Brune in Alaska, Trish Morgan in Alberta, Tracey Kuehn in New York, and Kathryn Brownson in Michigan.



In many nations, work has been changing, from farming to manufacturing to *knowledge work*. More and more work is outsourced to temporary employees and consultants or done by telecommuters communicating electronically from remote virtual workplaces. As work changes, will our attitudes toward our work also change? Will our satisfaction with work increase or decrease? Will the *psychological contract*—the sense of mutual obligations between workers and employers—become more or less trusting and secure? These are among the questions that fascinate psychologists who study work-related behavior.

Industrial-organizational (I/O) psychology applies psychology's principles to the workplace (see Close-Up: I/O Psychology at Work). Here we consider three of I/O psychology's subfields:

- **Personnel psychology** applies psychology's methods and principles to selecting and evaluating workers. Personnel psychologists match people with jobs, by identifying and placing well-suited candidates.
- **Organizational psychology** considers how work environments and management styles influence worker motivation, satisfaction, and productivity. Organizational psychologists modify jobs and supervision in ways that boost morale and productivity.

CLOSE UP:

I/O Psychology at Work

As scientists, consultants, and management professionals, industrial-organizational (I/O) psychologists are found working in varied areas:

Personnel Psychology

Selecting and placing employees

- Developing and validating assessment tools for selecting, placing, and promoting workers
- Analyzing job content
- Optimizing worker placement

Training and developing employees

- Identifying needs

- Designing training programs
- Evaluating training programs

Appraising performance

- Developing criteria
- Measuring individual performance
- Measuring organizational performance

Organizational Psychology

Developing organizations

- Analyzing organizational structures
- Maximizing worker satisfaction and productivity
- Facilitating organizational change

Enhancing quality of work life

- Expanding individual productivity
- Identifying elements of satisfaction
- Redesigning jobs

Human Factors (Engineering) Psychology

- Designing optimum work environments
- Optimizing person-machine interactions
- Developing systems technologies

Source: Adapted from the Society of Industrial and Organizational Psychology (www.siop.org).

- **Human factors psychology** explores how machines and environments can be optimally designed to fit human abilities. Human factors psychologists study people's natural perceptions and inclinations to create user-friendly machines and work settings.

RETRIEVE IT

- What is the value of finding flow in our work?

ANSWER: We become more likely to view our work as fulfilling and socially useful.

Personnel Psychology



B-2: How do personnel psychologists help organizations with employee selection, work placement, and performance appraisal?

Psychologists can assist organizations at various stages of selecting and assessing employees. They may help identify needed job skills, decide upon selection methods, recruit and evaluate applicants, introduce and train new employees, and appraise their performance.

Harnessing Strengths

As a new AT&T human resources executive, psychologist Mary Tenopyr (1997) was assigned to solve a problem: Customer-service representatives were failing at a high rate. After concluding that many of the hires were ill-matched to the demands of their new job, Tenopyr developed a new selection instrument:

1. She asked new applicants to respond to various test questions (without as yet making any use of their responses).
2. She followed up later to assess which applicants excelled on the job.
3. She identified the earlier test questions that best predicted success.

The happy result of her data-driven work was a new test that enabled AT&T to identify likely-to-succeed customer-service representatives. Personnel selection techniques such as this one aim to match people's strengths with work that enables them and their organization to flourish. Marry the strengths of people with the tasks of organizations and the result is often prosperity and profit.

Your strengths are any enduring qualities that can be productively applied. Are you naturally curious? Persuasive? Charming? Persistent? Competitive? Analytical? Empathic? Organized? Articulate? Neat? Mechanical? Any such trait, if matched with suitable work, can function as a strength (Buckingham, 2007). (See Close-Up: Discovering Your Strengths.)

Gallup researchers Marcus Buckingham and Donald Clifton (2001) have argued that the first step to a stronger organization is instituting a *strengths-based selection system*. Thus, as a manager, you would first identify a group of the most effective people in any role—the ones you would want to hire more of—and compare their strengths with those of a group of the least effective people in that role. In defining these groups, you would try to measure performance as objectively as possible. In one Gallup study of more than 5000 telecommunications customer-service representatives, those evaluated most favorably by their managers were strong in “harmony” and “responsibility,” while those actually rated most effective by customers were strong in energy, assertiveness, and eagerness to learn.

An example: If you needed to hire new people in software development, and you had discovered that your best software developers are analytical, disciplined,

industrial-organizational (I/O) psychology the application of psychological concepts and methods to optimizing human behavior in workplaces.

personnel psychology an I/O psychology subfield that focuses on employee recruitment, selection, placement, training, appraisal, and development.

organizational psychology an I/O psychology subfield that examines organizational influences on worker satisfaction and productivity and facilitates organizational change.

human factors psychology an I/O psychology subfield that explores how people and machines interact and how machines and physical environments can be made safe and easy to use.

Artistic strengths At age 21, Henri Matisse was a sickly and often depressed lawyer's clerk. When his mother gave him a box of paints to cheer him up one day, he felt the darkness lift and his energy surge. He began to fill his days with painting and drawing and went on to art school and a life as one of the world's great painters. For Matisse, doing art felt like “a comfortable armchair.” That is how exercising our strengths often feels.



CLOSE UP:

Discovering Your Strengths

You can use some of the techniques personnel psychologists have developed to identify your own strengths and pinpoint types of work that will likely prove satisfying and successful. Buckingham and Clifton (2001) have suggested asking yourself these questions:

- What activities give me pleasure? (Bringing order out of chaos? Playing host? Helping others? Challenging sloppy thinking?)
- What activities leave me wondering, “When can I do this again?” (Rather than, “When will this be over?”)

- What sorts of challenges do I relish? (And which do I dread?)
- What sorts of tasks do I learn easily? (And which do I struggle with?)

Some people find themselves in flow—their skills engaged and time flying—when teaching or selling or writing or cleaning or consoling or creating or repairing. If an activity feels good, if it comes easily, if you look forward to it, then look deeper and see your strengths at work.

Satisfied and successful people devote far less time to correcting their deficiencies than to accentuating their strengths. Top performers

are “rarely well rounded,” Buckingham and Clifton found (p. 26). Instead, they have sharpened their existing skills. Given the persistence of our traits and temperaments, we should focus not on our deficiencies, but rather on identifying and employing our talents. There may be limits to the benefits of assertiveness training if you are extremely shy, of public speaking courses if you tend to be nervous and soft spoken, or of drawing classes if you express your artistic side in stick figures.

Identifying your talents can help you recognize the activities you learn quickly and find absorbing. Knowing your strengths, you can develop them further.

and eager to learn, you would focus employment ads less on experience than on the identified strengths. Thus “Do you take a logical and systematic approach to problem solving [*analytical*]? Are you a perfectionist who strives for timely completion of your projects [*disciplined*]? Do you want to master Python, Java, and C# [*eager to learn*]? If you can say *yes* to these questions, then please call . . .”

Identifying people’s strengths and matching those strengths to work is a first step toward workplace effectiveness. To assess applicants’ strengths and decide who is best suited to the job, personnel managers use various tools (Sackett & Lievens, 2008), including ability tests (see Chapter 9), personality tests (Chapter 12), and behavioral observations in “assessment centers” that simulate job tasks (Chapter 12). Here we focus on job interviews.

Do Interviews Predict Performance?

Interviewers tend to feel confident in their ability to predict long-term job performance from a traditional, get-acquainted interview. What’s therefore shocking is how error prone interviewers’ predictions are, whether of future job success or graduate school success. From their review of 85 years of personnel-selection research, I/O psychologists Frank Schmidt and John Hunter (1998; Schmidt, 2002) determined that for all but less-skilled jobs, general mental ability best predicts on-the-job performance. Subjective overall evaluations from informal interviews are more useful than handwriting analysis (which is worthless). But informal interviews are less informative than aptitude tests, work samples, job knowledge tests, and past job performance. If there’s a contest between what our gut tells us about someone and what test scores, work samples, and past performance tell us, we should distrust our gut.

Unstructured Interviews and the Interviewer Illusion

Traditional *unstructured interviews* can provide a sense of someone’s personality—their expressiveness, warmth, and verbal ability, for example. But these informal interviews also give interviewees considerable power to control the impression they are making in the interview situation (Barrick et al., 2009). Why, then, do many interviewers have such faith in their ability to discern interviewees’ fitness for a job? “I have excellent interviewing skills, so I don’t need reference checking as much as

“Interviews are a terrible predictor of performance.”

Laszlo Bock, *Google’s Vice President, People Operations, 2007*

someone who doesn't have my ability to read people," is a comment too often heard by I/O consultants. This tendency to overrate their ability to predict people's futures has been labeled the *interviewer illusion* (Nisbett, 1987). Four factors explain the gap between interviewers' overconfidence and the resulting reality:

- *Interviewers presume that people are what they seem to be in the interview situation.* An unstructured interview may create a false impression of a person's behavior toward others in different situations. As Chapter 13 explained, when meeting others, we discount the enormous influence of varying situations and mistakenly presume that what we see is what we will get. But mountains of research on everything from chattiness to conscientiousness reveal that how we behave reflects not only our enduring traits but also the details of the particular situation (such as wanting to impress in a job interview).
- *Interviewers' preconceptions and moods color how they perceive interviewees' responses* (Cable & Gilovich, 1998; Macan & Dipboye, 1994). If interviewers instantly like a person who perhaps is similar to themselves, they may interpret the person's assertiveness as indicating "confidence" rather than "arrogance." If told certain applicants have been prescreened, interviewers are disposed to judge them more favorably.
- *Interviewers more often follow the successful careers of those they have hired than the successful careers of those they have rejected and lost track of.* This missing feedback prevents interviewers from getting a reality check on their hiring ability.
- *Interviews disclose the interviewee's good intentions, which are less revealing than habitual behaviors* (Ouellette & Wood, 1998). Intentions matter. People can change. But the best predictor of the person we will be is the person we have been. Compared with work-avoiding university students, those who engage in their tasks are more likely, a decade and more later, to be engaged workers (Salmela-Aro et al., 2009). Educational attainments predict job performance partly because people who have shown up for school each day and done their tasks also tend to show up for work and do their tasks (Ng & Feldman, 2009). Wherever we go, we take ourselves along.

Hoping to improve prediction and selection, personnel psychologists have put people in simulated work situations, scoured sources for information on past performance, aggregated evaluations from multiple interviews, administered tests, and developed job-specific interviews.

Structured Interviews

Unlike casual conversation aimed at getting a feel for someone, **structured interviews** offer a disciplined method of collecting information. A personnel psychologist may analyze a job, script questions, and train interviewers. The interviewers then put the same questions, in the same order, to all applicants, and rate each applicant on established scales.

In an unstructured interview, someone might ask, "How organized are you?" "How well do you get along with people?" or "How do you handle stress?" Street-smart applicants know how to score high: "Although I sometimes drive myself too hard, I handle stress by prioritizing and delegating, and by making sure I leave time for sleep and exercise."

By contrast, structured interviews pinpoint strengths (attitudes, behaviors, knowledge, and skills) that distinguish high performers in a particular line of work. The process includes outlining job-specific situations and asking candidates to explain how they would handle them, and how they handled similar situations in their prior employment: "Tell me about a time when you were caught between conflicting demands, without time to accomplish both. How did you handle that?"

To reduce memory distortions and bias, the interviewer takes notes and makes ratings as the interview proceeds and avoids irrelevant and follow-up questions.

"Between the idea and reality . . . falls the shadow."

T. S. Eliot, The Hollow Men, 1925

structured interview interview process that asks the same job-relevant questions of all applicants, each of whom is rated on established scales.

The structured interview therefore feels less warm, but that can be explained to the applicant: “This conversation won’t typify how we relate to each other in this organization.”

A review of 150 findings revealed that structured interviews had double the predictive accuracy of unstructured seat-of-the-pants interviews (Schmidt & Hunter, 1998; Wiesner & Cronshaw, 1988). Structured interviews also reduce bias, such as against overweight applicants (Kutcher & Bragger, 2004). Thanks partly to its greater reliability and partly to its job-analysis focus, the predictive power of one structured interview is roughly equal to that of the average judgment from three or four unstructured interviews (Huffcutt et al., 2001; Schmidt & Zimmerman, 2004).

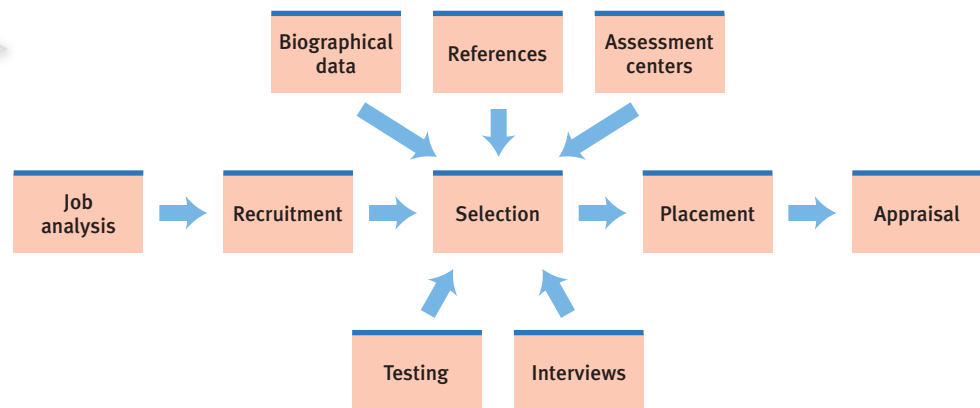
If, instead, we let our intuitions bias the hiring process, Malcolm Gladwell noted (2000, p. 86), then “all we will have done is replace the old-boy network, where you hired your nephew, with the new-boy network, where you hire whoever impressed you most when you shook his hand. Social progress, unless we’re careful, can merely be the means by which we replace the obviously arbitrary with the not so obviously arbitrary.”

To recap, personnel psychologists assist organizations in analyzing jobs, recruiting well-suited applicants, selecting and placing employees, and appraising employees’ performance (**FIGURE B.1**)—the topic we turn to next.

FIGURE B.1

Personnel psychologists’ tasks

Personnel psychologists consult in human resources activities, from job definition to employee appraisal.



Appraising Performance

Performance appraisal serves organizational purposes: It helps decide who to retain, how to appropriately reward and pay people, and how to better harness employee strengths, sometimes with job shifts or promotions. Performance appraisal also serves individual purposes: Feedback affirms workers’ strengths and helps motivate needed improvements.

Performance appraisal methods include

- *checklists* on which supervisors simply check specific behaviors that describe the worker (“always attends to customers’ needs,” “takes long breaks”).
- *graphic rating scales* on which a supervisor checks, perhaps on a five-point scale, how often a worker is dependable, productive, and so forth.
- *behavior rating scales* on which a supervisor checks scaled behaviors that describe a worker’s performance. If rating the extent to which a worker “follows procedures,” the supervisor might mark the employee somewhere between “often takes shortcuts” and “always follows established procedures” (Levy, 2003).

In some organizations, performance feedback comes not only from supervisors but also from all organizational levels. If you join an organization that practices *360-degree*

feedback (FIGURE B.2), you will rate yourself, your manager, and your other colleagues. And you will be rated by your manager, other colleagues, and customers (Green, 2002). The net result is often more open communication and more complete appraisal.

Performance appraisal, like other social judgments, is vulnerable to bias (Murphy & Cleveland, 1995). *Halo errors* occur when one's overall evaluation of an employee, or of a personal trait such as their friendliness, biases ratings of their specific work-related behaviors, such as their reliability. *Leniency* and *severity errors* reflect evaluators' tendencies to be either too easy or too harsh on everyone. *Recency errors* occur when raters focus only on easily remembered recent behavior. By using multiple raters and developing objective, job-relevant performance measures, personnel psychologists seek to support their organizations while also helping employees perceive the appraisal process as fair.

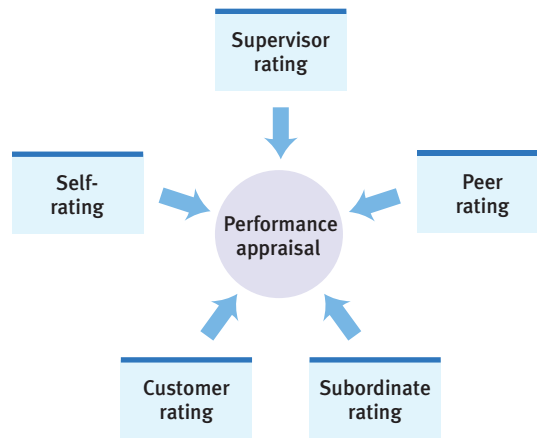


FIGURE B.2

360-degree feedback With multisource 360-degree feedback, our knowledge, skills, and behaviors are rated by ourselves and surrounding others. Professors, for example, may be rated by their department chairs, their students, and their colleagues. After receiving all these ratings, professors discuss the 360-degree feedback with their department chair.

RETRIEVE IT

- A human resources director explains to you that “I don’t bother with tests or references. It’s all about the interview.” Based on I/O research, what concerns does this raise?

ANSWER: (1) Interviewers may presume people are what they seem to be in interviews. (2) Interviewers’ preconceptions and moods color how they perceive interviewees’ responses. (3) Interviewers tend to track the successful careers of those they hire, not the successful careers of those they reject. (4) Interviewers tend to disclose prospective workers’ good intentions, not their habitual behaviors.

Organizational Psychology



B-3: What is the role of organizational psychologists?

The appraisal of work and the matching of talents to work matter, but so does overall motivation. Organizational psychologists assist with efforts to motivate employees and keep them engaged.

Satisfaction and Engagement

Partly because work is such a big part of life, I/O psychologists study employee satisfaction. Satisfaction with work feeds satisfaction with life (Bowling et al., 2010; and see Close-Up: Doing Well While Doing Good on the next page). Moreover, as we saw in Chapter 11, decreased job stress feeds improved health.

Satisfied employees also contribute to successful organizations. Positive moods at work enhance creativity, persistence, and helpfulness (Brief & Weiss, 2002; Kaplan et al., 2009). Are engaged, happy workers also less often absent? Less likely to quit? Less prone to theft? More punctual? More productive? Conclusive evidence of satisfaction’s benefits is, some have said, the Holy Grail of I/O psychology. Statistical digests of prior research have found a modest positive correlation between individual job satisfaction and performance (Judge et al., 2001; Ng et al., 2009; Parker et al., 2003). In one analysis of 4500 employees at 42 British manufacturing companies, the most productive workers tended to be those in satisfying work environments

“The only place success comes before work is in the dictionary.”

Former Green Bay Packers football coach Vince Lombardi

CLOSE UP:

Doing Well While Doing Good—“The Great Experiment”

At the end of the 1700s, the New Lanark, Scotland, cotton mill had more than 1000 workers. Many were children drawn from Glasgow’s poorhouses. They worked 13-hour days and lived in grim conditions. Their education and sanitation were neglected. Theft and drunkenness were commonplace. Most families occupied just one room.

On a visit to Glasgow, Welsh-born Robert Owen—an idealistic young cotton-mill manager—chanced to meet and fall in love with the mill owner’s daughter. After their marriage, Owen, with several partners, purchased the mill and on the first day of the 1800s took control as its manager. Before long, he began what he said was “the most important experiment for the happiness of the human race that had yet been instituted at any time in any part of the world” (Owen, 1814). The exploitation of child and adult labor was, he observed, producing unhappy and inefficient workers. Believing that better working and living conditions could pay economic dividends, he undertook numerous innovations: a nursery for preschool children, education for older children (with encouragement rather than corporal punishment), Sundays off, health care, paid sick days, unemployment pay for days when the mill could not

operate, and a company store selling goods at reduced prices.

Owen also innovated a goals- and worker-assessment program that included detailed records of daily productivity and costs. By each employee’s workstation, one of four colored boards indicated that person’s performance for the previous day. Owen could walk through the mill and at a glance see how individuals were performing. There was, he said, “no beating, no abusive language. . . . I merely looked at the person and then at the [color]. . . . I could at once see by the expression [which color] was shown.”

The commercial success that followed was essential to sustaining what became a movement toward humanitarian reforms. By 1816, with decades of profitability still ahead, Owen believed he had demonstrated “that society may be formed so as to exist without crime, without poverty, with health greatly improved, with little if any misery, and with intelligence and



Courtesy of New Lanark World Heritage Site

The great experiment New Lanark Mills, which today is preserved as a World Heritage Site (www.newlanark.org), provided an influential demonstration of how industries could do well while doing good. In its heyday, New Lanark was visited by many European royals and reformers who came to observe its vibrant workforce and prosperous business.

happiness increased a hundredfold.” Although his Utopian vision has not been fulfilled, Owen’s great experiment did lay the groundwork for employment practices that have today become accepted in much of the world.

(Patterson et al., 2004). But does satisfaction *produce* better job performance? The debate continues.

Nevertheless, some organizations do have a knack for cultivating more engaged and productive employees. In the United States, the *Fortune* “100 Best Companies to Work For” have also produced markedly higher-than-average returns for their investors (Fulmer et al., 2003). Other positive data come from the biggest-ever I/O

study, an analysis of Gallup data from more than 198,000 employees (**TABLE B.1**) in nearly 8000 business units of 36 large companies (including some 1100 bank branches, 1200 stores, and 4200 teams or departments). James Harter, Frank Schmidt, and Theodore Hayes (2002) explored correlations between various measures of organizational success and *employee engagement*—the extent of workers’ involvement, enthusiasm, and identification with their organizations (**TABLE B.2**). They found that engaged workers (compared with disengaged workers who were just putting in

An engaged employee Mohamed Mamow, left, was joined by his employer in saying the Pledge of Allegiance as he became a U.S. citizen. Mamow and his wife met in a Somali refugee camp and now are parents of five children, whom he supports by working as a machine operator. Mindful of his responsibility—“I don’t like to lose my job. I have a responsibility for my children and my family”—he arrives for work a half hour early and tends to every detail on his shift. “He is an extremely hard-working employee,” noted his employer, and “a reminder to all of us that we are really blessed” (Roelofs, 2010).



Darren Breen, Grand Rapids Press, 9/22/2010

Table B.1

The Gallup Workplace Audit

Overall satisfaction—On a 5-point scale, where 5 is extremely satisfied and 1 is extremely dissatisfied, how satisfied are you with (*name of company*) as a place to work? _____ On a scale of 1 to 5, where 1 is strongly disagree and 5 is strongly agree, please indicate your agreement with the following items.

1. I know what is expected from me at work.
2. I have the materials and equipment I need to do my work right.
3. At work, I have the opportunity to do what I do best every day.
4. In the last seven days, I have received recognition or praise for doing good work.
5. My supervisor, or someone at work, seems to care about me as a person.
6. There is someone at work who encourages my development.
7. At work, my opinions seem to count.
8. The mission/purpose of my company makes me feel my job is important.
9. My associates (fellow employees) are committed to doing quality work.
10. I have a best friend at work.
11. In the last six months, someone at work has talked to me about my progress.
12. This last year, I have had opportunities at work to learn and grow.

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time) knew what was expected of them, had what they needed to do their work, felt fulfilled in their work, had regular opportunities to do what they did best, perceived that they were part of something significant, and had opportunities to learn and develop. They also found that business units with engaged employees had more loyal customers, lower turnover rates, higher productivity, and greater profits.

But what causal arrows explain this correlation between business success and employee morale and engagement? Does success boost morale, or does high morale boost success? In a follow-up longitudinal study of 142,000 workers, Harter and his colleagues (2010) found that, over time, employee attitudes predicted future business success (more than the other way around). Another analysis compared companies with top-quartile versus below-average employee engagement levels. Over a three-year period, earnings grew 2.6 times faster for the companies with highly engaged workers (Ott, 2007).

Managing Well



B-4: What are some effective leadership techniques?

Every leader dreams of managing in ways that enhance people's satisfaction, engagement, and productivity and their organization's success. Effective leaders harness job-relevant strengths, set goals, and choose an appropriate leadership style.

Harnessing Job-Relevant Strengths

"The major challenge for CEOs over the next 20 years will be the effective deployment of human assets," observed Marcus Buckingham (2001). That challenge is "about psychology. It's about getting [individuals] to be more productive, more

Table B.2
Three Types of Employees

Engaged: working with passion and feeling a profound connection to their company or organization.

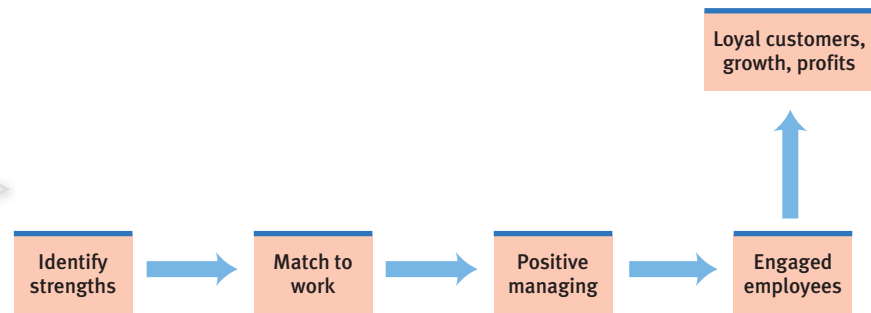
Not engaged: putting in the time but investing little passion or energy into their work.

Actively disengaged: unhappy workers undermining what their colleagues accomplish.

(Source: Adapted from Gallup via Crabtree, 2005.)

FIGURE B.3

On the right path The Gallup Organization offers this path to organizational success. (Adapted from Fleming, 2001.)



Positive coaching Larry Brown has been an adviser to the youth sports organization The Positive Coaching Alliance. He was observed during practices offering his players 4 to 5 positive comments for every negative comment (Insana, 2005). In 2004, he coached his underdog Detroit Pistons to the National Basketball Association championship.



Kirthmon F. Dozier/KRT/Newscom

focused, more fulfilled than [they were] yesterday.” The first step, he and others have maintained, is selecting the right people, followed by discerning employees’ natural talents, adjusting work roles to suit those talents, and developing talents into great strengths (**FIGURE B.3**). Consider the faculty at a given college or university. Should everyone be expected to teach the same course load, advise the same number of students, serve on the same number of committees, and engage in the same amount of research? Or should each job description be tailored to harness a specific person’s unique strengths?

Given that our temperament and our traits tend to follow us throughout our lives, managers would be wise to spend less time trying to instill talents that are not there and more time developing and drawing out those that are there (Tucker, 2002). Managers who excel

- start by helping people identify and measure their talents.
- match tasks to talents and then give people freedom to do what they do best.
- care how their people feel about their work.
- reinforce positive behaviors through recognition and reward.

Thus, rather than focusing on weaknesses and packing people off to training seminars to fix those problems, effective managers focus training time on educating people about their strengths and building upon them (which means not promoting people into roles ill-suited to their strengths). In Gallup surveys, 77 percent of engaged workers, and only 23 percent of not-engaged workers, strongly agreed that “my supervisor focuses on my strengths or positive characteristics” (Krueger & Killham, 2005).

Celebrating engaged and productive employees in every organizational role builds upon a basic principle of operant conditioning (Chapter 7): To teach a behavior, catch a person doing something right and reinforce it. It sounds simple, but many managers are like parents who, when a child brings home near-perfect scores, focus on the one low score in a troublesome biology class and ignore the rest. “Sixty-five percent of Americans received NO praise or recognition in the workplace last year,” reported the Gallup Organization (2004).

Setting Specific, Challenging Goals

In everyday life, our achievement goals sometimes involve approaching high levels of mastery or performance (such as mastering the material for this class and getting a high grade) and sometimes involve avoiding failure (Elliot & McGregor, 2001). In many situations, specific, challenging goals motivate achievement, especially when combined with progress reports (Johnson et al., 2006; Latham & Locke, 2007). Specific, measurable objectives, such as “finish gathering the history paper information by Friday,” serve to direct attention, promote effort, motivate persistence, and stimulate creative strategies.

When people state goals together with *subgoals* and *implementation intentions*—action plans that specify when, where, and how they will march toward achieving those

goals—they become more focused in their work, and on-time completion becomes more likely (Burgess et al., 2004; Fishbach et al., 2006; Koestner et al., 2002). Through a task's ups and downs, people best sustain their mood and motivation when they focus on immediate goals (such as daily study) rather than distant goals (such as a course grade). Better to have one's nose to the grindstone than one's eye on the ultimate prize (Houser-Marko & Sheldon, 2008). Thus, before beginning each new edition of this book, my editor, my associates, and I *manage by objectives*—we agree on target dates for the completion and editing of each chapter draft. If we focus on achieving each of these short-term goals, the prize—an on-time book—takes care of itself. So, to motivate high productivity, effective leaders work with people to define explicit goals, subgoals, and implementation plans, and then they provide feedback on progress.

Choosing an Appropriate Leadership Style

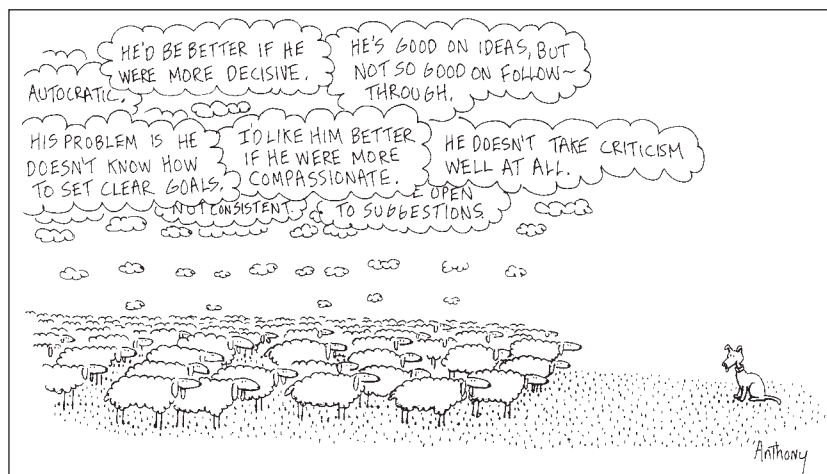
Leadership varies from a boss-focused directive style to an empowered-worker democratic style in which people cooperate in setting goals and developing strategies. Which works best may depend on the situation and the leader. The best leadership style for leading a discussion may not be the best style for leading troops on a charge (Fiedler, 1981). Moreover, different leaders are suited to different styles. Some excel at **task leadership**—setting standards, organizing work, and focusing attention on goals. Being goal-oriented, task leaders are good at keeping a group centered on its mission. Typically, they have a directive style, which can work well if the leader is bright enough to give good orders (Fiedler, 1987).

Other managers excel at **social leadership**—explaining decisions, mediating conflicts, and building high-achieving teams (Evans & Dion, 1991). Social leaders often have a democratic style: They delegate authority and welcome the participation of team members. Many experiments have demonstrated that social leadership is good for morale. Subordinates usually felt more satisfied and motivated, and performed better, when they participated in decision making (Cawley et al., 1998; Pereira & Osburn, 2007). Moreover, when members are sensitive to one another and participate equally, groups solve problems with greater “collective intelligence” (Woolley et al., 2010).

Because effective leadership styles vary with the situation and the person, the once-popular *great person theory of leadership*—that all great leaders share certain traits—now seems overstated (Vroom & Jago, 2007; Wielkiewicz & Stelzner, 2005). The same coach may seem great or inferior depending on the strength of the team and its competition. But a leader's personality does matter (Zaccaro, 2007). Effective leaders tend to be neither extremely assertive (impairing social relationships) or unassertive (limiting task leadership) (Ames, 2008). Effective leaders of laboratory

task leadership goal-oriented leadership that sets standards, organizes work, and focuses attention on goals.

social leadership group-oriented leadership that builds teamwork, mediates conflict, and offers support.



© The New Yorker Collection, 1988, Anthony Taber from cartoonbank.com. All Rights Reserved.

“Good leaders don’t ask more than their constituents can give, but they often ask—and get—more than their constituents intended to give or thought it was possible to give.”

John W. Gardner, Excellence, 1984

groups, work teams, and large corporations have also been found to exude a *charisma* that blends a goal-based vision, clear communication, and optimism that inspires others to follow (House & Singh, 1987; Shamir et al., 1993).

In one study of 50 Dutch companies, the firms with highest morale had chief executives who most inspired their colleagues “to transcend their own self-interests for the sake of the collective” (de Hoogh et al., 2004). *Transformational leadership* of this kind motivates others to identify with and commit themselves to the group’s mission. Transformational leaders, many of whom are natural extraverts, articulate high standards, inspire people to share their vision, and offer personal attention (Bono & Judge, 2004). The frequent result is more engaged, trusting, and effective workers (Turner et al., 2002). As leaders, women more than men tend to exhibit transformational leadership qualities. Alice Eagly (2007) believes this helps explain why companies with female top managers have recently tended to enjoy superior financial results, even after controlling for such variables as company size.

Data compiled from studies in India, Taiwan, and Iran indicate that effective managers—whether in coal mines, banks, or government offices—often exhibit a high degree of *both* task and social leadership (Smith & Tayeb, 1989). As achievement-minded people, effective managers certainly care about how well work is done, yet at the same time they are sensitive to their subordinates’ needs. In one national survey of American workers, those in family-friendly organizations offering flexible-time hours reported feeling greater loyalty to their employers (Roehling et al., 2001). A work environment that satisfies one’s need to belong also energizes employees. Employees who enjoy high-quality colleague relationships also engage their work with more vigor (Carmeli et al., 2009). Gallup researchers have asked more than 15 million employees worldwide if they have a “best friend at work.” The 30 percent who do “are *seven times* as likely to be engaged in their jobs” as those who don’t, report Tom Rath and James Harter (2010). And, as we noted earlier, positive, engaged employees are a mark of thriving organizations.

Increased employee participation in decision making is part of a management style that has spread from Sweden and Japan to many other locations (Naylor, 1990; Sundstrom et al., 1990). Although managers often think better of work they have directly supervised, studies reveal a *voice effect*: Given a chance to voice their opinion during a decision-making process, people have responded more positively to the decision (van den Bos & Spruijt, 2002). They also feel more empowered and are likely, therefore, to be more creative (Hennessey & Amabile, 2010; Huang et al., 2010).

The ultimate in employee participation is the employee-owned company. One such company in my town, the Fleetwood Group, is a 165-employee manufacturer of educational furniture and wireless electronic clickers. When its founder gave 45 percent of the company to his employees, who later bought out other family stockholders, Fleetwood became one of America’s first companies with an employee stock ownership plan (ESOP). Today, every employee owns part of the company, and as a group they own 100 percent. The more years employees work, the more they own, yet no one owns more than 5 percent. Like every corporate president, Doug Ruch works for his stockholders, who also just happen to be his employees.

As a company that endorses faith-inspired “servant leadership” and “respect and care for each team member-owner,” Fleetwood is free to place people above profits. Thus, when orders lagged during the recent recession, the employee-owners decided that job security meant more to them than profits. So the company paid otherwise idle workers to do community service—answering phones at nonprofit agencies, building Habitat for Humanity houses, and the like.

Fleetwood employees “act like they own the place”; Ruch contends that employee ownership attracts and retains talented people, “drives dedication,” and gives Fleetwood “a sustainable competitive advantage.” With stock growth averaging 17 percent a year, Fleetwood was named the 2006 National ESOP of the year.

★ ★ ★

We have considered *personnel psychology* (the I/O subfield that focuses on employee selection, placement, appraisal, and development). And we have considered *organizational psychology* (the I/O subfield that focuses on worker satisfaction and productivity, and on organizational change). Finally, we turn to *human factors psychology*, which explores the human-machine interface.

RETRIEVE IT

- What characteristics are important for transformational leaders?

ANSWER: Transformational leaders are able to inspire others to share a vision and commit themselves to a group's mission. They tend to be naturally extraverted and set high standards.

The Human Factor



B-5: How do human factors psychologists work to create user-friendly machines and work settings?

Designs sometimes neglect the human factor. Psychologist Donald Norman, an MIT alumnus with a Ph.D., bemoaned the complexity of assembling his new HDTV, related components, and seven remotes into a usable home theater system: “I was VP of Advanced Technology at Apple. I can program dozens of computers in dozens of languages. I understand television, really, I do. . . . It doesn't matter: I am overwhelmed.”

How much easier life might be if engineers would routinely test their designs and instructions on real people. *Human factors psychologists* work with designers and engineers to tailor appliances, machines, and work settings to our natural perceptions and inclinations. Bank ATM machines are internally more complex than remote controls ever were, yet, thanks to human factors engineering, ATMs are easier to operate. Digital recorders have solved the TV recording problem with a simple select-and-click menu system (“record that one”). Apple has similarly engineered easy usability with the iPhone and iPad.

Norman (2001) hosts a website (www.jnd.org) that illustrates good designs that fit people (see **FIGURE B.4**). Human factors psychologists also help design efficient environments. An ideal kitchen layout, researchers have found, puts needed items close to their usage point and near eye level. It locates work areas to enable doing tasks in order, such as placing the refrigerator, stove, and sink in a triangle.



The Ride On Carry On foldable chair attachment, “designed by a flight attendant mom,” enables a small suitcase to double as a stroller.

Courtesy www.rideoncarryon.com



The Oxo measuring cup allows the user to see the quantity from above.

Courtesy OXO Good Grips



The Chatsford Teapot comes with a built-in strainer.

Courtesy The London Teapot Company Ltd.

FIGURE B.4

Designing products that fit people
Human factors psychologist Donald Norman offers these and other examples of effectively designed products.

It creates counters that enable hands to work at or slightly below elbow height (Boehm–Davis, 2005).

Understanding human factors can help prevent accidents. By studying the human factor in driving accidents, psychologists seek to devise ways to reduce the distractions, fatigue, and inattention that contribute to 1.3 million annual worldwide traffic fatalities (Lee, 2008). Two-thirds of commercial air accidents have been caused by human error (Nickerson, 1998). After beginning commercial flights in the 1960s, the Boeing 727 was involved in several landing accidents caused by pilot error. Psychologist Conrad Kraft (1978) noted a common setting for these accidents: All took place at night, and all involved landing short of the runway after crossing a dark stretch of water or unilluminated ground. Kraft reasoned that, on rising terrain, city lights beyond the runway would project a larger retinal image, making the ground seem farther away than it was. By re-creating these conditions in flight simulations, Kraft discovered that pilots were deceived into thinking they were flying higher than their actual altitudes (**FIGURE B.5**). Aided by Kraft's finding, the airlines began requiring the co-pilot to monitor the altimeter—calling out altitudes during the descent—and the accidents diminished.

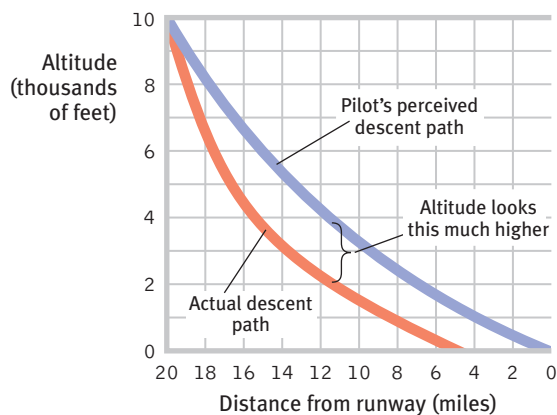


FIGURE B.5

The human factor in accidents

Lacking distance cues when approaching a runway from over a dark surface, pilots simulating a night landing tended to fly too low. (From Kraft, 1978.)

Later Boeing psychologists worked on other human factors problems (Murray, 1998): How should airlines best train and manage mechanics to reduce the maintenance errors that underlie about 50 percent of flight delays and 15 percent of accidents? What illumination and typeface would make on-screen flight data easiest to read? How could warning messages be most effectively worded—as an action statement (“Pull Up”) rather than a problem statement (“Ground Proximity”)?

Consider, finally, the available *assistive listening* technologies for people with hearing loss in various theaters, auditoriums, and places of worship. One technology, commonly available in the United States, requires a headset attached to a pocket-sized receiver that detects infrared or FM signals from the room's sound system. The well-meaning people who design, purchase, and install these systems correctly understand that the technology puts sound directly into the user's ears. Alas, few people with hearing loss undergo the hassle and embarrassment of locating, requesting, wearing, and returning a conspicuous headset. Most such units therefore sit in closets. Britain, the Scandinavian countries, Australia, and now parts of the United States, have instead installed *loop systems* (see www.hearingloop.org) that broadcast customized sound directly through a person's own hearing aid. When suitably equipped, a hearing aid can be transformed by a discrete touch of a switch into an in-the-ear loudspeaker. Offered convenient, inconspicuous, personalized sound, many more people elect to use assistive listening.

The human factor in safe landings

Advanced cockpit design and rehearsed emergency procedures aided pilot Chesley “Sully” Sullenberger, a U.S. Air Force Academy graduate who studied psychology and human factors. In January 2009, Sullenberger's instantaneous decisions safely guided his disabled airplane onto New York City's Hudson River, where all 155 of the passengers and crew were safely evacuated.



Designs that enable safe, easy, and effective interactions between people and technology often seem obvious after the fact. Why, then, aren't they more common? Technology developers sometimes mistakenly assume that others share their expertise—that what's clear to them will similarly be clear to others (Camerer et al., 1989; Nickerson, 1999). When people rap their knuckles on a table to convey a familiar tune (try this with a friend), they often expect their listener to recognize it. But for the listener, this is a near-impossible task (Newton, 1991). When you know a thing, it's hard to mentally simulate what it's like not to know, and that is called the *curse of knowledge*.

The point to remember: Everyone benefits when designers and engineers tailor machines and environments to fit human abilities and behaviors, when they user-test their inventions before production and distribution, and when they remain mindful of the curse of knowledge.

RETRIEVE IT

- What are the three main divisions within industrial-organizational psychology?

ANSWER: personnel, organizational, human factors

APPENDIX REVIEW

Psychology at Work

LEARNING OBJECTIVES

Test Yourself by taking a moment to answer each of these Learning Objective Questions (repeated here from within the Appendix). Then turn to Appendix D, Complete Chapter Reviews, to check your answers. Research suggests that trying to answer these questions on your own will improve your long-term memory of the concepts (McDaniel et al., 2009).

- B-1:** What is “flow,” and what are the three subfields of industrial-organizational psychology?

Personnel Psychology

- B-2:** How do personnel psychologists help organizations with employee selection, work placement, and performance appraisal?

Organizational Psychology

- B-3:** What is the role of organizational psychologists?
B-4: What are some effective leadership techniques?

The Human Factor

- B-5:** How do human factors psychologists work to create user-friendly machines and work settings?

TERMS AND CONCEPTS TO REMEMBER

Test yourself on these terms by trying to write down the definition before flipping back to the referenced page to check your answer.
 flow, p. B-1

industrial-organizational (I/O) psychology, p. B-2
 personnel psychology, p. B-2
 organizational psychology, p. B-2

human factors psychology, p. B-3
 structured interview, p. B-5
 task leadership, p. B-11
 social leadership, p. B-11

EXPERIENCE THE TESTING EFFECT

Test yourself repeatedly throughout your studies. This will not only help you figure out what you know and don't know; the testing itself will help you learn and remember the information more effectively thanks to the *testing effect*.

1. People who view their work as a calling often experience _____, a focused state of consciousness, with diminished awareness of themselves and of time.
 - a. stress
 - b. apathy
 - c. flow
 - d. facilitation
2. _____ psychologists study the recruitment, selection, placement, training, appraisal, and development of employees; _____ psychologists focus on how people and machines interact, and on optimizing devices and work environments.
3. A personnel psychologist scripted a set of questions to ask all applicants for a job opening. She then trained the firm's interviewers to ask only these questions, to take notes, and to rate applicants' responses. This technique is known as a(n)
 - a. structured interview.
 - b. unstructured interview.
 - d. performance appraisal checklist.
 - c. behavior rating scale.
4. In your job, you rate your own performance, your manager's, and your peers'. Your manager, your peers, and your customers also rate your performance. Your organization is using a form of performance appraisal called
 - a. flow procedure.
 - b. graphic feedback.
 - c. structured interviews.
 - d. 360-degree feedback.
5. What type of goals will best help you stay focused and motivated to do your best work in this class?
6. Research indicates that women are more likely than men to have a _____ leadership style.
7. Effective managers exhibit
 - a. only task leadership.
 - b. only social leadership.
 - c. both task and social leadership, depending on the situation and the person.
 - d. task leadership for building teams and social leadership for setting standards.
8. To reduce users' frustration and to avoid accidents, human factors psychologists help organizations avoid the curse of knowledge, which is the tendency for
 - a. a little bit of knowledge to be dangerous for the user.
 - b. users to override machines and resort to familiar habits.
 - c. engineers and designers to assume that users are idiots and need overly detailed instructions.
 - d. engineers and designers to assume that others will share their knowledge.

Find answers to these questions in Appendix E in the back of the book.

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more of the
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Subfields of Psychology

Jennifer Zwolinski, University of San Diego

What can you do with a degree in psychology? Lots!

As a psychology major, you will graduate with a scientific mind-set and an awareness of basic principles of human behavior (biological mechanisms, development, cognition, psychological disorders, social interaction). This background will prepare you for success in many areas, including business, the helping professions, health services, marketing, law, sales, and teaching. You may even go on to graduate school for specialized training to become a psychology professional. This appendix describes psychology's specialized subfields.¹ I also provide updated information about CAREERS IN PSYCHOLOGY at www.yourpsychportal.com, where you can learn more about the many interesting options available to those with bachelor's, master's, and doctoral degrees in psychology.

If you are like most psychology students, you may be unaware of the wide variety of specialties and work settings available in psychology (Terre & Stoddart, 2000). To date, the American Psychological Association (APA) has formed 56 divisions (**TABLE C.1** on the next page). The following paragraphs (arranged alphabetically) describe some careers in the main specialty areas of psychology, most of which require a graduate degree in psychology.

Clinical psychologists promote psychological health in individuals, groups, and organizations. Some clinical psychologists specialize in specific psychological disorders. Others treat a range of disorders, from adjustment difficulties to severe psychopathology. Clinical psychologists might engage in research, teaching, assessment, and consultation. Some hold workshops and lectures on psychological issues for other professionals or for the public. Clinical psychologists work in a variety of settings, including private practice, industry, mental health service organizations, schools, universities, legal systems, medical systems, counseling centers, government agencies, and military services.

To become a clinical psychologist, you will need to earn a doctorate from a clinical psychology program. The APA sets the standards for clinical psychology graduate programs, offering accreditation (official recognition) to those who meet their standards. In all U.S. states, clinical psychologists working in independent practice must obtain a license to offer services such as therapy and testing.

Cognitive psychologists study thought processes and focus on such topics as perception, language, attention, problem solving, memory, judgment and decision making, forgetting, and intelligence. Research interests include designing computer-based models of thought processes and identifying biological correlates of cognition. As a cognitive psychologist, you might work as a professor, industrial consultant, or human factors specialist in an educational or business setting.

Community psychologists move beyond focusing on specific individuals or families and deal with broad problems of mental health in community settings. These psychologists believe that human behavior is powerfully influenced by the interaction between people and their physical, social, political, and economic

¹Although this text covers the world of psychology for students in many countries, this appendix draws primarily from available U.S. data. Its descriptions of psychology's subfields are, however, also applicable in many other countries.



Table C.1

APA Divisions by Number and Name

1. Society for General Psychology	29. Psychotherapy
2. Society for the Teaching of Psychology	30. Society of Psychological Hypnosis
3. Experimental Psychology	31. State, Provincial, and Territorial Psychological Association Affairs
4. <i>There is currently no Division 4.</i>	32. Society for Humanistic Psychology
5. Evaluation, Measurement, and Statistics	33. Intellectual and Developmental Disabilities
6. Behavioral Neuroscience and Comparative Psychology	34. Society for Environmental, Population, and Conservation Psychology
7. Developmental Psychology	35. Society for the Psychology of Women
8. Society for Personality and Social Psychology	36. Society for the Psychology of Religion and Spirituality
9. Society for the Psychological Study of Social Issues (SPSSI)	37. Society for Child and Family Policy and Practice
10. Society for the Psychology of Aesthetics, Creativity, and the Arts	38. Health Psychology
11. <i>There is currently no Division 11.</i>	39. Psychoanalysis
12. Society of Clinical Psychology	40. Clinical Neuropsychology
13. Society of Consulting Psychology	41. American Psychology-Law Society
14. Society for Industrial and Organizational Psychology	42. Psychologists in Independent Practice
15. Educational Psychology	43. Society for Family Psychology
16. School Psychology	44. Society for the Psychological Study of Lesbian, Gay, Bisexual, and Transgender Issues
17. Society of Counseling Psychology	45. Society for the Psychological Study of Ethnic Minority Issues
18. Psychologists in Public Service	46. Media Psychology
19. Society for Military Psychology	47. Exercise and Sport Psychology
20. Adult Development and Aging	48. Society for the Study of Peace, Conflict, and Violence: Peace Psychology Division
21. Applied Experimental and Engineering Psychology	49. Society of Group Psychology and Group Psychotherapy
22. Rehabilitation Psychology	50. Society of Addiction Psychology
23. Society for Consumer Psychology	51. Society for the Psychological Study of Men and Masculinity
24. Theoretical and Philosophical Psychology	52. International Psychology
25. Behavior Analysis	53. Society of Clinical Child and Adolescent Psychology
26. Society for the History of Psychology	54. Society of Pediatric Psychology
27. Society for Community Research and Action: Division of Community Psychology	55. American Society for the Advancement of Pharmacotherapy
28. Psychopharmacology and Substance Abuse	56. Trauma Psychology

Source: American Psychological Association.

environments. They seek to promote psychological health by enhancing environmental settings, focusing on preventive measures and crisis intervention, with special attention to the problems of underserved groups and ethnic minorities. Given the shared emphasis on prevention, some community psychologists collaborate with professionals in other areas, such as public health. As a community psychologist, your work settings could include federal, state, and local departments of mental health, corrections, and welfare. You might conduct research or help



Karen Moskowitz/Getty Images

Cognitive consulting Cognitive psychologists may advise businesses on how to operate more effectively by understanding the human factors involved.

evaluate research in health service settings, serve as an independent consultant for a private or government agency, or teach and consult as a college or university faculty member.

Counseling psychologists help people adjust to life transitions or make lifestyle changes. Although similar to clinical psychologists, counseling psychologists typically help people with adjustment problems rather than severe psychopathology. Like clinical psychologists, counseling psychologists conduct therapy and provide assessments to individuals and groups. As a counseling psychologist, you would emphasize your clients' strengths, helping them to use their own skills, interests, and abilities to cope during transitions. You might find yourself working in an academic setting as a faculty member or administrator or in a university counseling center, community mental health center, business, or private practice. As with clinical psychology, if you plan to work in independent practice you will need to obtain a state license to provide counseling services to the public.

Developmental psychologists conduct research in age-related behavioral changes and apply their scientific knowledge to educational, child-care, policy, and related settings. As a developmental psychologist, you would investigate change across a broad range of topics, including the biological, psychological, cognitive, and social aspects of development. Developmental psychology informs a number of applied fields, including educational psychology, school psychology, child psychopathology, and gerontology. The field also informs public policy in areas such as education and child-care reform, maternal and child health, and attachment and adoption. You would probably specialize in a specific stage of the life span, such as infancy, childhood, adolescence, or middle or late adulthood. Your work setting could be an educational institution, day-care center, youth group program, or senior center.

Educational psychologists are interested in the psychological processes involved in learning. They study the relationship between learning and the physical and social environments, and they develop strategies for enhancing the learning process. As an educational psychologist, working in a university psychology department or school of education, you might conduct basic research on topics related to learning or develop innovative methods of teaching to enhance the learning process. You might design effective tests, including measures of aptitude and achievement. You might be employed by a school or government agency or charged with designing and implementing effective employee-training programs in a business setting.



Eitan Abramovich/AFP/Getty Images

Coping with disaster After Peru's deadly August 2007 earthquake, this community psychologist working with Médecins Sans Frontières (Doctors Without Borders) helped survivors cope with the loss of their homes and, for many, the death of family members and friends.

Experimental psychologists are a diverse group of scientists who investigate a variety of basic behavioral processes in humans and other animals. Prominent areas of experimental research include comparative methods of science, motivation, learning, thought, attention, memory, perception, and language. Most experimental psychologists identify with a particular subfield, such as cognitive psychology, depending on their interests and training. It is important to note that experimental research methods are not limited to the field of experimental psychology; many other subfields rely on experimental methodology to conduct studies. As an experimental psychologist, you would most likely work in an academic setting, teaching courses and supervising students' research in addition to conducting your own research. Or you might be employed by a research institution, zoo, business, or government agency.

Forensic psychologists apply psychological principles to legal issues. They conduct research on the interface of law and psychology, help to create public policies related to mental health, help law-enforcement agencies in criminal investigations, or consult on jury selection and deliberation processes. They also provide assessment to assist the legal community. Although most forensic psychologists are clinical psychologists, they might have expertise in other areas of psychology, such as social or cognitive psychology. Some also hold law degrees. As a forensic psychologist, you might work in a university psychology department, law school, research organization, community mental health agency, law-enforcement agency, court, or correctional setting.

Health psychologists are researchers and practitioners concerned with psychology's contribution to promoting health and preventing disease. As applied psychologists or clinicians, they may help individuals lead healthier lives by designing, conducting, and evaluating programs to stop smoking, lose weight, improve sleep, manage pain, prevent the spread of sexually transmitted infections, or treat psychosocial problems associated with chronic and terminal illnesses. As researchers and clinicians, they identify conditions and practices associated with health and illness to help create effective interventions. In public service, health psychologists study and work to improve government policies and health care systems. As a health psychologist, you could be employed in a hospital, medical school, rehabilitation center, public health agency, college or university, or, if you are also a clinical psychologist, in private practice.

Industrial-organizational (I/O) psychologists study the relationship between people and their working environments. They may develop new ways to increase productivity, improve personnel selection, or promote job satisfaction in an organizational setting. Their interests include organizational structure and change, consumer behavior, and personnel selection and training. As an I/O psychologist, you might conduct workplace training or provide organizational analysis and development. You may find yourself working in business, industry, the government, or a college or university. Or you may be self-employed as a consultant or work for a management consulting firm.

Neuropsychologists investigate the relationship between neurological processes (structure and function of the brain) and behavior. As a neuropsychologist you might assess, diagnose, or treat central nervous system disorders, such as Alzheimer's disease or stroke. You might also evaluate individuals for evidence of head injuries; learning and developmental disabilities, such as autism; and other psychiatric disorders, such as attention-deficit hyperactivity disorder (ADHD). If you are a *clinical neuropsychologist*, you might work in a hospital's neurology, neurosurgery, or psychiatric unit. Neuropsychologists also work in academic settings, where they conduct research and teach.

Psychometric and quantitative psychologists study the methods and techniques used to acquire psychological knowledge. A psychometrician may update existing neurocognitive or personality tests or devise new tests for use in clinical and



AP Photo/Jennifer Graglock

Criminal profiling On the popular U.S. TV show *Law and Order: Special Victims Unit*, Dr. George Huang (played by B. D. Wong) was an FBI agent and psychiatrist who used his background in forensic psychology to conduct criminal investigations.

school settings or in business and industry. These psychologists also administer, score, and interpret such tests. Quantitative psychologists collaborate with researchers to design, analyze, and interpret the results of research programs. As a psychometric or quantitative psychologist, you would need to be well trained in research methods, statistics, and computer technology. You would most likely be employed by a university or college, testing company, private research firm, or government agency.

Rehabilitation psychologists are researchers and practitioners who work with people who have lost optimal functioning after an accident, illness, or other event. As a rehabilitation psychologist, you would probably work in a medical rehabilitation institution or hospital. You might also work in a medical school, university, state or federal vocational rehabilitation agency, or in private practice serving people with physical disabilities.

School psychologists are involved in the assessment of and intervention for children in educational settings. They diagnose and treat cognitive, social, and emotional problems that may negatively influence children's learning or overall functioning at school. As a school psychologist, you would collaborate with teachers, parents, and administrators, making recommendations to improve student learning. You would work in an academic setting, a federal or state government agency, a child guidance center, or a behavioral research laboratory.

Social psychologists are interested in our interactions with others. Social psychologists study how our beliefs, feelings, and behaviors are affected by and influence other people. They study topics such as attitudes, aggression, prejudice, interpersonal attraction, group behavior, and leadership. As a social psychologist, you would probably be a college or university faculty member. You might also work in organizational consultation, market research, or other applied psychology fields. Some social psychologists work for hospitals, federal agencies, or businesses performing applied research.

Sport psychologists study the psychological factors that influence, and are influenced by, participation in sports and other physical activities. Their professional activities include coach education and athlete preparation, as well as research and teaching. Sport psychologists who also have a clinical or counseling degree can apply those skills to working with individuals with psychological problems, such as anxiety or substance abuse, that might interfere with optimal performance. As a sport psychologist, if you were not working in an academic or research setting, you would most likely work as part of a team or an organization or in a private capacity.

So, the next time someone asks you what you will do with your psychology degree, tell them you have a lot of options. You might use your acquired skills and understanding to get a job and succeed in any number of fields, or you might pursue graduate school and then career opportunities in associated professions. In any case, what you have learned about behavior and mental processes will surely enrich your life (Hammer, 2003).



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Class counselor School psychologists, who have their master's degree in psychology, may find themselves working with students individually or in groups, as well as in a consultative role for their school's administrators.

Curing catchers Sport psychologists often work directly with athletes to help them improve their performance. Here the Florida Marlins team psychologist consults with catching prospect Brad Davis during spring training.



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Complete Chapter Reviews

CHAPTER 1 Thinking Critically With Psychological Science

WHAT IS PSYCHOLOGY?

1-1: What are some important milestones in psychology's development?

Wilhelm Wundt established the first psychological laboratory in 1879 in Germany. Two early schools were *structuralism* and *functionalism*. Early researchers defined *psychology* as a “science of mental life.” In the 1920s, under the influence of John B. Watson and the *behaviorists*, the field's focus changed to the “scientific study of observable behavior.” In the 1960s, the *humanistic psychologists* and the *cognitive psychologists* revived interest in the study of mental processes. *Psychology* is now defined as the science of behavior and mental processes.

CONTEMPORARY PSYCHOLOGY

1-2: What is psychology's historic big issue?

Psychology's biggest and most enduring issue has been the *nature-nurture issue*, which focuses on the relative contributions of genes and experience. Today's science emphasizes the interaction of genes and experiences in specific environments. Charles Darwin's view that *natural selection* shapes behaviors as well as bodies is an important principle in contemporary psychology.

1-3: What are psychology's levels of analysis and related perspectives?

The *biopsychosocial approach* integrates information from three differing but complementary *levels of analysis*: the biological, psychological, and social-cultural. This approach offers a more complete understanding than could usually be reached by relying on only one of psychology's current perspectives (neuroscience, evolutionary, behavior genetics, psychodynamic, behavioral, cognitive, and social-cultural).

1-4: What are psychology's main subfields?

Within the science of psychology, researchers may conduct *basic research* to increase the field's knowledge base (often in biological, developmental, cognitive, personality, and social psychology) or *applied research* to solve practical problems (in industrial-organizational psychology and other areas). Those who engage in psychology as a helping profession may assist people as *counseling psychologists* (helping people with problems in living or achieving greater well-being) or as *clinical psychologists*, studying and assessing people with psychological disorders and treating them with psychotherapy. (*Psychiatrists* also study, assess, and treat people with disorders, but as medical doctors, they may prescribe drugs in addition to psychotherapy.) *Positive psychology* attempts to discover and promote traits that help people to thrive.

THE NEED FOR PSYCHOLOGICAL SCIENCE

1-5: How do hindsight bias, overconfidence, and the tendency to perceive order in random events illustrate why science-based answers are more valid than those based on intuition and common sense?

Hindsight bias (also called the “I-knew-it-all-along phenomenon”) is the tendency to believe, after learning an outcome, that we would have foreseen it. Overconfidence

in our judgments results partly from our bias to seek information that confirms them. These tendencies, plus our eagerness to perceive patterns in random events, lead us to overestimate our intuition. Although limited by the testable questions it can address, scientific inquiry can help us overcome our intuition's biases and shortcomings.

1-6: How do the scientific attitude's three main components relate to critical thinking?

The scientific attitude equips us to be curious, skeptical, and humble in scrutinizing competing ideas or our own observations. This attitude carries into everyday life as *critical thinking*, which puts ideas to the test by examining assumptions, discerning hidden values, evaluating evidence, and assessing conclusions.

HOW DO PSYCHOLOGISTS ASK AND ANSWER QUESTIONS?

1-7: How do theories advance psychological science?

Psychological *theories* are explanations that apply an integrated set of principles to organize observations and generate *hypotheses*—predictions that can be used to check the theory or produce practical applications of it. By testing their hypotheses, researchers can confirm, reject, or revise their theories. To enable other researchers to *replicate* the studies, researchers report them using precise *operational definitions* of their procedures and concepts. If others achieve similar results, confidence in the conclusion will be greater.

1-8: How do psychologists use case studies, naturalistic observations, and surveys to observe and describe behavior, and why is random sampling important?

Descriptive methods, which include *case studies*, *naturalistic observations*, and *surveys*, show us what can happen, and they may offer ideas for further study. The best basis for generalizing about a *population* is a representative sample; in a *random sample*, every person in the entire population being studied has an equal chance of participating. Descriptive methods cannot show cause and effect because researchers cannot control variables.

1-9: What are positive and negative correlations, and why do they enable prediction but not cause-effect explanation?

In a positive *correlation*, two factors increase or decrease together. In a negative correlation, one item increases as the other decreases. A *correlation coefficient* can describe the strength and direction of a relationship between two variables, from +1.00 (a perfect positive correlation) through zero (no correlation at all) to -1.00 (a perfect negative correlation). A correlation can indicate the possibility of a cause-effect relationship, but it does not prove the direction of the influence, or whether an underlying third factor may explain the correlation.

1-10: What are the characteristics of experimentation that make it possible to isolate cause and effect?

To discover cause-effect relationships, psychologists conduct *experiments*, manipulating one or more factors of interest and controlling other factors. Using *random assignment*, they can minimize *confounding variables*, such as preexisting differences between the *experimental group* (exposed to the treatment) and the *control group* (given a placebo or different version of the treatment). The *independent variable* is the factor the experimenter manipulates to study its effect; the *dependent variable* is the factor the experimenter measures to discover any changes occurring in response to the manipulations. Studies may use a *double-blind procedure* to avoid the *placebo effect*.

FREQUENTLY ASKED QUESTIONS ABOUT PSYCHOLOGY

1-11: Can laboratory experiments illuminate everyday life?

Researchers intentionally create a controlled, artificial environment in the laboratory in order to test general theoretical principles. These general principles help explain everyday behaviors.

1-12: Does behavior depend on one's culture and gender?

Attitudes and behaviors may vary somewhat by gender or across *cultures*, but because of our shared human kinship, the underlying processes and principles are more similar than different.

1-13: Why do psychologists study animals, and what ethical guidelines safeguard human and animal research participants?

Some psychologists are primarily interested in animal behavior; others want to better understand the physiological and psychological processes shared by humans and other species. Government agencies have established standards for animal care and housing. Professional associations and funding agencies also establish guidelines for protecting animals' well-being. The APA ethics code outlines standards for safeguarding human participants' well-being, including obtaining their *informed consent* and *debriefing* them later.

1-14: Is psychology free of value judgments?

Psychologists' values influence their choice of research topics, their theories and observations, their labels for behavior, and their professional advice. Applications of psychology's principles have been used mainly in the service of humanity.

IMPROVE YOUR RETENTION—AND YOUR GRADES**1-15: How can psychological principles help you learn and remember?**

The *testing effect* shows that learning and memory are enhanced by actively retrieving, rather than simply rereading, previously studied material. The *SQ3R* study method—survey, question, read, retrieve, and review—applies principles derived from memory research. Four additional tips are (1) distribute your study time; (2) learn to think critically; (3) process class information actively; and (4) overlearn.

CHAPTER 2 The Biology of Behavior**BIOLOGY AND BEHAVIOR****2-1: Why are psychologists concerned with human biology?**

Psychologists working from a *biological* perspective study the links between biology and behavior. We are biopsychosocial systems, in which biological, psychological, and social-cultural factors interact to influence behavior.

NEURAL COMMUNICATION**2-2: What are neurons, and how do they transmit information?**

Neurons are the elementary components of the nervous system, the body's speedy electrochemical information system. A neuron receives signals through its branching *dendrites*, and sends signals through its *axons*. Some axons are encased in a *myelin sheath*, which enables faster transmission. *Glial cells* provide myelin, and they support, nourish, and protect neurons; they may also play a role in learning and thinking. If the combined signals received by a neuron exceed a minimum *threshold*, the neuron fires, transmitting an electrical impulse (the *action potential*) down its axon by means of a chemistry-to-electricity process. The neuron's reaction is an all-or-none process.

2-3: How do nerve cells communicate with other nerve cells?

When action potentials reach the end of an axon (the axon terminals), they stimulate the release of *neurotransmitters*. These chemical messengers carry a message from the sending neuron across a *synapse* to receptor sites on a receiving neuron. The sending neuron, in a process called reuptake, then normally reabsorbs the excess neurotransmitter molecules in the synaptic gap. If incoming signals are strong enough, the receiving neuron generates its own action potential and relays the message to other cells.

2-4: How do neurotransmitters influence behavior?

Neurotransmitters travel designated pathways in the brain and may influence specific behaviors and emotions. Acetylcholine affects muscle action, learning, and memory. *Endorphins* are natural opiates released in response to pain and exercise. Drugs and other chemicals affect brain chemistry at synapses.

THE NERVOUS SYSTEM**2-5: What are the functions of the nervous system's main divisions, and what are the three main types of neurons?**

The *central nervous system (CNS)*—the brain and the spinal cord—is the *nervous system's* decision maker. The *peripheral nervous system (PNS)*, which connects the CNS to the rest of the body by means of *nerves*, gathers information and transmits CNS decisions to the rest of the body. The two main PNS divisions are the *somatic nervous system* (which enables voluntary control of the skeletal muscles) and the *autonomic nervous system* (which controls involuntary muscles and glands by means of its *sympathetic* and *parasympathetic* divisions). Neurons cluster into working networks. There are three types of neurons: (1) *Sensory (afferent) neurons* carry incoming information from sensory receptors to the brain and spinal cord. (2) *Motor (efferent) neurons* carry information from the brain and spinal cord out to the muscles and glands. (3) *Interneurons* communicate within the brain and spinal cord and between sensory and motor neurons.

THE ENDOCRINE SYSTEM**2-6: How does the endocrine system transmit information and interact with the nervous system?**

The *endocrine system* is a set of glands that secrete *hormones* into the bloodstream, where they travel through the body and affect other tissues, including the brain. The endocrine system's master gland, the *pituitary*, influences hormone release by other glands, including the *adrenal glands*. In an intricate feedback system, the brain's hypothalamus influences the pituitary gland, which influences other glands, which release hormones, which in turn influence the brain.

THE BRAIN**2-7: How do neuroscientists study the brain's connections to behavior and mind?**

Clinical observations and *lesioning* reveal the general effects of brain damage. Electrical, chemical, or magnetic stimulation can also reveal aspects of information processing in the brain. *MRI* scans show anatomy. *EEG*, *PET*, and *fMRI (functional MRI)* recordings reveal brain function.

2-8: What structures make up the brainstem, and what are the functions of the brainstem, thalamus, and cerebellum?

The *brainstem*, the oldest part of the brain, is responsible for automatic survival functions. Its components are the *medulla* (which controls heartbeat and breathing), the *pons* (which helps coordinate movements), and the *reticular formation* (which affects arousal). The *thalamus*, sitting above the brainstem, acts as the brain's sensory switchboard. The *cerebellum*, attached to the rear of the brainstem, coordinates muscle movement and balance and also helps process sensory information.

2-9: What are the limbic system's structures and functions?

The *limbic system* is linked to emotions, memory, and drives. Its neural centers include the hippocampus (which processes conscious memories); the *amygdala* (involved in responses of aggression and fear); and the *hypothalamus* (involved in various bodily maintenance functions, pleasurable rewards, and the control of the endocrine system). The hypothalamus controls the pituitary (the “master gland”) by stimulating it to trigger the release of hormones.

2-10: What are the functions of the various cerebral cortex regions?

The *cerebral cortex* has two hemispheres, and each hemisphere has four lobes: the *frontal*, *parietal*, *occipital*, and *temporal*. Each lobe performs many functions and interacts with other areas of the cortex. The *motor cortex*, at the rear of the frontal lobes, controls voluntary movements. The *sensory cortex*, at the front of the parietal lobes, registers and processes body touch and movement sensations. Body parts requiring precise control (in the motor cortex) or those that are especially sensitive (in the sensory cortex) occupy the greatest amount of space. Most of the brain's cortex—the major portion of each of the four lobes—is devoted to uncommitted *association areas*, which integrate information involved in learning, remembering, thinking, and other higher-level functions. Our mental experiences arise from coordinated brain activity.

2-11: To what extent can a damaged brain reorganize itself, and what is neurogenesis?

If one hemisphere is damaged early in life, the other will pick up many of its functions by reorganizing or building new pathways. This *plasticity* diminishes later in life. The brain sometimes mends itself by forming new neurons, a process known as *neurogenesis*.

2-12: What do split brains reveal about the functions of our two brain hemispheres?

Split-brain research (experiments on people with a severed *corpus callosum*) has confirmed that in most people, the left hemisphere is the more verbal, and that the right hemisphere excels in visual perception and the recognition of emotion. Studies of healthy people with intact brains confirm that each hemisphere makes unique contributions to the integrated functioning of the brain.

BEHAVIOR GENETICS: PREDICTING INDIVIDUAL DIFFERENCES**2-13: What are genes, and how do behavior geneticists explain our individual differences?**

Genes are the biochemical units of heredity that make up *chromosomes*, the threadlike coils of *DNA*. When genes are “turned on” (expressed), they provide the code for creating the proteins that form our body's building blocks. Most human traits are influenced by many genes acting together. *Behavior geneticists* seek to quantify genetic and *environmental* influences on our traits, in part through studies of *identical* (monozygotic) *twins*, *fraternal* (dizygotic) *twins*, and adoptive families. Heritable individual differences (in traits such as height and weight) do not necessarily explain gender or ethnic group differences. Shared family environments have little effect on personality.

2-14: How do heredity and environment work together?

Our genetic predispositions and our specific environments *interact*. Environments can trigger gene activity, and genetically influenced traits can evoke responses from others. The field of *epigenetics* studies the influences on gene expression that occur without changes in DNA.

EVOLUTIONARY PSYCHOLOGY: UNDERSTANDING HUMAN NATURE**2-15: How do evolutionary psychologists use natural selection to explain behavior tendencies?**

Evolutionary psychologists seek to understand how our traits and behavior tendencies are shaped by *natural selection*, as genetic variations increasing the odds of reproducing and surviving in their particular environment are most likely to be passed on to future generations. Some variations arise from *mutations* (random errors in gene replication), others from new gene combinations at conception. Humans share a genetic legacy and are predisposed to behave in ways that promoted our ancestors' surviving and reproducing. Charles Darwin's theory of evolution is an organizing principle in biology. He anticipated today's application of evolutionary principles in psychology.

CHAPTER 3 Consciousness and the Two-Track Mind

THE BRAIN AND CONSCIOUSNESS

3-1: What is the place of consciousness in psychology's history?

Since 1960, under the influence of cognitive psychology, neuroscience, and *cognitive neuroscience*, our awareness of ourselves and our environment—our *consciousness*—has reclaimed its place as an important area of research. After initially claiming consciousness as its area of study in the nineteenth century, psychologists had abandoned it in the first half of the twentieth century, turning instead to the study of observable behavior because they believed consciousness was too difficult to study scientifically.

3-2: What is the “dual processing” being revealed by today's cognitive neuroscience?

Scientists studying the brain mechanisms underlying consciousness and cognition have discovered that the mind processes information on two separate tracks, one operating at an explicit, conscious level (conscious sequential processing) and the other at an implicit, unconscious level (unconscious parallel processing). This *dual processing* affects our perception, memory, attitudes, and other cognitions.

3-3: How much information do we consciously attend to at once?

We *selectively attend* to, and process, a very limited portion of incoming information, blocking out much and often shifting the spotlight of our attention from one thing to another. Focused intently on one task, we often display *inattentional blindness* to other events and *change blindness* to changes around us.

SLEEP AND DREAMS

3-4: How do our biological rhythms influence our daily functioning?

Our bodies have an internal biological clock, roughly synchronized with the 24-hour cycle of night and day. This *circadian rhythm* appears in our daily patterns of body temperature, arousal, sleeping, and waking. Age and experiences can alter these patterns, resetting our biological clock.

3-5: What is the biological rhythm of our sleeping and dreaming stages?

Younger adults cycle through four distinct *sleep* stages about every 90 minutes. (The sleep cycle repeats more frequently for older adults.) Leaving the *alpha waves* of the awake, relaxed stage, we descend into the irregular brain waves of non-REM stage 1 (NREM-1) sleep, often with *hallucinations*, such as the sensation of falling or floating. NREM-2 sleep (in which we spend the most time) follows, lasting about 20 minutes, with its characteristic sleep spindles. We then enter NREM-3 sleep, lasting about 30 minutes, with large, slow *delta waves*. About an hour after falling asleep, we begin periods of *REM* (rapid eye movement) *sleep*. Most dreaming occurs in this stage (also known as paradoxical sleep) of internal arousal but outward paralysis. During a normal night's sleep, NREM-3 sleep shortens and REM and NREM-2 sleep lengthens.

3-6: How do biology and environment interact in our sleep patterns?

Our biology—our circadian rhythm as well as our age and our body's production of melatonin (influenced by the brain's *suprachiasmatic nucleus*)—interacts with cultural expectations and individual behaviors to determine our sleeping and waking patterns.

3-7: What are sleep's functions?

Sleep may have played a protective role in human evolution by keeping people safe during potentially dangerous periods. Sleep also helps restore and repair damaged neurons. REM and NREM-2 sleep help strengthen neural connections that build enduring memories. Sleep promotes creative problem solving the next day, and, finally, during deep sleep, the pituitary gland secretes a growth hormone necessary for muscle development.

3-8: How does sleep loss affect us, and what are the major sleep disorders?

Sleep deprivation causes fatigue and irritability, and it impairs concentration, productivity, and memory consolidation. It can also lead to depression, obesity, joint pain, a suppressed

immune system, and slowed performance (with greater vulnerability to accidents). Sleep disorders include *insomnia* (recurring wakefulness); *narcolepsy* (sudden uncontrollable sleepiness or lapsing into REM sleep); *sleep apnea* (the stopping of breathing while asleep; associated with obesity, especially in men); *night terrors* (high arousal and the appearance of being terrified; NREM-3 disorder found mainly in children); sleepwalking (NREM-3 disorder also found mainly in children); and sleeptalking.

3-9: What do we dream?

We usually *dream* of ordinary events and everyday experiences, most involving some anxiety or misfortune. Fewer than 10 percent (and less among women) of dreams have any sexual content. Most dreams occur during REM sleep.

3-10: What are the functions of dreams?

There are five major views of the function of dreams. (1) Freud's wish-fulfillment: Dreams provide a psychic "safety valve," with *manifest content* (story line) acting as a censored version of *latent content* (underlying meaning that gratifies our unconscious wishes). (2) Information-processing: Dreams help us sort out the day's events and consolidate them in memory. (3) Physiological function: Regular brain stimulation may help develop and preserve neural pathways in the brain. (4) Neural activation: The brain attempts to make sense of neural static by weaving it into a story line. (5) Cognitive development: Dreams reflect the dreamer's level of development. Most sleep theorists agree that REM sleep and its associated dreams serve an important function, as shown by the *REM rebound* that occurs following REM deprivation in humans and other species.

HYPNOSIS

3-11: What is hypnosis, and what powers does a hypnotist have over a hypnotized subject?

Hypnosis is a social interaction in which one person suggests to another that certain perceptions, feelings, thoughts, or behaviors will occur spontaneously. Highly hypnotizable people are able to focus attention totally on a task. Hypnosis does not enhance recall of forgotten events (it may even evoke false memories). It cannot force people to act against their will, though hypnotized people, like un hypnotized people, may perform unlikely acts. *Posthypnotic suggestions* have helped people harness their own healing powers but have not been very effective in treating addiction. Hypnosis can help relieve pain.

3-12: Is hypnosis an extension of normal consciousness or an altered state?

Many psychologists believe that hypnosis is a form of normal social influence and that hypnotized people act out the role of "good subject" by following directions given by an authoritative person. Other psychologists view hypnosis as a *dissociation*—a split between normal sensations and conscious awareness. Selective attention may also contribute by blocking attention to certain stimuli.

DRUGS AND CONSCIOUSNESS

3-13: What are tolerance, dependence, and addiction, and what are some common misconceptions about addiction?

Psychoactive drugs alter perceptions and moods. They may produce *tolerance*: With repeated use, achieving the desired effect requires larger doses. Continued use may lead to *physical* or *psychological dependence*. *Addiction* is compulsive drug craving and use. Three common misconceptions are that addictive drugs quickly corrupt; therapy is always required to overcome addiction; and the concept of addiction can meaningfully be extended beyond chemical dependence to a wide range of other behaviors.

3-14: What are depressants, and what are their effects?

Depressants, such as alcohol, *barbiturates*, and the *opiates*, dampen neural activity and slow body functions. Alcohol tends to disinhibit, increasing the likelihood that we will act on our impulses, whether harmful or helpful. It also impairs judgment, disrupts

memory processes by suppressing REM sleep, and reduces self-awareness and self-control. User expectations strongly influence alcohol's behavioral effects.

3-15: What are stimulants, and what are their effects?

Stimulants—including caffeine, *nicotine*, cocaine, the *amphetamines*, *methamphetamine*, and *Ecstasy*—excite neural activity and speed up body functions, triggering energy and mood changes. All are highly addictive. Nicotine's effects make smoking a difficult habit to kick, yet the percentage of Americans who smoke has been dramatically decreasing. Cocaine gives users a fast high, followed within an hour by a crash. Its risks include cardiovascular stress and suspiciousness. Use of methamphetamines may permanently reduce dopamine production. Ecstasy (MDMA) is a combined stimulant and mild hallucinogen that produces euphoria and feelings of intimacy. Its users risk immune system suppression, permanent damage to mood and memory, and (if taken during physical activity) dehydration and escalating body temperatures.

3-16: What are hallucinogens, and what are their effects?

Hallucinogens—such as *LSD* and marijuana—distort perceptions and evoke hallucinations—sensory images in the absence of sensory input. The user's mood and expectations influence the effects of LSD, but common experiences are hallucinations and emotions varying from euphoria to panic. Marijuana's main ingredient, *THC*, may trigger feelings of disinhibition, euphoria, relaxation, relief from pain, and intense sensitivity to sensory stimuli. It may also increase feelings of depression or anxiety, impair motor coordination and reaction time, disrupt memory formation, and damage lung tissue (because of the inhaled smoke).

3-17: Why do some people become regular users of consciousness-altering drugs?

Some people may be biologically vulnerable to particular drugs, such as alcohol. Psychological factors (such as stress, depression, and hopelessness) and social factors (such as peer pressure) combine to lead many people to experiment with—and sometimes become dependent on—drugs. Cultural and ethnic groups have differing rates of drug use. Each type of influence—biological, psychological, and social-cultural—offers a possible path for drug prevention and treatment programs.

CHAPTER 4 Developing Through the Life Span

DEVELOPMENTAL PSYCHOLOGY'S MAJOR ISSUES

4-1: What three issues have engaged developmental psychologists?

Developmental psychologists study physical, mental, and social changes throughout the life span. They focus on three issues: nature and nurture (the interaction between our genetic inheritance and our experiences); continuity and stages (whether development is gradual and continuous or a series of relatively abrupt changes); and stability and change (whether our traits endure or change as we age).

PRENATAL DEVELOPMENT AND THE NEWBORN

4-2: What is the course of prenatal development, and how do teratogens affect that development?

The life cycle begins at conception, when one sperm cell unites with an egg to form a *zygote*. The zygote's inner cells become the *embryo*, and the outer cells become the placenta. In the next 6 weeks, body organs begin to form and function, and by 9 weeks, the *fetus* is recognizably human. *Teratogens* are potentially harmful agents that can pass through the placental screen and harm the developing embryo or fetus, as happens with *fetal alcohol syndrome*.

4-3: What are some newborn abilities, and how do researchers explore infants' mental abilities?

Babies are born with sensory equipment and reflexes that facilitate their survival and their social interactions with adults. For example, they quickly learn to discriminate

their mother's smell and sound. Researchers use techniques that test *habituation*, such as the novelty-preference procedure, to explore infants' abilities.

INFANCY AND CHILDHOOD

4-4: During infancy and childhood, how do the brain and motor skills develop?

The brain's nerve cells are sculpted by heredity and experience. As a child's brain develops, neural connections grow more numerous and complex. Experiences then trigger a pruning process, in which unused connections weaken and heavily used ones strengthen. This process continues until puberty. Early childhood is an important period for shaping the brain, but our brain modifies itself in response to our learning throughout life. In childhood, complex motor skills—sitting, standing, walking—develop in a predictable sequence, though the timing of that sequence is a function of individual *maturation* and culture. We have no conscious memories of events occurring before about age 3½. This infantile amnesia occurs in part because major brain areas have not yet matured.

4-5: From the perspectives of Piaget, Vygotsky, and today's researchers, how does a child's mind develop?

In his theory of *cognitive* development, Jean Piaget proposed that children actively construct and modify their understanding of the world through the processes of *assimilation* and *accommodation*. They form *schemas* that help them organize their experiences. Progressing from the simplicity of the *sensorimotor stage* of the first two years, in which they develop *object permanence*, children move to more complex ways of thinking. In the *preoperational stage* (about age 2 to about 6 or 7), they develop a *theory of mind*. (Children with *autism* have trouble understanding others' states of mind.) In the preoperational stage, children are *egocentric* and unable to perform simple logical operations. At about age 7, they enter the *concrete operational stage* and are able to comprehend the principle of *conservation*. By about age 12, children enter the *formal operational stage* and can reason systematically. Research supports the sequence Piaget proposed, but it also shows that young children are more capable, and their development more continuous, than he believed. Lev Vygotsky's studies of child development focused on the ways a child's mind grows by interacting with the social environment. In his view, parents and caretakers provide temporary scaffolds enabling children to step to higher levels of learning.

4-6: How do parent-infant attachment bonds form?

At about 8 months, soon after object permanence develops, children separated from their caregivers display *stranger anxiety*. Infants form *attachments* not simply because parents gratify biological needs but, more important, because they are comfortable, familiar, and responsive. Ducks and other animals have a more rigid attachment process, called *imprinting*, that occurs during a *critical period*.

4-7: How have psychologists studied attachment differences, and what have they learned?

Attachment has been studied in strange situation experiments, which show that some children are securely attached and others are insecurely attached. Infants' differing attachment styles reflect both their individual *temperament* and the responsiveness of their parents and child-care providers. Adult relationships seem to reflect the attachment styles of early childhood, lending support to Erik Erikson's idea that *basic trust* is formed in infancy by our experiences with responsive caregivers.

4-8: How does childhood neglect or abuse affect children's attachments?

Children are very resilient, but those who are severely neglected by their parents, or otherwise prevented from forming attachments at an early age, may be at risk for attachment problems.

4-9: How does day care affect children?

Quality day care, with responsive adults interacting with children in a safe and stimulating environment, does not appear to harm children's thinking and language

skills. Some studies have linked extensive time in day care with increased aggressiveness and defiance, but other factors—the child’s temperament, the parents’ sensitivity, and the family’s economic and educational levels and culture—also matter.

4-10: What are three parenting styles, and how do children’s traits relate to them?

Parenting styles—authoritarian, permissive, and authoritative—reflect varying degrees of control. Children with high self-esteem tend to have authoritative parents and to be self-reliant and socially competent, but the direction of cause and effect in this relationship is not clear. Child-rearing practices reflect both individual and cultural values.

ADOLESCENCE

4-11: How is *adolescence* defined, and how do physical changes affect developing teens?

Adolescence is the transition period from childhood to adulthood, extending from *puberty* to social independence. Boys seem to benefit from “early” maturation, girls from “late” maturation. The brain’s frontal lobes mature and myelin growth increases during adolescence and the early twenties, enabling improved judgment, impulse control, and long-term planning.

4-12: How did Piaget, Kohlberg, and later researchers describe adolescent cognitive and moral development?

Piaget theorized that adolescents develop a capacity for formal operations and that this development is the foundation for moral judgment. Lawrence Kohlberg proposed a stage theory of moral reasoning, from a preconventional morality of self-interest, to a conventional morality concerned with upholding laws and social rules, to (in some people) a postconventional morality of universal ethical principles. Other researchers believe that morality lies in moral intuition and moral action as well as thinking. Some critics argue that Kohlberg’s postconventional level represents morality from the perspective of individualist, middle-class people.

4-13: What are the social tasks and challenges of adolescence?

Erikson theorized that each life stage has its own psychosocial task, and that a chief task of adolescence is solidifying one’s sense of self—one’s *identity*. This often means “trying on” a number of different roles. *Social identity* is the part of the self-concept that comes from a person’s group memberships.

4-14: How do parents and peers influence adolescents?

During adolescence, parental influence diminishes and peer influence increases, in part because of the selection effect—the tendency to choose similar others. But adolescents also do adopt their peers’ ways of dressing, acting, and communicating. Parents have more influence in religion, politics, and college and career choices.

4-15: What is emerging adulthood?

The transition from adolescence to adulthood is now taking longer. *Emerging adulthood* is the period from age 18 to the mid-twenties, when many young people are not yet fully independent. But critics note that this stage is found mostly in today’s Western cultures.

ADULTHOOD

4-16: What physical changes occur during middle and late adulthood?

Muscular strength, reaction time, sensory abilities, and cardiac output begin to decline in the late twenties and continue to decline throughout middle adulthood (roughly age 40 to 65) and late adulthood (the years after 65). Women’s period of fertility ends with *menopause* around age 50; men have no similar age-related sharp drop in hormone levels or fertility. In late adulthood, the immune system weakens, increasing susceptibility to life-threatening illnesses. Chromosome tips (telomeres) wear down, reducing the chances of normal genetic replication. But for some, longevity-supporting genes, low stress, and good health habits enable better health in later life.

4-17: How does memory change with age?

As the years pass, recall begins to decline, especially for meaningless information, but recognition memory remains strong. Developmental researchers study age-related changes (such as memory) with *cross-sectional studies* (comparing people of different ages) and *longitudinal studies* (retesting the same people over a period of years). “Terminal decline” describes the cognitive decline in the final few years of life.

4-18: What themes and influences mark our social journey from early adulthood to death?

Adults do not progress through an orderly sequence of age-related social stages. Chance events can determine life choices. The *social clock* is a culture’s preferred timing for social events, such as marriage, parenthood, and retirement. Adulthood’s dominant themes are love and work, which Erikson called *intimacy* and generativity.

4-19: Do self-confidence and life satisfaction vary with life stages?

Self-confidence tends to strengthen across the life span. Surveys show that life satisfaction is unrelated to age. Positive emotions increase after midlife and negative ones decrease.

4-20: A loved one’s death triggers what range of reactions?

People do not grieve in predictable stages, as was once supposed. Strong expressions of emotion do not purge grief, and bereavement therapy is not significantly more effective than grieving without such aid. Erikson viewed the late-adulthood psychosocial task as developing a sense of integrity (versus despair).

CHAPTER 5 Gender and Sexuality**GENDER DEVELOPMENT****5-1: What are some gender similarities and differences in aggression, social power, and social connectedness?**

Gender refers to the socially constructed roles and characteristics by which a culture defines “male” and “female.” We are more alike than different, thanks to our similar genetic makeup—we see, hear, learn, and remember similarly. Males and females do differ in body fat, muscle, height, age of onset of puberty, life expectancy, and vulnerability to certain disorders. Men admit to more *aggression* than women do, and they are more likely to be physically aggressive. Women’s aggression is more likely to be relational. In most societies, men have more social power, and their leadership style tends to be directive, whereas women’s is more democratic. Women focus more on social connectedness, and they “tend and befriend.”

5-2: How is our biological sex determined, and how do sex hormones influence prenatal and adolescent development?

Both sex chromosomes and sex hormones influence development. Biological sex is determined by the father’s contribution to the twenty-third pair of chromosomes. The mother always contributes an *X chromosome*. The father may also contribute an X chromosome, producing a female, or a *Y chromosome*, producing a male by triggering additional *testosterone* release and the development of male sex organs. Intersex individuals are born with intermediate or unusual combinations of male and female characteristics. During *puberty*, both *primary* and *secondary sex characteristics* develop. Sex-related genes and physiology influence behavioral and cognitive gender differences between males and females.

5-3: How do gender roles and gender typing influence gender development?

Gender roles, the behaviors a culture expects from its males and females, vary across place and time. *Social learning theory* proposes that we learn *gender identity*—our sense of being male or female—as we learn other things: through reinforcement, punishment, and observation. Critics argue that cognition also plays a role because modeling and

rewards cannot explain *gender typing*. *Transgender* people's gender identity or expression differs from their birth sex. Their sexual orientation may be heterosexual, homosexual, bisexual, or asexual.

HUMAN SEXUALITY

5-4: How do hormones influence human sexual motivation?

The female *estrogen* and male *testosterone* hormones influence human sexual behavior less directly than they influence sexual behavior in other species. Women's sexuality is more responsive to testosterone level than to estrogen level. Short-term shifts in testosterone level are normal in men, partly in response to stimulation.

5-5: What is the human sexual response cycle, and how do sexual dysfunctions and paraphilias differ?

William Masters and Virginia Johnson described four stages in the human *sexual response cycle*: excitement, plateau, orgasm (which seems to involve similar feelings and brain activity in males and females), and resolution. During the resolution phase, males experience a *refractory period*, during which renewed arousal and orgasm are impossible. *Sexual dysfunctions* are problems that consistently impair sexual arousal or functioning. They can often be successfully treated by behaviorally oriented therapy or drug therapy. Sexual paraphilias are conditions, which may be classified as disorders, in which sexual arousal is related to socially undesirable behavior.

5-6: How can sexually transmitted infections be prevented?

Safe-sex practices help prevent sexually transmitted infections (STIs). Condoms are especially effective in preventing transmission of HIV, the virus that causes *AIDS*. A vaccination administered before sexual contact can prevent most human papilloma virus infections.

5-7: How do external and imagined stimuli contribute to sexual arousal?

External stimuli can trigger sexual arousal in both men and women. In experiments, depictions of sexual coercion have increased acceptance of rape. Sexually explicit material may lead people to perceive their partners as comparatively less appealing and to devalue their relationships. Imagined stimuli (dreams and fantasies) also influence sexual arousal.

5-8: What factors influence teenagers' sexual behaviors and use of contraceptives?

Rates of teen intercourse vary from culture to culture and era to era. Factors contributing to teen pregnancy include minimal communication about birth control with parents, partners, and peers; guilt related to sexual activity; alcohol use; and mass media norms of unprotected and impulsive sexuality. High intelligence, religious engagement, father presence, and participation in service learning programs have been predictors of teen sexual restraint.

SEXUAL ORIENTATION

5-9: What has research taught us about sexual orientation?

Sexual orientation is an enduring sexual attraction toward members of one's own sex (homosexual orientation), the other sex (heterosexual orientation), or both sexes (bisexual orientation). Sexual orientation is not an indicator of mental health. There is no evidence that environmental influences determine sexual orientation. Evidence for biological influences includes the presence of same-sex attraction in many animal species; straight-gay differences in body and brain characteristics; higher rates in certain families and in identical twins; exposure to certain hormones during critical periods of prenatal development; and the fraternal birth-order effect.

AN EVOLUTIONARY EXPLANATION OF HUMAN SEXUALITY

5-10: How might an evolutionary psychologist explain gender differences in sexuality and mating preferences?

Evolutionary psychologists use natural selection to explain why men tend to have a recreational view of sexual activity and women tend to have a relational view. They

reason that men's attraction to multiple healthy, fertile appearing partners increases their chances of spreading their genes widely. Because women incubate and nurse babies, they increase their own and their children's chances of survival by searching for mates with the potential for long-term investment in their joint offspring.

5-11: What are the key criticisms of evolutionary explanations of human sexuality, and how do evolutionary psychologists respond?

Critics argue that evolutionary psychologists (1) start with an effect and work backward to an explanation, (2) absolve people from taking responsibility for their sexual behavior, and (3) do not recognize social and cultural influences. Evolutionary psychologists respond that understanding our predispositions can help us overcome them. They recognize the importance of social and cultural influences, but they also cite the value of testable predictions based on evolutionary principles.

CHAPTER 6 Sensation and Perception

BASIC PRINCIPLES OF SENSATION AND PERCEPTION

6-1: What are *sensation* and *perception*? What do we mean by *bottom-up processing* and *top-down processing*?

Sensation is the process by which our sensory receptors and nervous system receive and represent stimulus energies from our environment. *Perception* is the process of organizing and interpreting this information, enabling recognition of meaningful events. Sensation and perception are actually parts of one continuous process. *Bottom-up processing* is sensory analysis that begins at the entry level, with information flowing from the sensory receptors to the brain. *Top-down processing* is information processing guided by high-level mental processes, as when we construct perceptions by filtering information through our experience and expectations.

6-2: What three steps are basic to all our sensory systems?

Our senses (1) receive sensory stimulation (often using specialized receptor cells); (2) transform that stimulation into neural impulses; and (3) deliver the neural information to the brain. *Transduction* is the process of converting one form of energy into another.

6-3: What are the absolute and difference thresholds, and do stimuli below the absolute threshold have any influence on us?

Our *absolute threshold* for any stimulus is the minimum stimulation necessary for us to be consciously aware of it 50 percent of the time. (Stimuli below that threshold are *subliminal*.) *Signal detection theory* predicts how and when we will detect a faint stimulus amid background noise. Individual absolute thresholds vary, depending on the strength of the signal and also on our experience, expectations, motivation, and alertness. Our *difference threshold* (also called *just noticeable difference*, or *jnd*) is the difference we can discern between two stimuli 50 percent of the time. *Weber's law* states that two stimuli must differ by a constant proportion (not a constant amount) to be perceived as different. *Priming* shows that we process some information from stimuli below our absolute threshold for conscious awareness, but the effect is too fleeting to enable exploitation with subliminal messages.

6-4: What is the function of sensory adaptation?

Sensory adaptation (our diminished sensitivity to constant or routine odors, sounds, and touches) focuses our attention on informative changes in our environment.

6-5: How do our expectations, contexts, emotions, and motivation influence our perceptions?

Perceptual set is a mental predisposition that functions as a lens through which we perceive the world. Our learned concepts (schemas) prime us to organize and interpret ambiguous stimuli in certain ways. Our physical and emotional context, as well as our motivation, can create expectations and color our interpretation of events and behaviors.

VISION

6-6: What is the energy that we see as visible light?

What we see as light is only a thin slice of the broad spectrum of electromagnetic energy. The portion visible to humans extends from the blue-violet to the red light wavelengths.

6-7: How does the eye transform light energy into neural messages, and how do the eye and brain process that information?

After entering the eye and being focused by a lens, light energy particles strike the eye's inner surface, the *retina*, where light-sensitive *rods* and color-sensitive *cones* convert the light energy into neural impulses. The *hue* we perceive in a light depends on its *wavelength*, and its brightness depends on its *intensity*. After processing by bipolar and ganglion cells in the eyes' retina, neural impulses travel through the *optic nerve*, to the thalamus, and on to the visual cortex. In the visual cortex, *feature detectors* respond to specific features of the visual stimulus. Supercell clusters in other critical areas respond to more complex patterns. Through *parallel processing*, the brain handles many aspects of vision (color, movement, form, and depth) simultaneously. Other neural teams integrate the results, comparing them with stored information and enabling perceptions.

6-8: What theories help us understand color vision?

The *Young-Helmholtz trichromatic (three-color) theory* proposed that the retina contains three types of color receptors. Contemporary research has found three types of cones, each most sensitive to the wavelengths of one of the three primary colors of light (red, green, or blue). *Hering's opponent-process theory* proposed three additional color processes (red-versus-green, blue-versus-yellow, black-versus-white). Contemporary research has confirmed that, en route to the brain, neurons in the retina and the thalamus code the color-related information from the cones into pairs of opponent colors. These two theories, and the research supporting them, show that color processing occurs in two stages.

6-9: How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?

Gestalt psychologists searched for rules by which the brain organizes fragments of sensory data into *gestalts* (from the German word for "whole"), or meaningful forms. In pointing out that the whole may exceed the sum of its parts, they noted that we filter sensory information and construct our perceptions. To recognize an object, we must first perceive it (see it as a *figure*) as distinct from its surroundings (the *ground*). We bring order and form to stimuli by organizing them into meaningful *groups*, following such rules as proximity, continuity, and closure.

6-10: How do we use binocular and monocular cues to perceive the world in three dimensions?

Depth perception is our ability to see objects in three dimensions and judge distance. The *visual cliff* and other research demonstrate that many species perceive the world in three dimensions at, or very soon after, birth. *Binocular cues*, such as *retinal disparity*, are depth cues that rely on information from both eyes. *Monocular cues* (such as relative size, interposition, relative height, relative motion, linear perspective, and light and shadow) let us judge depth using information transmitted by only one eye.

6-11: How do perceptual constancies help us organize our sensations into meaningful perceptions?

Perceptual constancy enables us to perceive objects as stable despite the changing image they cast on our retinas. *Color constancy* is our ability to perceive consistent color in objects, even though the lighting and wavelengths shift. Brightness (or lightness) constancy is our ability to perceive an object as having a constant lightness even when its illumination—the light cast upon it—changes. Our brain constructs our experience of an object's color or brightness through comparisons with other surrounding objects. Shape constancy is our ability to perceive familiar objects (such as an opening door) as unchanging in shape. Size constancy is perceiving objects as unchanging in size despite

their changing retinal images. Knowing an object's size gives us clues to its distance; knowing its distance gives clues about its size, but we sometimes misread monocular distance cues and reach the wrong conclusions, as in the Moon illusion.

6-12: What does research on restored vision, sensory restriction, and perceptual adaptation reveal about the effects of experience on perception?

Experience guides our perceptual interpretations. People blind from birth who gained sight after surgery lack the experience to visually recognize shapes, forms, and complete faces. Sensory restriction research indicates that there is a critical period for some aspects of sensory and perceptual development. Without early stimulation, the brain's neural organization does not develop normally. People given glasses that shift the world slightly to the left or right, or even upside down, experience *perceptual adaptation*. They are initially disoriented, but they manage to adapt to their new context.

HEARING

6-13: What are the characteristics of air pressure waves that we hear as sound, and how does the ear transform sound energy into neural messages?

Sound waves are bands of compressed and expanded air. Our ears detect these changes in air pressure and transform them into neural impulses, which the brain decodes as sound. Sound waves vary in amplitude, which we perceive as differing loudness, and in *frequency*, which we experience as differing *pitch*. The outer ear is the visible portion of the ear. The *middle ear* is the chamber between the eardrum and *cochlea*. The *inner ear* consists of the cochlea, semicircular canals, and vestibular sacs. Through a mechanical chain of events, sound waves traveling through the auditory canal cause tiny vibrations in the eardrum. The bones of the middle ear amplify the vibrations and relay them to the fluid-filled cochlea. Rippling of the basilar membrane, caused by pressure changes in the cochlear fluid, causes movement of the tiny hair cells, triggering neural messages to be sent (via the thalamus) to the auditory cortex in the brain. *Sensorineural hearing loss* (or nerve deafness) results from damage to the cochlea's hair cells or their associated nerves. *Conduction hearing loss* results from damage to the mechanical system that transmits sound waves to the cochlea. *Cochlear implants* can restore hearing for some people.

6-14: What theories help us understand pitch perception?

Place theory explains how we hear high-pitched sounds, and *frequency theory* explains how we hear low-pitched sounds. (A combination of the two theories explains how we hear pitches in the middle range.) Place theory proposes that our brain interprets a particular pitch by decoding the place where a sound wave stimulates the cochlea's basilar membrane. Frequency theory proposes that the brain deciphers the frequency of the neural impulses traveling up the auditory nerve to the brain.

6-15: How do we locate sounds?

Sound waves strike one ear sooner and more intensely than the other. The brain analyzes the minute differences in the sounds received by the two ears and computes the sound's source.

THE OTHER SENSES

6-16: How do we sense touch?

Our sense of touch is actually several senses—pressure, warmth, cold, and pain—that combine to produce other sensations, such as “hot.”

6-17: How can we best understand and control pain?

Pain reflects bottom-up sensations (such as input from nociceptors, the sensory receptors that detect hurtful temperatures, pressure, or chemicals) and top-down processes (such as experience, attention, and culture). One theory of pain is that a “*gate*” in the spinal cord either opens to permit pain signals traveling up small nerve fibers to reach the brain, or closes to prevent their passage. The biopsychosocial

perspective views our perception of pain as the sum of biological, psychological, and social-cultural influences. Pain treatments often combine physical and psychological elements, including placebos and distractions.

6-18: How do we experience taste and smell?

Taste and smell are chemical senses. Taste is a composite of five basic sensations—sweet, sour, salty, bitter, and umami—and of the aromas that interact with information from the taste receptor cells of the taste buds. There are no basic sensations for smell. We have some 5 million olfactory receptor cells, with about 350 different receptor proteins. Odor molecules trigger combinations of receptors, in patterns that the olfactory cortex interprets. The receptor cells send messages to the brain's olfactory bulb, then to the temporal lobe, and to parts of the limbic system.

6-19: How do we sense our body's position and movement?

Through *kinesthesia*, we sense the position and movement of our body parts. We monitor our head's (and thus our body's) position and movement, and maintain our balance with our *vestibular sense*.

SENSORY INTERACTION

6-20: How do our senses interact?

Our senses can influence one another. This *sensory interaction* occurs, for example, when the smell of a favorite food amplifies its taste. *Embodied cognition* is the influence of bodily sensations, gestures, and other states on cognitive preferences and judgments.

6-21: What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test?

Parapsychology is the study of paranormal phenomena, including *extrasensory perception (ESP)* and psychokinesis. The three most testable forms of ESP are telepathy (mind-to-mind communication), clairvoyance (perceiving remote events), and precognition (perceiving future events). Skeptics argue that (1) to believe in ESP, you must believe the brain is capable of perceiving without sensory input; (2) researchers have been unable to replicate ESP phenomena under controlled conditions.

CHAPTER 7 Learning

HOW DO WE LEARN?

7-1: What is learning, and what are some basic forms of learning?

Learning is the process of acquiring new and relatively enduring information or behaviors. In *associative learning*, we learn that certain events occur together. In classical conditioning, we learn to associate two or more stimuli (a *stimulus* is any event or situation that evokes a response). In operant conditioning, we learn to associate a response and its consequences. Through *cognitive learning*, we acquire mental information that guides our behavior. For example, in observational learning, we learn new behaviors by observing events and watching others.

CLASSICAL CONDITIONING

7-2: What are the basic components of classical conditioning, and what was behaviorism's view of learning?

Classical conditioning is a type of learning in which an organism comes to associate stimuli. In classical conditioning, an *NS* is a stimulus that elicits no response before conditioning. A *UR* is an event that occurs naturally (such as salivation), in response to some stimulus. A *US* is something that naturally and automatically (without learning) triggers the unlearned response (as food in the mouth triggers salivation). A *CS* is a previously neutral stimulus (such as a tone) that, after association with a *US* (such as food) comes to trigger a *CR*. A *CR* is the learned response (salivating) to the originally neutral (but now conditioned) stimulus. Ivan Pavlov's work on classical conditioning

laid the foundation for *behaviorism*, the view that psychology should be an objective science that studies behavior without reference to mental processes. The behaviorists believed that the basic laws of learning are the same for all species, including humans.

7-3: In classical conditioning, what are the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination?

In classical conditioning, *acquisition* is associating an NS with the US so that the NS begins triggering the CR. Acquisition occurs most readily when the NS is presented just before (ideally, about a half-second before) a US, preparing the organism for the upcoming event. This finding supports the view that classical conditioning is biologically adaptive. *Extinction* is diminished responding when the CS no longer signals an impending US. *Spontaneous recovery* is the appearance of a formerly extinguished response, following a rest period. *Generalization* is the tendency to respond to stimuli that are similar to a CS. *Discrimination* is the learned ability to distinguish between a CS and other irrelevant stimuli.

7-4: Why does Pavlov’s work remain so important, and what have been some applications of his work to human health and well-being?

Pavlov taught us that significant psychological phenomena can be studied objectively, and that classical conditioning is a basic form of learning that applies to all species. Classical conditioning techniques are used to improve human health and well-being in many areas, including behavioral therapy for some types of psychological disorders. The body’s immune system may also respond to classical conditioning.

OPERANT CONDITIONING

7-5: What is operant conditioning, and how is operant behavior reinforced and shaped?

In *operant conditioning*, behaviors followed by reinforcers increase; those followed by punishers often decrease. Expanding on Edward Thorndike’s *law of effect*, B. F. Skinner and others found that the behavior of rats or pigeons placed in an *operant chamber* (Skinner box) can be *shaped* by using reinforcers to guide closer and closer approximations of the desired behavior.

7-6: How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

Reinforcement is any consequence that strengthens behavior. *Positive reinforcement* adds a desirable stimulus to increase the frequency of a behavior. *Negative reinforcement* removes an aversive stimulus to increase the frequency of a behavior. *Primary reinforcers* (such as receiving food when hungry or having nausea end during an illness) are innately satisfying—no learning is required. *Conditioned* (or secondary) *reinforcers* (such as cash) are satisfying because we have learned to associate them with more basic rewards (such as the food or medicine we buy with them). Immediate reinforcers (such as a purchased treat) offer immediate payback; delayed reinforcers (such as a weekly paycheck) require the ability to delay gratification.

7-7: How do different reinforcement schedules affect behavior?

A *reinforcement schedule* defines how often a response will be reinforced. In *continuous reinforcement* (reinforcing desired responses every time they occur), learning is rapid, but so is extinction if rewards cease. In *partial (intermittent) reinforcement* (reinforcing responses only sometimes), initial learning is slower, but the behavior is much more resistant to extinction. *Fixed-ratio schedules* reinforce behaviors after a set number of responses; *variable-ratio schedules*, after an unpredictable number. *Fixed-interval schedules* reinforce behaviors after set time periods; *variable-interval schedules*, after unpredictable time periods.

7-8: How does punishment differ from negative reinforcement, and how does punishment affect behavior?

Punishment administers an undesirable consequence (such as spanking) or withdraws something desirable (such as taking away a favorite toy) in an attempt to decrease the

frequency of a behavior (a child's disobedience). Negative reinforcement (taking an aspirin) removes an aversive stimulus (a headache). This desired consequence (freedom from pain) increases the likelihood that the behavior (taking aspirin to end pain) will be repeated. Punishment can have undesirable side effects, such as suppressing rather than changing unwanted behaviors; teaching aggression; creating fear; encouraging discrimination (so that the undesirable behavior appears when the punisher is not present); and fostering depression and feelings of helplessness.

7-9: Why did Skinner's ideas provoke controversy, and how might his operant conditioning principles be applied at school, in sports, at work, and at home?

Critics of Skinner's principles believed the approach dehumanized people by neglecting their personal freedom and seeking to control their actions. Skinner replied that people's actions are already controlled by external consequences, and that reinforcement is more humane than punishment as a means for controlling behavior. In school, teachers can use shaping techniques to guide students' behaviors, and they can use interactive software and websites to provide immediate feedback. In sports, coaches can build players' skills and self-confidence by rewarding small improvements. At work, managers can boost productivity and morale by rewarding well-defined and achievable behaviors. At home, parents can reward desired behaviors but not undesirable ones. We can shape our own behaviors by stating our goals, monitoring the frequency of desired behaviors, reinforcing desired behaviors, and gradually reducing rewards as behaviors become habitual. Operant conditioning techniques are also used in behavior modification therapies.

7-10: How does operant conditioning differ from classical conditioning?

In operant conditioning, an organism learns associations between its own behavior and resulting events; this form of conditioning involves *operant behavior* (behavior that operates on the environment, producing rewarding or punishing consequences). In classical conditioning, the organism forms associations between stimuli-events it does not control; this form of conditioning involves *respondent behavior* (automatic responses to some stimulus).

BIOLOGY, COGNITION, AND LEARNING

7-11: How do biological constraints affect classical and operant conditioning?

Classical conditioning principles, we now know, are constrained by biological predispositions, so that learning some associations is easier than learning others. Learning is adaptive: Each species learns behaviors that aid its survival. Biological constraints also place limits on operant conditioning. Training that attempts to override biological constraints will probably not endure because animals will revert to predisposed patterns.

7-12: How do cognitive processes affect classical and operant conditioning?

In classical conditioning, animals may learn when to expect a US and may be aware of the link between stimuli and responses. In operant conditioning, *cognitive mapping* and *latent learning* research demonstrate the importance of cognitive processes in learning. Other research shows that excessive rewards (driving *extrinsic motivation*) can undermine *intrinsic motivation*.

LEARNING BY OBSERVATION

7-13: What is observational learning, and how do some scientists believe it is enabled by mirror neurons?

In *observational learning*, as we observe and imitate others we learn to anticipate a behavior's consequences because we experience vicarious reinforcement or vicarious punishment. Our brain's frontal lobes have a demonstrated ability to mirror the activity of another's brain. (Some psychologists believe *mirror neurons* enable this process.) The same areas fire when we perform certain actions (such as responding to pain or moving our mouth to form words) as when we observe someone else performing those actions.

7-14: What is the impact of prosocial modeling and of antisocial modeling?

Children tend to imitate what a model does and says, whether the behavior being modeled is *prosocial* (positive, constructive, and helpful) or antisocial. If a model's actions and words are inconsistent, children may imitate the hypocrisy they observe.

CHAPTER 8 Memory**STUDYING MEMORY****8-1: What is memory, and how is it measured?**

Memory is learning that has persisted over time, through the storage and retrieval of information. Evidence of memory may be *recalling* information, *recognizing* it, or *relearning* it more easily on a later attempt.

8-2: How do psychologists describe the human memory system?

Psychologists use memory models to think and communicate about memory. Information-processing models involve three processes: *encoding*, *storage*, and *retrieval*. The connectionism information-processing model views memories as products of interconnected neural networks. The three processing stages in the Atkinson-Shiffrin model are *sensory memory*, *short-term memory*, and *long-term memory*. More recent research has updated this model to include two important concepts: (1) *working memory*, to stress the active processing occurring in the second memory stage; and (2) automatic processing, to address the processing of information outside of conscious awareness.

BUILDING MEMORIES: ENCODING**8-3: How do explicit and implicit memories differ?**

Through parallel processing, the human brain processes many things simultaneously, on dual tracks. *Explicit* (declarative) *memories*—our conscious memories of facts and experiences—form through *effortful processing*, which requires conscious effort and attention. *Implicit* (nondeclarative) *memories*—of skills and classically conditioned associations—happen without our awareness, through *automatic processing*.

8-4: What information do we automatically process?

In addition to skills and classically conditioned associations, we automatically process incidental information about space, time, and frequency.

8-5: How does sensory memory work?

Sensory memory feeds some information into working memory for active processing there. An *iconic memory* is a very brief (a few tenths of a second) sensory memory of visual stimuli; an *echoic memory* is a three- or four-second sensory memory of auditory stimuli.

8-6: What is the capacity of our short-term and working memory?

Short-term memory capacity is about seven items, plus or minus two, but this information disappears from memory quickly without rehearsal. Working memory capacity varies, depending on age, intelligence level, and other factors.

8-7: What are some effortful processing strategies that can help us remember new information?

Effective effortful processing strategies include *chunking*, *mnemonics*, hierarchies, and distributed practice sessions. The *testing effect* is the finding that consciously retrieving, rather than simply rereading, information enhances memory.

8-8: What are the levels of processing, and how do they affect encoding?

Depth of processing affects long-term retention. In *shallow processing*, we encode words based on their structure or appearance. Retention is best when we use *deep processing*, encoding words based on their meaning. We also more easily remember material that is personally meaningful—the self-reference effect.

MEMORY STORAGE

8-9: What are the capacity and location of our long-term memories?

Our long-term memory capacity is essentially unlimited. Memories are not stored intact in the brain in single spots. Many parts of the brain interact as we form and retrieve memories.

8-10: What roles do the frontal lobes and hippocampus play in memory storage?

The frontal lobes and *hippocampus* are parts of the brain network dedicated to explicit memory formation. Many brain regions send information to the frontal lobes for processing. The hippocampus, with the help of surrounding areas of cortex, registers and temporarily holds elements of explicit memories before moving them to other brain regions for long-term storage.

8-11: What roles do the cerebellum and basal ganglia play in our memory processing?

The cerebellum and basal ganglia are parts of the brain network dedicated to implicit memory formation. The cerebellum is important for storing classically conditioned memories. The basal ganglia are involved in motor movement and help form procedural memories for skills. Many reactions and skills learned during our first three years continue into our adult lives, but we cannot consciously remember learning these associations and skills, a phenomenon psychologists call “infantile amnesia.”

8-12: How do emotions affect our memory processing?

Emotional arousal causes an outpouring of stress hormones, which lead to activity in the brain’s memory-forming areas. Significantly stressful events can trigger very clear *flashbulb memories*.

8-13: How do changes at the synapse level affect our memory processing?

Long-term potentiation (LTP) appears to be the neural basis of learning. In LTP, neurons become more efficient at releasing and sensing the presence of neurotransmitters, and more connections develop between neurons.

RETRIEVAL: GETTING INFORMATION OUT

8-14: How do external cues, internal emotions, and order of appearance influence memory retrieval?

Three measures of retention are recalling information, recognizing it, or relearning it more easily on a later attempt. External cues activate associations that help us retrieve memories; this process may occur without our awareness, as it does in *priming*. Returning to the same physical context or emotional state (*mood congruency*) in which we formed a memory can help us retrieve it. The *serial position effect* accounts for our tendency to recall best the last items (which may still be in working memory) and the first items (which we’ve spent more time rehearsing) in a list.

FORGETTING

8-15: Why do we forget?

Anterograde amnesia is an inability to form new memories. *Retrograde amnesia* is an inability to retrieve old memories. Normal forgetting can happen because we have never encoded information; because the physical trace has decayed; or because we cannot retrieve what we have encoded and stored. Retrieval problems may result from *proactive* (forward-acting) *interference*, as prior learning interferes with recall of new information, or from *retroactive* (backward-acting) *interference*, as new learning disrupts recall of old information. Some believe that motivated forgetting occurs, but researchers have found little evidence of *repression*.

MEMORY CONSTRUCTION ERRORS

8-16: How do misinformation, imagination, and source amnesia influence our memory construction? How do we decide whether a memory is real or false?

In experiments demonstrating the *misinformation effect*, people have formed false memories, incorporating misleading details, after receiving wrong information after

an event, or after repeatedly imagining and rehearsing something that never happened. When we reassemble a memory during retrieval, we may attribute it to the wrong source (*source amnesia*). Source amnesia may help explain *déjà vu*. False memories feel like real memories and can be persistent but are usually limited to the gist of the event.

8-17: How reliable are young children’s eyewitness descriptions, and why are reports of repressed and recovered memories so hotly debated?

Children are susceptible to the misinformation effect, but if questioned in neutral words they understand, they can accurately recall events and people involved in them. The debate (between memory researchers and some well-meaning therapists) focuses on whether most memories of early childhood abuse are repressed and can be recovered during therapy using “memory work” techniques using leading questions or hypnosis. Psychologists now agree that (1) sexual abuse happens; (2) injustice happens; (3) forgetting happens; (4) recovered memories are commonplace; (5) memories of things that happened before age 3 are unreliable; (6) memories “recovered” under hypnosis or the influence of drugs are especially unreliable; and (7) memories, whether real or false, can be emotionally upsetting.

IMPROVING MEMORY

8-18: How can you use memory research findings to do better in this and other courses?

Memory research findings suggest the following strategies for improving memory: Study repeatedly, make material meaningful, activate retrieval cues, use mnemonic devices, minimize interference, sleep more, and test yourself to be sure you can retrieve, as well as recognize, material.

CHAPTER 9 Thinking, Language, and Intelligence

THINKING

9-1: What is cognition, and what are the functions of concepts?

Cognition refers to all the mental activities associated with thinking, knowing, remembering, and communicating. We use *concepts*, mental groupings of similar objects, events, ideas, or people, to simplify and order the world around us. We form most concepts around *prototypes*, or best examples of a category.

9-2: What cognitive strategies assist our problem solving, and what obstacles hinder it?

An *algorithm* is a methodical, logical rule or procedure (such as a step-by-step description for evacuating a building during a fire) that guarantees a solution to a problem. A *heuristic* is a simpler strategy (such as running for an exit if you smell smoke) that is usually speedier than an algorithm but is also more error-prone. *Insight* is not a strategy-based solution, but rather a sudden flash of inspiration that solves a problem. Obstacles to problem solving include *confirmation bias*, which predisposes us to verify rather than challenge our hypotheses, and fixation, such as *mental set*, which may prevent us from taking the fresh perspective that would lead to a solution.

9-3: What is intuition, and how can the availability heuristic, overconfidence, belief perseverance, and framing influence our decisions and judgments?

Intuition is the effortless, immediate, automatic feeling or thoughts we often use instead of systematic reasoning. Heuristics enable snap judgments. Using the *availability heuristic*, we judge the likelihood of things based on how readily they come to mind, which often leads us to fear the wrong things. *Overconfidence* can lead us to overestimate the accuracy of our beliefs. When a belief we have formed and explained has been discredited, *belief perseverance* may cause us to cling to that belief. A remedy for belief perseverance is to consider how we might have explained an opposite result. *Framing* is the way a question or statement is worded. Subtle wording differences can dramatically alter our responses.

9-4: How do smart thinkers use intuition?

As people gain expertise, they grow adept at making quick, shrewd judgments. Smart thinkers welcome their intuitions (which are usually adaptive), but when making complex decisions they gather as much information as possible and then take time to let their two-track mind process all available information.

9-5: What is creativity, and what fosters it?

Creativity, the ability to produce novel and valuable ideas, correlates somewhat with aptitude, but is more than school smarts. Aptitude tests require *convergent thinking*, but creativity requires *divergent thinking*. Robert Sternberg has proposed that creativity has five components: expertise; imaginative thinking skills; a venturesome personality; intrinsic motivation; and a creative environment that sparks, supports, and refines creative ideas.

9-6: What do we know about animal thinking?

Researchers make inferences about other species' consciousness and intelligence based on behavior. Evidence from studies of various species shows that other animals use concepts, numbers, and tools and that they transmit learning from one generation to the next (cultural transmission). And, like humans, other species also show insight, self-awareness, altruism, cooperation, and grief.

LANGUAGE**9-7: What are the structural components of a language?**

Phonemes are a language's basic units of sound. *Morphemes* are the elementary units of meaning. *Grammar*—the system of rules that enables us to communicate—includes semantics (rules for deriving meaning) and syntax (rules for ordering words into sentences).

9-8: What are the milestones in language development, and how do we acquire language?

Language development's timing varies, but all children follow the same sequence. Receptive language (the ability to understand what is said to or about you) develops before productive language (the ability to produce words). At about 4 months of age, infants *babble*, making sounds found in languages from all over the world. By about 10 months, their babbling contains only the sounds found in their household language. Around 12 months of age, children begin to speak in single words. This *one-word stage* evolves into *two-word (telegraphic)* utterances before their second birthday, after which they begin speaking in full sentences. Linguist Noam Chomsky has proposed that all human languages share a universal grammar—the basic building blocks of language—and that humans are born with a predisposition to learn language. B.F. Skinner believed we learn language as we learn other things—by association, imitation, and reinforcement. We acquire a specific language through learning as our biology and experience interact. Childhood is a critical period for learning to speak and/or sign fluently.

9-9: What brain areas are involved in language processing and speech?

Aphasia is an impairment of language, usually caused by left-hemisphere damage. Two important language- and speech-processing areas are *Broca's area*, a region of the frontal lobe that controls language expression, and *Wernicke's area*, a region in the left temporal lobe that controls language reception. Language processing is spread across other brain areas as well, where different neural networks handle specific linguistic subtasks.

9-10: Do other animals share our capacity for language?

A number of chimpanzees and bonobos have (1) learned to communicate with humans by signing or by pushing buttons wired to a computer, (2) developed vocabularies of nearly 400 words, (3) communicated by stringing these words together, (4) taught their skills to younger animals, and (5) demonstrated some understanding of syntax. But only humans communicate in complex sentences. Nevertheless, other animals' impressive abilities to think and communicate challenge humans to consider what this means about the moral rights of other species.

THINKING AND LANGUAGE

9-11: What is the relationship between thinking and language, and what is the value of thinking in images?

Although Benjamin Lee Whorf's *linguistic determinism* hypothesis suggested that language determines thought, it is more accurate to say that language influences thought. Different languages embody different ways of thinking, and immersion in bilingual education can enhance thinking. We often think in images when we use implicit (nondeclarative, procedural) memory—our automatic memory system for motor and cognitive skills and classically conditioned associations. Thinking in images can increase our skills when we mentally practice upcoming events.

INTELLIGENCE

9-12: How do psychologists define *intelligence*, and what are the arguments for *g*?

Intelligence is a mental quality consisting of the ability to learn from experience, solve problems, and use knowledge to adapt to new situations. Charles Spearman proposed that we have one *general intelligence* (*g*) underlying all other specific mental abilities. He helped develop factor analysis, a statistical procedure that identifies clusters of related abilities.

9-13: How do Gardner's and Sternberg's theories of multiple intelligences differ?

Savant syndrome seems to support Howard Gardner's view that we have multiple intelligences. He proposed eight independent intelligences: linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, intrapersonal, interpersonal, and naturalist. Robert Sternberg's triarchic theory proposes three intelligence areas that predict real-world skills: analytical (academic problem-solving), creative, and practical.

9-14: What are the four components of emotional intelligence?

Emotional intelligence, which is an aspect of social intelligence, is the ability to perceive, understand, manage, and use emotions. Emotionally intelligent people achieve greater personal and professional success. Some critics question whether calling these abilities "intelligence" stretches that concept too far.

9-15: When and why were intelligence tests created, and how do today's tests differ from early intelligence tests?

Alfred Binet started the modern intelligence-testing movement in France in 1904 when he developed questions to help predict children's future progress in the Paris school system. During the early twentieth century, Lewis Terman of Stanford University revised Binet's work for use in the United States (which resulted in the *Stanford-Binet* intelligence test). William Stern contributed the concept of the *IQ* (intelligence quotient). The most widely used intelligence tests today are the *Wechsler Adult Intelligence Scale (WAIS)* and Wechsler's tests for children. These tests differ from their predecessors in the way they offer an overall intelligence score as well as scores for various verbal and performance areas.

9-16: What is a normal curve, and what does it mean to say that a test has been standardized and is reliable and valid?

The distribution of test scores often forms a *normal* (bell-shaped) *curve* around the central average score, with fewer and fewer scores at the extremes. *Standardization* establishes a basis for meaningful score comparisons by giving a test to a representative sample of future test-takers. *Reliability* is the extent to which a test yields consistent results (on two halves of the test, or when people are retested). *Validity* is the extent to which a test measures or predicts what it is supposed to. A test has *content validity* if it samples the pertinent behavior (as a driving test measures driving ability). It has *predictive validity* if it predicts a behavior it was designed to predict. (Aptitude tests have predictive ability if they can predict future achievements.)

9-17: What are the traits of those at the low and high intelligence extremes?

At the low extreme are those with unusually low scores. An intelligence test score of or below 70 is one diagnostic criterion for the diagnosis of *intellectual disability*; other

criteria are limited conceptual, social, and practical skills. One condition included in this category is *Down syndrome*, a developmental disorder caused by an extra copy of chromosome 21. People at the high-intelligence extreme tend to be healthy and well-adjusted, as well as unusually successful academically.

9-18: How does aging affect crystallized and fluid intelligence?

Cross-sectional studies (comparing people of different ages) and longitudinal studies (retesting the same group over a period of years) have shown that *fluid intelligence* declines in older adults, in part because neural processing slows. *Crystallized intelligence* tends to increase. The stability of intelligence test scores increases with age.

9-19: What evidence points to a genetic influence on intelligence, and what is heritability?

Studies of twins, family members, and adoptees indicate a significant hereditary contribution to intelligence scores. Intelligence seems to be polygenetic, and researchers are searching for genes that exert an influence. *Heritability* is the proportion of variation among individuals that can be attributed to genes.

9-20: What does evidence reveal about environmental influences on intelligence?

Studies of twins, family members, and adoptees also provide evidence of environmental influences. Test scores of identical twins raised apart are slightly less similar (though still very highly correlated) than the scores of identical twins raised together. Studies of children reared in extremely impoverished environments with minimal social interaction indicate that life experiences can significantly influence intelligence test performance. No evidence supports the idea that normal, healthy children can be molded into geniuses by growing up in an exceptionally enriched environment.

9-21: How and why do the genders differ in mental ability scores?

Males and females tend to have the same average intelligence test scores, but they differ in some specific abilities. Girls are better spellers, more verbally fluent, better at locating objects, better at detecting emotions, and more sensitive to touch, taste, and color. Boys outperform girls at spatial ability and related mathematics, though girls outperform boys in math computation. Boys also outnumber girls at the low and high extremes of mental abilities. Evolutionary and cultural explanations have been proposed for these gender differences.

9-22: How and why do racial and ethnic groups differ in mental ability scores?

Racial and ethnic groups differ in their average intelligence test scores. The evidence suggests that environmental differences are largely, perhaps entirely, responsible for these group differences.

9-23: Are intelligence tests inappropriately biased?

Aptitude tests aim to predict how well a test-taker will perform in a given situation. So they are necessarily “biased” in the sense that they are sensitive to performance differences caused by cultural experience. By “inappropriately biased,” psychologists mean that a test predicts less accurately for one group than for another. In this sense, most experts consider the major aptitude tests unbiased. *Stereotype threat*, a self-confirming concern that one will be evaluated based on a negative stereotype, affects performance on all kinds of tests.

CHAPTER 10 > Motivation and Emotion

MOTIVATIONAL CONCEPTS

10-1: How do psychologists define *motivation*? From what perspectives do they view motivated behavior?

Motivation is a need or desire that energizes and directs behavior. The *instinct/evolutionary* perspective explores genetic influences on complex behaviors.

Drive-reduction theory explores how physiological needs create aroused tension states (drives) that direct us to satisfy those needs. Environmental *incentives* can intensify drives. Drive-reduction's goal is *homeostasis*, maintaining a steady internal state. Arousal theory proposes that some behaviors (such as those driven by curiosity) do not reduce physiological needs but rather are prompted by a search for an optimum level of arousal. The *Yerkes-Dodson law* states that performance increases with arousal, but only to a certain point, after which it decreases. Performance peaks at lower levels of arousal for difficult tasks, and at higher levels for easy or well-learned tasks. Abraham Maslow's *hierarchy of needs* proposes a pyramid of human needs, from basic needs such as hunger and thirst up to higher-level needs such as self-actualization and self-transcendence.

HUNGER

10-2: What physiological factors produce hunger?

Hunger's pangs correspond to the stomach's contractions, but hunger also has other causes. Neural areas in the brain, some within the hypothalamus, monitor blood chemistry (including level of *glucose*) and incoming information about the body's state. Appetite hormones include insulin (controls blood glucose); ghrelin (secreted by an empty stomach); orexin (secreted by the hypothalamus); leptin (secreted by fat cells); and PYY (secreted by the digestive tract). *Basal metabolic rate* is the body's resting rate of energy expenditure. The body may have a *set point* (a biologically fixed tendency to maintain an optimum weight) or a looser settling point (also influenced by the environment).

10-3: What cultural and situational factors influence hunger?

Hunger also reflects our memory of when we last ate and our expectation of when we should eat again. Humans as a species prefer certain tastes (such as sweet and salty), but our individual preferences are also influenced by conditioning, culture, and situation. Some taste preferences, such as the avoidance of new foods, or of foods that have made us ill, have survival value.

10-4: What factors predispose some people to become and remain obese?

Genes and environment interact to produce obesity. Obesity correlates with depression, especially among women. Twin and adoption studies indicate that body weight is also genetically influenced. Environmental influences include lack of exercise, an abundance of high-calorie food, and social influence. Those wishing to lose weight are advised to make a lifelong change in habits: Get enough sleep; boost energy expenditure through exercise; limit variety and minimize exposure to tempting food cues; eat healthy foods and reduce portion sizes; space meals throughout the day; beware of the binge; monitor eating during social events; forgive the occasional lapse; and connect to a support group.

THE NEED TO BELONG

10-5: What evidence points to our human need to belong?

Our need to affiliate or belong—to feel connected and identified with others—had survival value for our ancestors, which may explain why humans in every society live in groups. Because of their need to belong, people suffer when socially excluded, and they may engage in self-defeating behaviors (performing below their ability) or in antisocial behaviors. Feeling loved activates brain regions associated with reward and safety systems. Social isolation can put us at risk mentally and physically.

10-6: How does social networking influence us?

We connect with others through social networking, strengthening our relationships with those we already know. When networking, people tend toward increased self-disclosure. Working out strategies for self-control and disciplined usage can help people maintain a healthy balance between social connections and school and work performance.

ACHIEVEMENT MOTIVATION

10-7: What is achievement motivation?

Achievement motivation is a desire for significant accomplishment, for mastery of skills or ideas, for control, and for rapidly attaining a high standard. Achievements are more closely related to grit (passionate dedication to a long-term goal) than to raw ability.

EMOTION: AROUSAL, BEHAVIOR, AND COGNITION

10-8: How do arousal, cognition, and expressive behavior interact in emotion?

Emotions are psychological responses of the whole organism involving an interplay among physiological arousal, expressive behaviors, and conscious experience. Theories of emotion generally address two major questions: (1) Does physiological arousal come before or after emotional feelings, and (2) how do cognition and feeling interact? The *James-Lange theory* maintains that emotional feelings follow our body's response to emotion-inducing stimuli. The *Cannon-Bard theory* proposes that our physiological response to an emotion-inducing stimulus occurs at the same time as our subjective feeling of the emotion (one does not cause the other). The Schachter-Singer *two-factor theory* holds that our emotions have two ingredients, physical arousal and a cognitive label, and the cognitive labels we put on our states of arousal are an essential ingredient of emotion. Lazarus agreed that many important emotions arise from our interpretations or inferences. Zajonc and LeDoux, however, believe that some simple emotional responses occur instantly, not only outside our conscious awareness, but before any cognitive processing occurs. This interplay between emotion and cognition illustrates our dual-track mind.

EMBODIED EMOTION

10-9: What are some of the basic emotions?

Izard's 10 basic emotions are joy, interest-excitement, surprise, sadness, anger, disgust, contempt, fear, shame, and guilt.

10-10: What is the link between emotional arousal and the autonomic nervous system?

The arousal component of emotion is regulated by the autonomic nervous system's sympathetic (arousing) and parasympathetic (calming) divisions. In a crisis, the fight-or-flight response automatically mobilized your body for action.

10-11: Do different emotions activate different physiological and brain-pattern responses?

Emotions may be similarly arousing, but some subtle physiological responses, such as facial muscle movements, distinguish them. Meaningful differences have also been found in activity in some brain pathways and cortical areas.

10-12: How effective are polygraphs in using body states to detect lies?

Polygraphs, which measure several physiological indicators of emotion, are not accurate enough to justify widespread use in business and law enforcement. The use of guilty knowledge questions and new forms of technology may produce better indications of lying.

EXPRESSED AND EXPERIENCED EMOTION

10-13: How do we communicate nonverbally?

Much of our communication is through body movements, facial expressions, and voice tones. Even seconds-long filmed slices of behavior can reveal feelings.

10-14: How do women and men differ in their emotional expressions and experiences?

Women tend to read emotional cues more easily and to be more empathic. Their faces also express more emotion.

10-15: Do gestures and facial expressions mean the same thing in all cultures?

The meaning of gestures varies with culture, but facial expressions, such as those of happiness and fear, are common the world over. Cultures also differ in the amount of emotion they express.

10-16: How do our facial expressions influence our feelings?

Research on the *facial feedback effect* shows that our facial expressions can trigger emotional feelings and signal our body to respond accordingly. We also mimic others' expressions, which helps us empathize.

CHAPTER 11 > Stress, Health, and Human Flourishing**STRESS AND HEALTH****11-1: What events provoke stress responses, and how do we respond and adapt to stress?**

Stress is the process by which we appraise and respond to stressors (catastrophic events, significant life changes, and daily hassles) that challenge or threaten us. Walter Cannon viewed the stress response as a “fight-or-flight” system. Hans Selye proposed a general three-stage (alarm-resistance-exhaustion) *general adaptation syndrome (GAS)*. Facing stress, women may have a *tend-and-befriend* response; men may withdraw socially, turn to alcohol, or become aggressive.

11-2: How does stress make us more vulnerable to disease?

Psychoneuroimmunologists study mind-body interactions, including stress-related physical illnesses, such as hypertension and some headaches. Stress diverts energy from the immune system, inhibiting the activities of its B and T lymphocytes, macrophages, and NK cells. Stress does not cause diseases such as AIDS and cancer, but by altering our immune functioning it may make us more vulnerable to them and influence their progression.

11-3: Why are some of us more prone than others to coronary heart disease?

Coronary heart disease, North America's number one cause of death, has been linked with the reactive, anger-prone *Type A* personality. Compared with relaxed, easygoing *Type B* personalities, Type A people secrete more of the hormones that accelerate the buildup of plaque on the heart's artery walls. Chronic stress also contributes to persistent inflammation, which heightens the risk of clogged arteries and depression.

11-4: What are some healthful ways to cope with feelings of anger?

Chronic hostility is one of the negative emotions linked to heart disease. Emotional *catharsis* may be temporarily calming, but in the long run it does not reduce anger. Rehearsing anger can make us more angry. Controlled assertions of feelings may resolve conflicts, and forgiveness may rid us of angry feelings.

COPING WITH STRESS**11-5: In what two ways do people try to alleviate stress?**

We use *problem-focused coping* to change the stressor or the way we interact with it. We use *emotion-focused coping* to avoid or ignore stressors and attend to emotional needs related to stress reactions.

11-6: How does a perceived lack of control affect health?

Being unable to avoid repeated aversive events can lead to *learned helplessness*. People who perceive an *internal locus of control* achieve more, enjoy better health, and are happier than those who perceive an *external locus of control*. *Self-control* requires attention and energy, but it predicts good adjustment, better grades, and social success. A perceived lack of control provokes an outpouring of hormones that put people's health at risk.

11-7: What are the links among basic outlook on life, social support, stress, and health?

Studies of people with an optimistic outlook show that their immune system is stronger, their blood pressure does not increase as sharply in response to stress, their recovery from heart bypass surgery is faster, and their life expectancy is longer, compared with their pessimistic counterparts. Social support promotes health by calming us, reducing blood pressure and stress hormones, and by fostering stronger immune functioning.

REDUCING STRESS

11-8: How effective is aerobic exercise as a way to manage stress and improve well-being?

Aerobic exercise is sustained, oxygen-consuming activity that increases heart and lung fitness. It increases arousal, leads to muscle relaxation and sounder sleep, triggers production of neurotransmitters, and enhances self-image. It can relieve depression and, in later life, is associated with better cognitive functioning and longer life.

11-9: In what ways might relaxation and meditation influence stress and health?

Relaxation and meditation have been shown to reduce stress by relaxing muscles, lowering blood pressure, improving immune functioning, and lessening anxiety and depression. Massage therapy also relaxes muscles and reduces depression.

11-10: What is the faith factor, and what are some possible explanations for the link between faith and health?

The faith factor is the finding that religiously active people tend to live longer than those who are not religiously active. Possible explanations may include the effect of intervening variables, such as the healthy behaviors, social support, or positive emotions often found among people who regularly attend religious services.

HAPPINESS

11-11: What are the main effects of being happy?

A good mood brightens people's perceptions of the world. Happy people tend to be healthy, energized, and satisfied with life. They also are more willing to help others (the *feel-good, do-good phenomenon*).

11-12: What is subjective well-being, and what topics do positive psychology researchers explore? What are the three "pillars" of the movement?

Subjective well-being is your perception of being happy or satisfied with life. *Positive psychologists* study use scientific methods to study human flourishing, including topics such as positive emotions, positive health, positive neuroscience, and positive education. The three pillars of positive psychology are positive well-being; positive character; and positive groups, communities, and cultures.

11-13: How do time, wealth, adaptation, and comparison affect our happiness levels?

The moods triggered by good or bad events seldom last beyond that day. Even significant good events, such as sudden wealth, seldom increase happiness for long. Happiness is relative to our own experiences (the *adaptation-level phenomenon*) and to others' success (the *relative deprivation principle*).

11-14: What are some predictors of happiness, and how can we be happier?

Some individuals, because of their genetic predispositions and personal histories, are happier than others. Cultures, which vary in the traits they value and the behaviors they expect and reward, also influence personal levels of happiness. Those who want to be happier can (1) realize that financial success may not lead to enduring happiness; (2) take control of their time; (3) act happy to trigger facial and behavioral feedback; (4) seek skill-engaging work and leisure to foster "flow"; (5) exercise; (6) get adequate sleep; (7) nurture close relationships; (8) focus beyond themselves; (9) record and express their gratitude; (10) nurture their spiritual self.

CHAPTER 12 Personality

Personality is an individual's characteristic pattern of thinking, feeling, and acting.

PSYCHODYNAMIC THEORIES

Psychodynamic theories view personality from the perspective that behavior is a dynamic interaction between the conscious and unconscious mind. The theories trace their origin to Sigmund Freud's theory of *psychoanalysis*.

12-1: How did Sigmund Freud's treatment of psychological disorders lead to his view of the unconscious mind?

In treating patients whose disorders had no clear physical explanation, Freud concluded that these problems reflected unacceptable thoughts and feelings, hidden away in the *unconscious* mind. To explore this hidden part of a patient's mind, Freud used *free association* and dream analysis.

12-2: What was Freud's view of personality?

Freud believed that personality results from conflict arising from the interaction among the mind's three systems: the *id* (pleasure-seeking impulses), *ego* (reality-oriented executive), and *superego* (internalized set of ideals, or conscience).

12-3: What developmental stages did Freud propose?

He believed children pass through five *psychosexual stages* (oral, anal, phallic, latency, and genital). Unresolved conflicts at any stage can leave a person's pleasure-seeking impulses *fixated* (stalled) at that stage.

12-4: How did Freud think people defended themselves against anxiety?

For Freud, anxiety was the product of tensions between the demands of the *id* and *superego*. The *ego* copes by using unconscious *defense mechanisms*, such as *repression*, which he viewed as the basic mechanism underlying and enabling all the others.

12-5: Which of Freud's ideas did his followers accept or reject?

Freud's early followers, the neo-Freudians, accepted many of his ideas. They differed in placing more emphasis on the conscious mind and in stressing social motives more than sex or aggression. Contemporary psychodynamic theorists and therapists reject Freud's emphasis on sexual motivation. They stress, with support from modern research findings, the view that much of our mental life is unconscious, and they believe that our childhood experiences influence our adult personality and attachment patterns. Many also believe that our species' shared evolutionary history shaped some universal predispositions.

12-6: What are projective tests, how are they used, and what are some criticisms of them?

Projective tests attempt to assess personality by showing people ambiguous stimuli (open to many possible interpretations) and treating their answers as revelations of unconscious motives. One such test, the *Rorschach inkblot test*, has low reliability and validity, except in a few areas, such as hostility and anxiety.

12-7: How do contemporary psychologists view Freud's psychoanalysis?

They give Freud credit for drawing attention to the vast unconscious, to the struggle to cope with our sexuality, to the conflict between biological impulses and social restraints, and for some forms of defense mechanisms (false consensus effect/projection; reaction formation). But his concept of repression, and his view of the unconscious as a collection of repressed and unacceptable thoughts, wishes, feelings, and memories, cannot survive scientific scrutiny. Freud offered after-the-fact explanations, which are hard to test scientifically. Research does not support many of Freud's specific ideas, such as the view that development is fixed in childhood. (We now know it is lifelong.)

12-8: How has modern research developed our understanding of the unconscious?

Current research confirms that we do not have full access to all that goes on in our mind, but the current view of the unconscious is that it is a separate and parallel track of information processing which occurs outside our awareness. This processing includes schemas that control our perceptions; priming; implicit memories of learned skills; instantly activated emotions; and stereotypes that our information processing of others' traits and characteristics.

HUMANISTIC THEORIES

12-9: How did humanistic psychologists view personality, and what was their goal in studying personality?

The *humanistic psychologists'* view of personality focused on the potential for healthy personal growth and people's striving for self-determination and self-realization. Abraham Maslow proposed that human motivations form a hierarchy of needs; if basic needs are fulfilled, people will strive toward *self-actualization* and self-transcendence. Carl Rogers believed that the ingredients of a growth-promoting environment are genuineness, acceptance (including *unconditional positive regard*), and empathy. *Self-concept* was a central feature of personality for both Maslow and Rogers.

12-10: How did humanistic psychologists assess a person's sense of self?

Some rejected any standardized assessments and relied on interviews and conversations. Rogers sometimes used questionnaires in which people described their ideal and actual selves, which he later used to judge progress during therapy.

12-11: How have humanistic theories influenced psychology? What criticisms have they faced?

Humanistic psychology helped renew interest in the concept of self. Critics have said that humanistic psychology's concepts were vague and subjective, its values self-centered, and its assumptions naively optimistic.

TRAIT THEORIES

12-12: How do psychologists use traits to describe personality?

Trait theorists see personality as a stable and enduring pattern of behavior. They describe our differences rather than trying to explain them. Using factor analysis, they identify clusters of behavior tendencies that occur together. Genetic predispositions influence many traits.

12-13: What are personality inventories, and what are their strengths and weaknesses as trait-assessment tools?

Personality inventories (such as the *MMPI*) are questionnaires on which people respond to items designed to gauge a wide range of feelings and behaviors. Test items are *empirically derived*, and the tests are objectively scored. But people can fake their answers to create a good impression, and the ease of computerized testing may lead to misuse of the tests.

12-14: Which traits seem to provide the most useful information about personality variation?

The Big Five personality factors—conscientiousness, agreeableness, neuroticism, openness, and extraversion (CANOE)—currently offer the clearest picture of personality. These factors are stable and appear to be found in all cultures.

12-15: Does research support the consistency of personality traits over time and across situations?

A person's average traits persist over time and are predictable over many different situations. But traits cannot predict behavior in any one particular situation.

SOCIAL-COGNITIVE THEORIES

12-16: How do the social-cognitive theorists view personality development, and how do they explore behavior?

Albert Bandura first proposed the *social-cognitive perspective*, which views personality as the product of the interaction between a person's traits (including thinking) and the situation—the social context. Social-cognitive researchers apply principles of learning, cognition, and social behavior to personality. *Reciprocal determinism* is a term describing the interaction and mutual influence of behavior, internal personal factors, and environmental factors.

12-17: What criticisms have social-cognitive researchers faced?

Social-cognitive researchers build on well-established concepts of learning and cognition. They tend to believe that the best way to predict someone's behavior in a given situation is to observe that person's behavior in similar situations. They have been faulted for underemphasizing the importance of unconscious motives, emotions, and biologically influenced traits.

EXPLORING THE SELF**12-18: Why has psychology generated so much research on the self? How important is self-esteem to psychology and to our well-being?**

The *self* is the center of personality, organizing our thoughts, feelings, and actions. Considering possible selves helps motivate us toward positive development, but focusing too intensely on ourselves can lead to the *spotlight effect*. *Self-esteem* is our feeling of self-worth; *self-efficacy* is our sense of competence on a task. High self-esteem correlates with less pressure to conform, persistence at difficult tasks, and social skills. But the direction of the correlation is not clear. Psychologists are now more pessimistic about the value of unrealistically promoting children's feelings of self-worth, rather than rewarding their achievements, which lead to feelings of competence.

12-19: What evidence reveals self-serving bias, and how do defensive and secure self-esteem differ?

Self-serving bias is our tendency to perceive ourselves favorably, as when viewing ourselves as better than average or when accepting credit for our successes but not blame for our failures. *Narcissism* is excessive self-love and self-absorption. Defensive (unrealistically high) self-esteem is fragile, focuses on sustaining itself, and views failure or criticism as a threat. Secure self-esteem enables us to feel accepted for who we are.

12-20: How do individualist and collectivist cultures influence people?

Within any culture, the degree of individualism or collectivism varies from person to person. Cultures based on self-reliant *individualism*, like those found in North America and Western Europe, tend to value personal independence and individual achievement. They define identity in terms of self-esteem, personal goals and attributes, and personal rights and liberties. Cultures based on socially connected *collectivism*, like those in many parts of Asia and Africa, tend to value interdependence, tradition, and harmony, and they define identity in terms of group goals, commitments, and belonging to one's group.

CHAPTER 13 > Social Psychology**SOCIAL THINKING****13-1: What do social psychologists study? How do we tend to explain others' behavior and our own?**

Social psychologists use scientific methods to study how people think about, influence, and relate to one another. They study the social influences that explain why the same person will act differently in different situations. When explaining others' behavior, we may—especially if we come from an individualistic Western culture—commit the *fundamental attribution error*, by underestimating the influence of the situation and overestimating the effects of stable, enduring traits. When explaining our own behavior, we more readily attribute it to the influence of the situation.

13-2: How do attitudes and actions interact?

Attitudes are feelings, often influenced by our beliefs, that predispose us to respond in certain ways. *Peripheral route persuasion* uses incidental cues (such as celebrity endorsement) to try to produce fast but relatively thoughtless changes in attitudes. *Central route persuasion* offers evidence and arguments to trigger thoughtful responses. When other influences are minimal, attitudes that are stable, specific, and easily recalled can affect our actions. Actions can modify attitudes, as in the *foot-in-the-door*

phenomenon (complying with a large request after having agreed to a small request) and *role playing* (acting a social part by following guidelines for expected behavior). When our attitudes don't fit with our actions, *cognitive dissonance theory* suggests that we will reduce tension by changing our attitudes to match our actions.

SOCIAL INFLUENCE

13-3: How do cultural norms affect our behavior?

A *culture* is an enduring set of behaviors, ideas, attitudes, values, and traditions shared by a group and transmitted from one generation to the next. Cultural *norms* are understood rules that inform members of a culture about accepted and expected behaviors. Cultures differ across time and space, and cultures change.

13-4: What is automatic mimicry, and how do conformity experiments reveal the power of social influence?

Automatic mimicry (the chameleon effect)—our tendency to unconsciously imitate others' expressions, postures, and voice tones—is a form of *conformity*. Solomon Asch and others have found that we are most likely to adjust our behavior or thinking to coincide with a group standard when (a) we feel incompetent or insecure, (b) our group has at least three people, (c) everyone else agrees, (d) we admire the group's status and attractiveness, (e) we have not already committed to another response, (f) we know we are being observed, and (g) our culture encourages respect for social standards. We may conform to gain approval (*normative social influence*) or because we are willing to accept others' opinions as new information (*informational social influence*).

13-5: What did Milgram's obedience experiments teach us about the power of social influence?

Stanley Milgram's experiments—in which people obeyed orders even when they thought they were harming another person—demonstrated that strong social influences can make ordinary people conform to falsehoods or give in to cruelty. Obedience was highest when (a) the person giving orders was nearby and was perceived as a legitimate authority figure; (b) the research was supported by a prestigious institution; (c) the victim was depersonalized or at a distance; and (d) there were no role models for defiance.

13-6: How is our behavior affected by the presence of others?

In *social facilitation*, the mere presence of others arouses us, improving our performance on easy or well-learned tasks but decreasing it on difficult ones. In *social loafing*, participating in a group project makes us feel less responsible, and we may free-ride on others' efforts. When the presence of others both arouses us and makes us feel anonymous, we may experience *deindividuation*—loss of self-awareness and self-restraint.

13-7: What are group polarization and groupthink, and how much power do we have as individuals?

In *group polarization*, group discussions with like-minded others strengthen members' prevailing beliefs and attitudes. Internet communication magnifies this effect, for better and for worse. *Groupthink* is driven by a desire for harmony within a decision-making group, overriding realistic appraisal of alternatives. The power of the individual and the power of the situation interact. A small minority that consistently expresses its views may sway the majority.

SOCIAL RELATIONS

13-8: What is prejudice? What are its social and emotional roots?

Prejudice is an unjustifiable, usually negative, attitude toward a group and its members. Prejudice's three components are beliefs (often *stereotypes*), emotions, and predispositions to action (*discrimination*). Overt prejudice in North America has decreased over time, but implicit prejudice—an automatic, unthinking attitude—continues. The social roots of prejudice include social inequalities and divisions. Higher-status groups often justify their privileged position with the *just-world phenomenon*. We tend to favor our own group (*ingroup bias*) as we divide ourselves into “us” (the *ingroup*) and “them” (the

outgroup). Prejudice can also be a tool for protecting our emotional well-being, as when we focus our anger by blaming events on a *scapegoat*.

13-9: What are the cognitive roots of prejudice?

The cognitive roots of prejudice grow from our natural ways of processing information: forming categories, remembering vivid cases, and believing that the world is just and our own and our culture's ways of doing things are the right ways.

13-10: How does psychology's definition of aggression differ from everyday usage? What biological factors make us more prone to hurt one another?

In psychology, *aggression* is any physical or verbal behavior intended to hurt or destroy. Biology influences our threshold for aggressive behaviors at three levels: genetic (inherited traits), neural (activity in key brain areas), and biochemical (such as alcohol or excess testosterone in the bloodstream). Aggression is a complex behavior resulting from the interaction of biology and experience.

13-11: What psychological and social-cultural factors may trigger aggressive behavior?

Frustration (*frustration-aggression principle*), previous reinforcement for aggressive behavior, and observing an aggressive role model, and poor self-control can all contribute to aggression. Media portrayals of violence provide *social scripts* that children learn to follow. Viewing sexual violence contributes to greater aggression toward women. Playing violent video games increases aggressive thoughts, emotions, and behaviors.

13-12: Why do we befriend or fall in love with some people but not others?

Proximity (geographical nearness) increases liking, in part because of the *mere exposure effect*—exposure to novel stimuli increases liking of those stimuli. Physical attractiveness increases social opportunities and improves the way we are perceived. Similarity of attitudes and interests greatly increases liking, especially as relationships develop. We also like those who like us.

13-13: How does romantic love typically change as time passes?

Intimate love relationships start with *passionate love*—an intensely aroused state. Over time, the strong affection of *companionate love* may develop, especially if enhanced by an *equitable* relationship and by intimate *self-disclosure*.

13-14: When are people most—and least—likely to help?

Altruism is unselfish regard for the well-being of others. We are most likely to help when we (a) notice an incident, (b) interpret it as an emergency, and (c) assume responsibility for helping. Other factors, including our mood and our similarity to the victim, also affect our willingness to help. We are least likely to help if other bystanders are present (the *bystander effect*).

13-15: How do social exchange theory and social norms explain helping behavior?

Social exchange theory is the view that we help others because it is in our own self-interest; in this view, the goal of social behavior is maximizing personal benefits and minimizing costs. Others believe that helping results from socialization, in which we are taught guidelines for expected behaviors in social situations, such as the *reciprocity norm* and the *social-responsibility norm*.

13-16: How do social traps and mirror-image perceptions fuel social conflict?

A *conflict* is a perceived incompatibility of actions, goals, or ideas. *Social traps* are situations in which people in conflict pursue their own individual self-interest, harming the collective well-being. Individuals and cultures in conflict also tend to form *mirror-image perceptions*: Each party views the opponent as untrustworthy and evil-intentioned, and itself as an ethical, peaceful victim.

13-17: How can we transform feelings of prejudice, aggression, and conflict into attitudes that promote peace?

Peace can result when individuals or groups work together to achieve *superordinate* (shared) *goals*. Research indicates that four processes—contact, cooperation, communication, and conciliation—help promote peace.

CHAPTER 14 > Psychological Disorders

WHAT IS A PSYCHOLOGICAL DISORDER?

14-1: How should we draw the line between normal behavior and psychological disorder?

The DSM-5 Task Force defined a *psychological disorder* as a “significant dysfunction in an individual’s cognitions, emotions, or behaviors,” reflecting “a disturbance in the psychological, biological, or developmental processes underlying mental functioning.” Dysfunctional behaviors are maladaptive and often distress the person with the disorder.

14-2: Why is there controversy over attention-deficit hyperactivity disorder?

A child who by age 7 displays extreme inattention, hyperactivity, and impulsivity may be diagnosed with *attention-deficit hyperactivity disorder (ADHD)* and treated with medication and other therapy. The controversy centers on whether the growing number of ADHD cases reflects overdiagnosis or increased awareness of the disorder. Long-term effects of stimulant-drug treatment for ADHD are not yet known.

14-3: How is our understanding of disorders affected by whether we use a medical model or a biopsychosocial approach?

The *medical model* assumes that psychological disorders are mental illnesses with physical causes that can be diagnosed, treated, and, in most cases, cured through therapy, sometimes in a hospital. The biopsychosocial perspective assumes that three sets of influences—biological (evolution, genetics, brain structure and chemistry), psychological (stress, trauma, learned helplessness, mood-related perceptions and memories), and social and cultural circumstances (roles, expectations, definitions of “normality” and “disorder”)—interact to produce specific psychological disorders.

14-4: How and why do clinicians classify psychological disorders, and why do some psychologists criticize the use of diagnostic labels?

The American Psychiatric Association’s *DSM-IV-TR (Diagnostic and Statistical Manual of Mental Disorders)* contains diagnostic labels and descriptions that provide a common language and shared concepts for communications and research. (*DSM-5* will soon replace and update *DSM-IV-TR*.) Some critics believe the DSM editions have become too detailed and extensive. Most U.S. health insurance organizations require an ICD/DSM diagnosis before paying for therapy. Other critics view DSM diagnoses as arbitrary labels that create preconceptions which bias perceptions of the labeled person’s past and present behavior. One such label, “insanity,” raises moral and ethical questions about whether society should hold people with disorders responsible for their violent actions. Most people with disorders are nonviolent and are more likely to be victims than attackers.

ANXIETY DISORDERS

14-5: What are the main anxiety disorders, and how do they differ from the ordinary worries and fears we all experience?

Anxious feelings and behaviors are classified as an *anxiety disorder* only when they form a pattern of distressing, persistent anxiety or maladaptive behaviors that reduce anxiety. People with *generalized anxiety disorder* feel persistently and uncontrollably tense and apprehensive, for no apparent reason. In the more extreme *panic disorder*, anxiety escalates into periodic episodes of intense dread. Those with a *phobia* may be irrationally afraid of a specific object or situation. Persistent and repetitive thoughts (obsessions) and actions (compulsions) characterize *obsessive-compulsive disorder*. Symptoms of *post-traumatic stress disorder* include four or more weeks of haunting memories, nightmares, social withdrawal, jumpy anxiety, and sleep problems following some traumatic experience.

14-6: How do conditioning, cognition, and biology contribute to the feelings that mark anxiety disorders?

The learning perspective views anxiety disorders as a product of fear conditioning, stimulus generalization, fearful-behavior reinforcement, and observational learning of

others' fears and cognitions (interpretations, irrational beliefs, and hypervigilance). The biological perspective considers the role that fears of life-threatening animals, objects or situations played in natural selection and evolution; genetic predispositions for high levels of emotional reactivity and neurotransmitter production; and abnormal responses in the brain's fear circuits.

MOOD DISORDERS

14-7: What are mood disorders? How does major depressive disorder differ from bipolar disorder?

Mood disorders are characterized by emotional extremes. A person with *major depressive disorder* experiences two or more weeks of seriously depressed moods and feelings of worthlessness, and takes little interest in, and derives little pleasure from, most activities. A person with the less common condition of *bipolar disorder* experiences not only depression but also *mania*—episodes of hyperactive and wildly optimistic, impulsive behavior.

14-8: How do the biological and social-cognitive perspectives explain mood disorders?

The biological perspective on depression focuses on genetic predispositions and on abnormalities in brain structures and function (including those found in neurotransmitter systems). The social-cognitive perspective views depression as an ongoing cycle of stressful experiences (interpreted through negative beliefs, attributions, and memories) leading to negative moods and actions and fueling new stressful experiences.

14-9: What factors affect suicide and self-injuring, and what are some of the important warning signs to watch for in suicide prevention efforts?

Suicide rates differ by nation, race, gender, age group, income, religious involvement, marital status, and (for gay and lesbian youth) social support structure. Those with depression are more at risk for suicide than others are, but social suggestion, health status, and economic and social frustration are also contributing factors. Non-suicidal self-injury (NSSI) does not usually lead to suicide but may escalate to suicidal thoughts and acts if untreated. People who engage in NSSI do not tolerate stress well and tend to be self-critical, with poor communication and problem-solving skills. Environmental barriers (such as jump barriers) are effective in preventing suicides. Forewarnings of suicide may include verbal hints, giving away possessions, withdrawal, preoccupation with death, and discussing one's own suicide.

SCHIZOPHRENIA

14-10: What the schizophrenia subtypes, and what patterns of thinking, perceiving, feeling, and behaving characterize schizophrenia?

Schizophrenia is a group of disorders that typically strike during late adolescence, affect men very slightly more than women, and seem to occur in all cultures. Schizophrenia's subtypes are paranoid, disorganized, catatonic, undifferentiated, and residual. Symptoms are disorganized and delusional thinking, disturbed perceptions, and inappropriate emotions and actions. *Delusions* are false beliefs; hallucinations are sensory experiences without sensory stimulation. Schizophrenia symptoms may be positive (the presence of inappropriate behaviors) or negative (the absence of appropriate behaviors).

14-11: How do chronic and acute schizophrenia differ?

In chronic (or process) schizophrenia, the disorder develops gradually and recovery is doubtful. In acute (or reactive) schizophrenia, the onset is sudden, in reaction to stress, and the prospects for recovery are brighter.

14-12: What brain abnormalities are associated with schizophrenia?

People with schizophrenia have increased dopamine receptors, which may intensify brain signals, creating positive symptoms such as hallucinations and paranoia. Brain abnormalities associated with schizophrenia include enlarged, fluid-filled cerebral

cavities and corresponding decreases in the cortex. Brain scans reveal abnormal activity in the frontal lobes, thalamus, and amygdala. Interacting malfunctions in multiple brain regions and their connections may produce schizophrenia's symptoms.

14-13: What prenatal events are associated with an increased risk of developing schizophrenia?

Possible contributing factors include viral infections or famine conditions during the mother's pregnancy; low weight or oxygen deprivation at birth; and maternal diabetes or older paternal age.

14-14: How do genes influence schizophrenia?

Twin and adoption studies indicate that the predisposition to schizophrenia is inherited. Multiple genes probably interact to produce schizophrenia. No environmental causes invariably produce schizophrenia, but environmental events (such as prenatal viruses or maternal stress) may "turn on" genes for this disorder in those who are predisposed to it.

OTHER DISORDERS

14-15: What are dissociative disorders, and why are they controversial?

Dissociative disorders are conditions in which conscious awareness seems to become separated from previous memories, thoughts, and feelings. Skeptics note that *dissociative identity disorder*, formerly known as multiple personality disorder, increased dramatically in the late twentieth century, that it is rarely found outside North America, and that it may reflect role-playing by people who are vulnerable to therapists' suggestions. Others view this disorder as a manifestation of feelings of anxiety, or as a response learned when behaviors are reinforced by anxiety-reduction.

14-16: What are the three main eating disorders, and how do biological, psychological, and social-cultural influences make people more vulnerable to these disorders?

In those with eating disorders (most often women or gay men), psychological factors can overwhelm the body's tendency to maintain a normal weight. Despite being significantly underweight, people with *anorexia nervosa* (usually adolescent females) continue to diet and exercise excessively because they view themselves as fat. Those with *bulimia nervosa* (usually females in their teens and twenties) secretly binge and then compensate by purging, fasting, or excessive exercise. Those with *binge-eating disorder* binge but do not follow with purging, fasting, and exercise. Cultural pressures, low self-esteem, and negative emotions interact with stressful life experiences and genetics to produce eating disorders.

14-17: What are the three clusters of personality disorders? What behaviors and brain activity characterize the antisocial personality?

Personality disorders are disruptive, inflexible, and enduring behavior patterns that impair social functioning. This disorder forms three clusters, based on main characteristics: (1) anxiety; (2) eccentric or odd behaviors; and (3) dramatic or impulsive behaviors. *Antisocial personality disorder* (one of those in the third cluster) is characterized by a lack of conscience and, sometimes, aggressive and fearless behavior. Genetic predispositions may interact with the environment to produce the altered brain activity associated with antisocial personality disorder.

RATES OF PSYCHOLOGICAL DISORDERS

14-18: How many people currently have, or have had, a psychological disorder? Is poverty a risk factor?

Psychological disorder rates vary, depending on the time and place of the survey. In one multinational survey, rates for any disorder ranged from less than 5 percent (Shanghai) to more than 25 percent (the United States). Poverty is a risk factor: Conditions and experiences associated with poverty contribute to the development of psychological disorders. But some disorders, such as schizophrenia, can drive people into poverty.

CHAPTER 15 Therapy

TREATING PSYCHOLOGICAL DISORDERS

15-1: How do *psychotherapy*, *biomedical therapy*, and an *eclectic approach to therapy* differ?

Psychotherapy is treatment involving psychological techniques; it consists of interactions between a trained therapist and someone seeking to overcome psychological difficulties or achieve personal growth. The major psychotherapies derive from psychology's psychodynamic, humanistic, behavioral, and cognitive perspectives. *Biomedical therapy* treats psychological disorders with medications or procedures that act directly on a patient's physiology. An *eclectic approach* combines techniques from various forms of therapy.

THE PSYCHOLOGICAL THERAPIES

15-2: What are the goals and techniques of psychoanalysis, and how have they been adapted in psychodynamic therapy?

Through *psychoanalysis*, Sigmund Freud tried to give people self-insight and relief from their disorders by bringing anxiety-laden feelings and thoughts into conscious awareness. Psychoanalytic techniques included using free association and *interpretation* of instances of *resistance* and *transference*. *Psychodynamic therapy* has been influenced by traditional psychoanalysis but differs from it in many ways, including the lack of belief in id, ego, and superego. This contemporary therapy is briefer, less expensive, and more focused on helping the client find relief from current symptoms. Psychodynamic therapists help clients understand how past relationships create themes that may be acted out in present relationships.

15-3: What are the basic themes of humanistic therapy, and what are the specific goals and techniques of Rogers' client-centered approach?

Both psychoanalytic and humanistic therapists are *insight therapies*—they attempt to improve functioning by increasing clients' awareness of motives and defenses. Humanistic therapy's goals have included helping clients grow in self-awareness and self-acceptance; promoting personal growth rather than curing illness; helping clients take responsibility for their own growth; focusing on conscious thoughts rather than unconscious motivations; and seeing the present and future as more important than the past. Carl Rogers' *client-centered therapy* proposed that therapists' most important contributions are to function as a psychological mirror through *active listening* and to provide a growth-fostering environment of *unconditional positive regard*, characterized by genuineness, acceptance, and empathy.

15-4: How does the basic assumption of behavior therapy differ from the assumptions of psychodynamic and humanistic therapies? What techniques are used in exposure therapies and aversive conditioning?

Behavior therapies are not insight therapies. Their goal is to apply learning principles to modify problem behaviors. Classical conditioning techniques, including *exposure therapies* (such as *systematic desensitization* or *virtual reality exposure therapy*) and *aversive conditioning*, attempt to change behaviors through *counterconditioning*—evoking new responses to old stimuli that trigger unwanted behaviors.

15-5: What is the basic idea of operant conditioning therapy, and what arguments have been used for and against it?

Therapy based on operant conditioning principles uses behavior modification techniques to change unwanted behaviors through positively reinforcing desired behaviors and ignoring or punishing undesirable behaviors. Critics maintain that (1) techniques such as those used in *token economies* may produce behavior changes that disappear when rewards end, and (2) deciding which behaviors should change is authoritarian and unethical. Proponents argue that treatment with positive rewards is more humane than punishing people or institutionalizing them for undesired behaviors.

15-6: What are the goals and techniques of the cognitive therapies and of cognitive-behavioral therapy?

The *cognitive therapies*, such as Aaron Beck's cognitive therapy for depression, assume that our thinking influences our feelings, and that the therapist's role is to change clients' self-defeating thinking by training them to view themselves in more positive ways. Rational-emotive behavior therapy is a confrontational cognitive therapy that, actively challenges irrational beliefs. The widely researched and practiced *cognitive-behavioral therapy* combines cognitive therapy and behavior therapy by helping clients regularly act out their new ways of thinking and talking in their everyday life.

15-7: What are the aims and benefits of group and family therapy?

Group therapy sessions can help more people and costs less per person than individual therapy would. Clients may benefit from exploring feelings and developing social skills in a group situation, from learning that others have similar problems, and from getting feedback on new ways of behaving. *Family therapy* views a family as an interactive system and attempts to help members discover the roles they play and to learn to communicate more openly and directly.

EVALUATING PSYCHOTHERAPIES**15-8: Does psychotherapy work? Who decides?**

Clients' and therapists' positive testimonials cannot prove that psychotherapy is actually effective, and the placebo effect makes it difficult to judge whether improvement occurred because of the treatment. Using meta-analyses to statistically combine the results of hundreds of randomized psychotherapy outcome studies, researchers have found that those not undergoing treatment often improve, but those undergoing psychotherapy are more likely to improve more quickly, and with less chance of relapse.

15-9: Are some psychotherapies more effective than others for specific disorders?

No one type of psychotherapy is generally superior to all others. Therapy is most effective for those with clear-cut, specific problems. Some therapies—such as behavior conditioning for treating phobias and compulsions—are more effective for specific disorders. Psychodynamic therapy has been effective for depression and anxiety, and cognitive and cognitive-behavioral therapies have been effective in coping with anxiety, PTSD, and depression. *Evidence-based practice* integrates the best available research with clinicians' expertise and patients' characteristics, preferences, and circumstances.

15-10: How do alternative therapies fare under scientific scrutiny?

Abnormal states tend to return to normal on their own, and the placebo effect can create the impression that a treatment has been effective. These two tendencies complicate assessments of alternative therapies (nontraditional therapies that claim to cure certain ailments). EMDR has shown some effectiveness—not from the eye movement but rather from the exposure therapy nature of the treatments. Light exposure therapy does seem to relieve the symptoms of seasonal affective disorder (SAD) by activating a brain region that influences arousal and hormones.

15-11: What three elements are shared by all forms of psychotherapy?

All psychotherapies offer new hope for demoralized people; a fresh perspective; and (if the therapist is effective) an empathic, trusting, and caring relationship. The emotional bond of trust and understanding between therapist and client—the therapeutic alliance—is an important element in effective therapy.

15-12: How do culture and values influence the therapist-client relationship?

Therapists differ in the values that influence their goals in therapy and their views of progress. These differences may create problems if therapists and clients differ in their cultural or religious perspectives.

15-13: What should a person look for when selecting a therapist?

A person seeking therapy may want to ask about the therapist's treatment approach, values, credentials, and fees. An important consideration is whether the therapy seeker feels comfortable and able to establish a bond with the therapist.

THE BIOMEDICAL THERAPIES**15-14: What are the drug therapies? How do double-blind studies help researchers evaluate a drug's effectiveness?**

Psychopharmacology, the study of drug effects on mind and behavior, has helped make drug therapy the most widely used biomedical therapy. *Antipsychotic drugs*, used in treating schizophrenia, block dopamine activity. Side effects may include tardive dyskinesia (with involuntary movements of facial muscles, tongue, and limbs) or increased risk of obesity and diabetes. *Antianxiety drugs*, which depress central nervous system activity, are used to treat anxiety disorders. These drugs can be physically and psychologically addictive. *Antidepressant drugs*, which increase the availability of serotonin and norepinephrine, are used for depression, with modest effectiveness beyond that of placebo drugs. The antidepressants known as selective serotonin reuptake inhibitors (often called SSRI drugs) are now used to treat other disorders, including strokes and anxiety disorders. Lithium and Depakote are mood stabilizers prescribed for those with bipolar disorder. Studies may use a double-blind procedure to avoid the placebo effect and researcher's bias.

15-15: How are brain stimulation and psychosurgery used in treating specific disorders?

Electroconvulsive therapy (ECT), in which a brief electric current is sent through the brain of an anesthetized patient, is an effective, last-resort treatment for severely depressed people who have not responded to other therapy. Newer alternative treatments for depression include vagus nerve stimulation, *repetitive transcranial magnetic stimulation (rTMS)* and, in preliminary clinical experiments, deep-brain stimulation that calms an overactive brain region linked with negative emotions. *Psychosurgery* removes or destroys brain tissue in hopes of modifying behavior. Radical psychosurgical procedures such as *lobotomy* were once popular, but neurosurgeons now rarely perform brain surgery to change behavior or moods. Brain surgery is a last-resort treatment because its effects are irreversible.

15-16: How, by adopting a healthier lifestyle, might people find some relief from depression, and how does this reflect our being biopsychosocial systems?

Depressed people who undergo a program of aerobic exercise, adequate sleep, light exposure, social engagement, negative-thought reduction, and better nutrition often gain some relief. In our integrated biopsychosocial system, stress affects our body chemistry and health; chemical imbalances can produce depression; and social support and other lifestyle changes can lead to relief of symptoms.

PREVENTING PSYCHOLOGICAL DISORDERS**15-17: What is the rationale for preventive mental health programs?**

Preventive mental health programs are based on the idea that many psychological disorders could be prevented by changing oppressive, esteem-destroying environments into more benevolent, nurturing environments that foster growth, self-confidence, and *resilience*. Struggling with challenges can lead to post-traumatic growth. Community psychologists are often active in preventive mental health programs.

APPENDIX A > Statistical Reasoning in Everyday Life**DESCRIBING DATA****A-1: How can we describe data with measures of central tendency and variation?**

A measure of central tendency is a single score that represents a whole set of scores. Three such measures are the *mode* (the most frequently occurring score), the *mean* (the

arithmetic average), and the *median* (the middle score in a group of data). Measures of variation tell us how diverse data are. Two measures of variation are the *range* (which describes the gap between the highest and lowest scores) and the *standard deviation* (which states how much scores vary around the mean, or average, score). Scores often form a *normal* (or bell-shaped) *curve*.

A-2: What does it mean when we say two things are correlated?

When we say two things are correlated, we are saying that they accompany each other in their movements. The strength of their relationship is expressed as a *correlation coefficient*, which ranges from +1.00 (a perfect positive correlation) through 0 (no correlation) to -1.00 (a perfect negative correlation). Their relationship may be displayed in a *scatterplot*, in which each dot represents a value for the two variables. Correlations predict but cannot explain.

A-3: What is regression toward the mean?

Regression toward the mean is the tendency for extreme or unusual scores to fall back toward their average.

SIGNIFICANT DIFFERENCES

A-4: How do we know whether an observed difference can be generalized to other populations?

To feel confident about generalizing an observed difference to other populations, we would want to know that the sample studied was representative of the larger population being studied; that the observations, on average, had low variability; that the sample consisted of more than a few cases; and that the observed difference was *statistically significant*.

A-5: What are cross-sectional studies and longitudinal studies, and why is it important to know which method was used?

In a *cross-sectional study*, people of different ages are compared. In a *longitudinal study*, a group of people is studied periodically over a long period of time. To draw meaningful conclusions about a study's results, we need to know whether the study used a representative sample to draw its conclusions. Studies of intelligence and aging, for example, have drawn different conclusions depending on whether a cross-sectional or longitudinal study was used.

APPENDIX B Psychology at Work

B-1: What is “flow,” and what are the three subfields of industrial-organizational psychology?

Flow is a completely involved, focused state of consciousness with diminished awareness of self and time. It results from fully engaging one's skills. *Industrial-organizational (I/O) psychology's* three subfields are *personnel*, *organizational*, and *human factors psychology*.

PERSONNEL PSYCHOLOGY

B-2: How do personnel psychologists help organizations with employee selection, work placement, and performance appraisal?

Personnel psychologists work with organizations to devise selection methods for new employees; recruit and evaluate applicants; design and evaluate training programs; identify people's strengths; analyze job content; and appraise individual and organizational performance. Unstructured, subjective interviews foster the interviewer illusion; *structured interviews* pinpoint job-relevant strengths and are better predictors of performance. Checklists, graphic rating scales, and behavior rating scales are useful performance appraisal methods.

ORGANIZATIONAL PSYCHOLOGY

B-3: What is the role of organizational psychologists?

Organizational psychologists examine influences on worker satisfaction and productivity and facilitate organizational change. Employee satisfaction and engagement tend to correlate with organizational success.

B-4: What are some effective leadership techniques?

Effective leaders harness job-relevant strengths; set specific challenging goals; and choose an appropriate leadership style. Leadership style may be goal-oriented (*task leadership*), group-oriented (*social leadership*), or some combination of the two.

THE HUMAN FACTOR

B-5: How do human factors psychologists work to create user-friendly machines and work settings?

Human factors psychologists contribute to human safety and improved design by encouraging developers and designers to consider human perceptual abilities, to avoid the curse of knowledge, and to test users to reveal perception-based problems.

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Answers for *Experience the Testing Effect* Questions

CHAPTER 1 Thinking Critically With Psychological Science

1. Wilhelm Wundt
2. a
3. a
4. b
5. The environment (nurture) has an influence on us, but that influence is constrained by our biology (nature). Nature and nurture interact. People predisposed to be very tall (nature), for example, are unlikely to become Olympic gymnasts, no matter how hard they work (nurture).
6. d
7. psychiatrist
8. c
9. Hindsight bias
10. d
11. The scientific attitude teaches us to look for evidence instead of relying on our often fallible intuition. In evaluating a claim in the media, look for any signs of empirical evidence, preferably from several studies. Ask the following questions in your analysis: Are claims based on scientific findings? Have several studies replicated the findings and confirmed them? Are any experts cited? If so, research their background. Are they affiliated with a credible university, college, or institution? Have they conducted or written about scientific research?
12. hypotheses
13. c
14. representative
15. negative
16. a
17. (a) *Alcohol use is associated with violence. (One interpretation: Drinking triggers or unleashes aggressive behavior.)* Perhaps anger triggers drinking, or perhaps the same genes or child-rearing practices are predisposing both drinking and aggression. (Here researchers have learned that drinking does indeed trigger aggressive behavior.) (b) *Educated people live longer, on average, than less-educated people. (One interpretation: Education lengthens life and enhances health.)* Perhaps richer people can afford more education and better health care. (Research supports this conclusion.)

(c) *Teens engaged in team sports are less likely to use drugs, smoke, have sex, carry weapons, and eat junk food than are teens who do not engage in team sports. (One interpretation: Team sports encourage healthy living.)* Perhaps some third factor explains this correlation—teens who use drugs, smoke, have sex, carry weapons, and eat junk food may be “loners” who do not enjoy playing on any team.

(d) *Adolescents who frequently see smoking in movies are more likely to smoke. (One interpretation: Movie stars’ behavior influences impressionable teens.)* Perhaps adolescents who smoke and attend movies frequently have less parental supervision and more access to spending money than other adolescents.

18. experiments
19. placebo
20. c
21. independent variable
22. b
23. b
24. d

CHAPTER 2 The Biology of Behavior

1. axon
2. c
3. a
4. neurotransmitters
5. b
6. c
7. autonomic
8. central
9. a
10. adrenal glands
11. b
12. d
13. c
14. cerebellum
15. b
16. amygdala

17. b
18. hypothalamus
19. d
20. The visual cortex is a neural network of sensory neurons connected via interneurons to other neural networks, including auditory networks. This allows you to integrate visual and auditory information to respond when a friend you recognize greets you at a party.
21. c
22. association areas
23. frontal
24. You would hear sounds, but without the temporal lobe association areas you would be unable to make sense of what you were hearing.
25. c
26. ON; HER
27. a
28. b
29. Behavior geneticists study the relative power and limits of genetic and environmental influences on behavior.
30. chromosomes
31. gene
32. b
33. c
34. identical
35. b

CHAPTER 3 Consciousness and the Two-Track Mind

1. inattentional blindness
2. unconscious; conscious
3. circadian rhythm
4. b
5. NREM-3
6. It increases in duration.
7. c
8. With narcolepsy, the person periodically falls directly into REM sleep, with no warning; with sleep apnea, the person repeatedly awakens during the night.
9. d
10. The neural activation theory suggests that dreams are the brain's attempt to make sense of random neural activity.
11. The information-processing explanation of dreaming proposes that brain activity during REM sleep enables us to sift through *what one has dwelt on by day*.
12. REM rebound
13. a
14. c
15. dissociation
16. tolerance
17. a
18. Alcohol is a disinhibitor—it makes us more likely to do what we would have done when sober, whether that is being helpful or being aggressive.
19. d
20. LSD
21. a
22. b

CHAPTER 4 Developing Through the Life Span

1. continuity/stages
2. c
3. teratogens
4. a
5. frontal
6. b
7. We have no conscious memories of events occurring before about age 3½, in part because major brain areas have not yet matured.
8. Infants in Piaget's *sensorimotor stage* tend to be focused only on their own perceptions of the world and may, for example, be unaware that objects continue to exist when unseen. A child in the *preoperational stage* is still egocentric and incapable of appreciating simple logic, such as the reversibility of operations. A preteen in the *concrete operational stage* is beginning to think logically about concrete events but not about abstract concepts.
9. a
10. stranger anxiety
11. Before these studies, many psychologists believed that infants became attached to those who nourished them.
12. temperament
13. b
14. formal operations
15. b
16. emerging adulthood
17. b
18. a

19. Cross-sectional studies compare people of different ages. Longitudinal studies restudy and retest the same people over a long period of time.
20. generativity
21. c
22. b

CHAPTER 5 Gender and Sexuality

1. c
2. Y
3. d
4. 11; 13
5. intersex
6. b
7. gender identity
8. b
9. b
10. Sexual dysfunctions are problems that men and women may have related to sexual arousal and sexual function. Paraphilias are conditions, which may be classified as psychological disorders, where sexual arousal is associated with socially unacceptable target partners and/or suffering of self or others.
11. Does; doesn't
12. c
13. d
14. c
15. Researchers have found no evidence that any environmental factor (parental relationships, childhood experiences, peer relationships, or dating experiences) influences the development of our sexual orientation.
12. feature detectors
13. parallel processing
14. d
15. Your brain constructs this perception of color in two stages. In the first stage, the lemon reflects light energy into your eyes, where it is transformed into neural messages. Three sets of cones, each sensitive to a different light frequency (red, blue, and green) process color. In this case, the light energy stimulates both red-sensitive and green-sensitive cones. In the second stage, opponent-process cells sensitive to paired opposites of color (red/green, yellow/blue, and black/white) evaluate the incoming neural messages as they pass through your optic nerve to the thalamus and visual cortex. When the yellow-sensitive opponent-process cells are stimulated, you identify the lemon as yellow.
16. d
17. a
18. b
19. c
20. monocular
21. b
22. b
23. perceptual adaptation
24. cochlea
25. The *outer ear* collects sound waves, which are translated into mechanical waves by the *middle ear* and turned into fluid waves in the *inner ear*. The *auditory nerve* then translates the energy into electrical waves and sends them to the brain, which perceives and interprets the sound.
26. Place; frequency
27. c
28. Our experience of pain is influenced by biological factors (such as sensory receptors that detect pressure), psychological factors (such as our focused attention), and social-cultural factors (such as social expectations about tolerance and expression of pain).
29. We feel pain in our brain, so we may diminish the experience of pain by changing the messages sent to the brain. Gate-control theory proposes that our pain sensory receptors send signals to the spinal cord, which relays messages to the brain. Small fibers in the spinal cord open the gate to pain; large fibers close the gate, blocking those signals. Meditation triggers large-fiber activity by shifting our attention elsewhere (toward the breath or repeated word); exercise triggers large-fiber activity by generating competing stimulation and endorphin release.
30. Kinesthesia; vestibular sense

CHAPTER 6 Sensation and Perception

1. b
2. perception
3. d
4. just noticeable difference
5. b
6. d
7. a
8. wavelength
9. a
10. c
11. c

31. Your vestibular sense regulates balance and body positioning through kinesthetic receptors triggered by fluid in your inner ear. Wobbly legs and a spinning world are signs that these receptors are still responding to the ride's turbulence. As your vestibular sense adjusts to solid ground, your balance will be restored.
32. We have specialized receptors for detecting sweet, salty, sour, bitter, and umami tastes. Being able to detect pleasurable tastes enabled our ancestors to seek out energy- and protein-rich foods. Detecting aversive tastes deterred them from eating toxic substances, increasing their chances of survival.
33. d
34. d

CHAPTER 7 Learning

- information; behaviors
- c
- conditioned
- discrimination
- b
- A sexual image is a US that triggers a UR of interest or arousal. Before the advertisement pairs a product with a sexual image, the product is an NS. Over time the product can become a CS that triggers the CR of interest or arousal.
- Skinner's
- shaping
- b
- Your instructor could reinforce your attentive behavior by taking away something you dislike. For example, your instructor could offer to shorten the length of an assigned paper or replace lecture time with an in-class activity. In both cases, the instructor would remove something aversive in order to negatively reinforce your focused attention.
- partial
- a
- variable-interval
- c
- d
- b
- b
- latent learning
- observational learning
- vicarious; vicarious
- a
- mirror
- c

CHAPTER 8 Memory

- recall
- encoding; storage; retrieval
- a
- iconic; echoic
- seven
- mnemonics
- a
- implicit
- c
- d
- Memories are stored within a web of many associations, one of which is mood. When you recall happy moments from your past, you deliberately activate these positive links. You may then experience mood-congruent memory and recall other happy moments, which could improve your mood and brighten your interpretation of current events.
- a
- d
- d
- retroactive
- repression
- b
- Eliza's immature hippocampus and lack of verbal skills would have prevented her from encoding an explicit memory of the wedding reception at the age of two. It's more likely that Eliza learned information (from hearing the story repeatedly) that she eventually constructed into a memory that feels very real.
- source amnesia
- déjà vu
- b
- b

CHAPTER 9 Thinking, Language, and Intelligence

- concept
- algorithm
- Oscar will need to guard against *confirmation bias* (searching for support for his own views and ignoring contradictory

evidence) as he seeks out opposing viewpoints. Even if Oscar encounters new information that disproves his beliefs, *belief perseverance* may lead him to cling to these views anyway. It will take more compelling evidence to change his beliefs than it took to create them.

4. c
5. availability
6. framing
7. b
8. c
9. phonemes; morphemes; grammar
10. telegraphic speech
11. universal grammar
12. a
13. general intelligence (*g*)
14. c
15. academic; practical; creative
16. d
17. d
18. c
19. reliability
20. a
21. c
22. c
23. The heritability (difference due to genes) of body weight will be greater in country X, where environmental differences in available nutrition are minimal.
24. Stereotype threat

CHAPTER 10 Motivation and Emotion

1. b
2. a
3. incentive
4. Arousal
5. b
6. a
7. Maslow's hierarchy of needs best supports this statement because it addresses the primacy of some motives over others. Once our basic physiological needs are met, safety concerns are addressed next, followed by belongingness and love needs (such as the desire to kiss).
8. homeostasis
9. c
10. glucose; low

11. basal metabolic
12. d
13. Sanjay's plan is problematic. After he gains weight, the extra fat will require less energy to maintain than it did to gain in the first place. Sanjay may have a hard time getting rid of it later, when his metabolism slows down in an effort to retain his body weight.
14. c
15. Monitor the time spent on cell phones and Facebook, as well as our feelings about that time. Hide distracting online friends. Turn off or put away distracting devices. Consider a Facebook fast, and get outside and away from technology regularly.
16. James-Lange
17. b
18. c
19. A polygraph measures physiological changes, such as heart rate and perspiration, that are associated with emotions. Its use as a lie detector is controversial because the measure cannot distinguish between emotions with similar physiology (such as anxiety and guilt).
20. facial feedback

CHAPTER 11 Stress, Health, and Human Flourishing

1. resistance; exhaustion
2. tend; befriend
3. b
4. d
5. lymphocytes
6. c
7. Type A individuals frequently experience negative emotions (anger, depression), during which the sympathetic nervous system diverts blood away from the liver. This leaves fat and cholesterol circulating in the bloodstream for deposit near the heart and other organs, increasing the risk of heart disease and other health problems. Thus, Type A individuals actually harm themselves by directing anger at others.
8. negative
9. emotion
10. b
11. internal
12. d
13. aerobic
14. c

15. d
16. Positive
17. b
18. relative deprivation

CHAPTER 12 Personality

1. repression
2. c
3. superego
4. b
5. anxiety
6. Projective
7. d
8. a
9. a
10. d
11. Freud might argue that the criminal may have lacked the proper guidance as a child for developing a strong superego, allowing the id free rein. Rogers might assert that the criminal was raised in an environment lacking genuineness, acceptance (unconditional positive regard), and empathy, which inhibited psychological growth and led to a negative self-concept.
12. unconditional positive regard
13. trait
14. c
15. b
16. b
17. a
18. social-cognitive
19. b
20. Yes, if that self-love is of the *secure* type. Secure self-esteem promotes a focus beyond the self and a higher quality of life. Excessive self-love may promote artificially high or defensive self-esteem, which may lead to unhappiness if negative external feedback triggers anger or aggression.
21. b.

CHAPTER 13 Social Psychology

1. a
2. peripheral
3. foot-in-the-door
4. Cognitive dissonance theory best supports this suggestion. If Jamal acts confident, his behavior will contradict his

negative self-thoughts, creating cognitive dissonance. To relieve the tension, Jamal may realign his attitudes with his actions by viewing himself as more outgoing and confident.

5. c
6. a
7. The presence of a large audience generates arousal and strengthens Dr. Huang's most likely response: enhanced performance on a task he has mastered (teaching music history) and impaired performance on a task he finds difficult (statistics).
8. deindividuation
9. group polarization
10. stereotypes
11. b
12. more
13. d
14. c
15. c
16. c
17. mere exposure
18. companionate; passionate
19. d
20. c
21. mirror-image
22. superordinate

CHAPTER 14 Psychological Disorders

1. No. Anna's behavior is unusual, causes her distress, and may make her a few minutes late on occasion, but it does not appear to significantly disrupt her ability to function. Like most of us, Anna demonstrates some unusual behaviors that are not disabling or dysfunctional, and, thus, do not suggest a psychological disorder.
2. c
3. medical
4. c
5. a
6. a
7. phobia
8. c
9. obsessive-compulsive
10. c
11. depression

- 12. c
- 13. increasing
- 14. norepinephrine; serotonin
- 15. social-cognitive
- 16. b
- 17. hallucination
- 18. No. Schizophrenia involves the altered perceptions, emotions, and behaviors of a mind split from reality. It does not involve rapid changes in mood or identity, as suggested by this comparison.
- 19. a
- 20. c
- 21. b
- 22. c
- 23. b
- 24. poverty
- 25. d

CHAPTER 15 Therapy

- 1. a
- 2. Insight
- 3. d
- 4. active listening
- 5. c
- 6. counterconditioning
- 7. systematic desensitization
- 8. Behavior therapies are often the best choice for treating phobias. Viewing Rico's fear of the freeway as a learned response, a behavior therapist might help Rico learn to replace his anxious response to freeway driving with a relaxation response.
- 9. token economy
- 10. d
- 11. Cognitive-behavioral
- 12. b
- 13. c
- 14. d
- 15. research evidence, clinical expertise, and knowledge of the patient
- 16. The placebo effect is the healing power of belief in a treatment. When patients expect a treatment to be effective, they may believe it was.
- 17. c
- 18. antianxiety
- 19. lithium
- 20. b
- 21. d

APPENDIX A Statistical Reasoning in Everyday Life

- 1. b
- 2. d
- 3. normal curve
- 4. a
- 5. negative
- 6. scatterplot
- 7. Regression toward the mean is a statistical phenomenon describing the tendency of extreme scores or outcomes to return to normal after an unusual event. Without knowing this, we may inaccurately decide the return to normal was a result of our own behavior.
- 8. cross-sectional
- 9. a

APPENDIX B Psychology at Work

- 1. c
- 2. Personnel; human factors
- 3. a
- 4. d
- 5. Focusing on specific, short-term goals, such as maintaining a regular study schedule, will be more helpful than focusing on more distant general goals, such as earning a good grade in this class.
- 6. transformational
- 7. c
- 8. d

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A

absolute threshold the minimum stimulation needed to detect a particular stimulus 50 percent of the time. (p. 193)

accommodation (1) in developmental psychology, adapting our current understandings (schemas) to incorporate new information. (2) in sensation and perception, the process by which the eye's lens changes shape to focus near or far objects on the retina. (pp. 125, 201)

achievement motivation a desire for significant accomplishment, for mastery of skills or ideas, for control, and for rapidly attaining a high standard. (p. 370)

achievement test a test designed to assess what a person has learned. (p. 334)

acquisition in classical conditioning, the initial stage, when one links a neutral stimulus and an unconditioned stimulus so that the neutral stimulus begins triggering the conditioned response. In operant conditioning, the strengthening of a reinforced response. (p. 241)

action potential a neural impulse; a brief electrical charge that travels down an axon. (p. 37)

active listening empathic listening in which the listener echoes, restates, and clarifies. A feature of Rogers' client-centered therapy. (p. 549)

adaptation-level phenomenon our tendency to form judgments (of sounds, of lights, of income) relative to a neutral level defined by our prior experience. (p. 416)

addiction compulsive drug craving and use, despite adverse consequences. (p. 101)

adolescence the transition period from childhood to adulthood, extending from puberty to independence. (p. 140)

adrenal [ah-DRĒEN-el] **glands** a pair of endocrine glands that sit just above the kidneys and secrete hormones (epinephrine and norepinephrine) that help arouse the body in times of stress. (p. 45)

aerobic exercise sustained exercise that increases heart and lung fitness; may also alleviate depression and anxiety. (p. 407)

aggression any physical or verbal behavior intended to hurt or destroy. (pp. 164, 481)

AIDS (acquired immune deficiency syndrome) a life-threatening, sexually transmitted infection caused by the *human immunodeficiency virus* (HIV). AIDS depletes the immune system, leaving the person vulnerable to infections. (p. 174)

alcohol dependence (popularly known as alcoholism). Alcohol use marked by tolerance, withdrawal if suspended, and a drive to continue use. (p. 102)

algorithm a methodical, logical rule or procedure that guarantees solving a par-

ticular problem. Contrasts with the usually speedier—but also more error-prone—use of *heuristics*. (p. 307)

alpha waves the relatively slow brain waves of a relaxed, awake state. (p. 85)

altruism unselfish regard for the welfare of others. (p. 493)

amphetamines drugs that stimulate neural activity, causing speeded-up body functions and associated energy and mood changes. (p. 104)

amygdala [uh-MIG-duh-la] two lima-bean-sized neural clusters in the limbic system; linked to emotion. (p. 50)

anorexia nervosa an eating disorder in which a person (usually an adolescent female) maintains a starvation diet despite being significantly (15 percent or more) underweight. (p. 536)

anterograde amnesia an inability to form new memories. (p. 290)

antianxiety drugs drugs used to control anxiety and agitation. (p. 569)

antidepressant drugs drugs used to treat depression and some anxiety disorders. Different types work by altering the availability of various neurotransmitters. (p. 569)

antipsychotic drugs drugs used to treat schizophrenia and other forms of severe thought disorder. (p. 568)

antisocial personality disorder a personality disorder in which a person (usually a man) exhibits a lack of conscience for wrongdoing, even toward friends and family members. May be aggressive and ruthless or a clever con artist. (p. 538)

anxiety disorders psychological disorders characterized by distressing, persistent anxiety or maladaptive behaviors that reduce anxiety. (p. 513)

aphasia impairment of language, usually caused by left-hemisphere damage either to Broca's area (impairing speaking) or to Wernicke's area (impairing understanding). (p. 322)

applied research scientific study that aims to solve practical problems. (p. 9)

aptitude test a test designed to predict a person's future performance; *aptitude* is the capacity to learn. (p. 334)

assimilation interpreting our new experiences in terms of our existing schemas. (p. 125)

association areas areas of the cerebral cortex that are not involved in primary motor or sensory functions; rather, they are involved in higher mental functions such as learning, remembering, thinking, and speaking. (p. 56)

associative learning learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a

response and its consequences (as in operant conditioning). (p. 238)

attachment an emotional tie with another person; shown in young children by their seeking closeness to the caregiver and showing distress on separation. (p. 132)

attention-deficit hyperactivity disorder (ADHD) a psychological disorder marked by the appearance by age 7 of one or more of three key symptoms: extreme inattention, hyperactivity, and impulsivity. (p. 507)

attitude feelings, often influenced by our beliefs, that predispose us to respond in a particular way to objects, people, and events. (p. 460)

attribution theory the theory that we explain someone's behavior by crediting either the situation or the person's disposition. (p. 458)

audition the sense or act of hearing. (p. 216)

autism a disorder that appears in childhood and is marked by deficient communication, social interaction, and understanding of others' states of mind. (p. 130)

automatic processing unconscious encoding of incidental information, such as space, time, and frequency, and of well-learned information, such as word meanings. (p. 274)

autonomic [aw-tuh-NAHM-ik] **nervous system (ANS)** the part of the peripheral nervous system that controls the glands and the muscles of the internal organs (such as the heart). Its sympathetic division arouses; its parasympathetic division calms. (p. 42)

availability heuristic estimating the likelihood of events based on their availability in memory; if instances come readily to mind (perhaps because of their vividness), we presume such events are common. (p. 309)

aversive conditioning a type of counterconditioning that associates an unpleasant state (such as nausea) with an unwanted behavior (such as drinking alcohol). (p. 552)

axon the neuron extension that passes messages through its branches to other neurons or to muscles or glands. (p. 36)

B

babbling stage beginning at about 4 months, the stage of speech development in which the infant spontaneously utters various sounds at first unrelated to the household language. (p. 320)

barbiturates drugs that depress central nervous system activity, reducing anxiety but impairing memory and judgment. (p. 103)

basal metabolic rate the body's resting rate of energy expenditure. (p. 358)

basic research pure science that aims to increase the scientific knowledge base. (p. 9)

basic trust according to Erik Erikson, a sense that the world is predictable and trustworthy; said to be formed during infancy by appropriate experiences with responsive caregivers. (p. 135)

behavior genetics the study of the relative power and limits of genetic and environmental influences on behavior. (p. 62)

behavior therapy therapy that applies learning principles to the elimination of unwanted behaviors. (p. 550)

behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2). (pp. 4, 240)

belief perseverance clinging to one's initial conceptions after the basis on which they were formed has been discredited. (p. 312)

binge-eating disorder significant binge-eating episodes, followed by distress, disgust, or guilt, but without the compensatory purging or fasting that marks bulimia nervosa. (p. 536)

binocular cues depth cues, such as retinal disparity, that depend on the use of two eyes. (p. 210)

biological psychology the scientific study of the links between biological (genetic, neural, hormonal) and psychological processes. (Some biological psychologists call themselves *behavioral neuroscientists*, *neuropsychologists*, *behavior geneticists*, *physiological psychologists*, or *biopsychologists*.) (p. 36)

biomedical therapy prescribed medications or procedures that act directly on the person's physiology. (p. 546)

biopsychosocial approach an integrated approach that incorporates biological, psychological, and social-cultural levels of analysis. (p. 6)

bipolar disorder a mood disorder in which a person alternates between the hopelessness and lethargy of depression and the overexcited state of mania. (Formerly called manic-depressive disorder.) (p. 520)

blind spot the point at which the optic nerve leaves the eye, creating a "blind" spot because no receptor cells are located there. (p. 202)

blindsight a condition in which a person can respond to a visual stimulus without consciously experiencing it. (p. 79)

bottom-up processing analysis that begins with the sensory receptors and works up to the brain's integration of sensory information. (p. 192)

brainstem the oldest part and central core of the brain, beginning where the spinal cord swells as it enters the skull; the brainstem is responsible for automatic survival functions. (p. 47)

Broca's area controls language expression—an area of the frontal lobe, usually in the left hemisphere, that directs the muscle movements involved in speech. (p. 323)

bulimia nervosa an eating disorder in which a person alternates binge eating (usually of high-calorie foods) with purging (by vomiting or laxative use) or fasting. (p. 536)

bystander effect the tendency for any given bystander to be less likely to give aid if other bystanders are present. (p. 494)

C

Cannon-Bard theory the theory that an emotion-arousing stimulus simultaneously triggers (1) physiological responses and (2) the subjective experience of emotion. (p. 372)

case study an observation technique in which one person is studied in depth in the hope of revealing universal principles. (p. 17)

catharsis in psychology, the idea that "releasing" aggressive energy (through action or fantasy) relieves aggressive urges. (p. 398)

central nervous system (CNS) the brain and spinal cord. (p. 41)

central route persuasion occurs when interested people focus on the arguments and respond with favorable thoughts. (p. 460)

cerebellum [seh-uh-BELL-um] the "little brain" at the rear of the brainstem; functions include processing sensory input, coordinating movement output and balance, and enabling nonverbal learning and memory. (p. 50)

cerebral [seh-REE-bruhl] **cortex** the intricate fabric of interconnected neural cells covering the cerebral hemispheres; the body's ultimate control and information-processing center. (p. 53)

change blindness failing to notice changes in the environment. (p. 82)

chromosomes threadlike structures made of DNA molecules that contain the genes. (p. 62)

chunking organizing items into familiar, manageable units; often occurs automatically. (p. 276)

circadian [ser-KAY-dee-an] **rhythm** the biological clock; regular bodily rhythms (for example, of temperature and wakefulness) that occur on a 24-hour cycle. (p. 83)

classical conditioning a type of learning in which one learns to link two or more stimuli and anticipate events. (p. 239)

client-centered therapy a humanistic therapy, developed by Carl Rogers, in which the therapist uses techniques such as active listening within a genuine, accepting, empathic environment to facilitate clients' growth. (Also called *person-centered therapy*.) (p. 549)

clinical psychology a branch of psychology that studies, assesses, and treats people with psychological disorders. (p. 9)

cochlea [KOHK-lee-uh] a coiled, bony, fluid-filled tube in the inner ear; sound waves traveling through the cochlear fluid trigger nerve impulses. (p. 216)

cochlear implant a device for converting sounds into electrical signals and stimulating the auditory nerve through electrodes threaded into the cochlea. (p. 218)

cognition all the mental activities associated with thinking, knowing, remembering, and communicating. (pp. 124, 306)

cognitive dissonance theory the theory that we act to reduce the discomfort (dissonance) we feel when two of our thoughts (cognitions) are inconsistent. For example, when we become aware that our attitudes and our actions clash, we can reduce the resulting dissonance by changing our attitudes. (p. 462)

cognitive learning the acquisition of mental information, whether by observing events, by watching others, or through language. (p. 239)

cognitive map a mental representation of the layout of one's environment. For example, after exploring a maze, rats act as if they have learned a cognitive map of it. (p. 259)

cognitive neuroscience the interdisciplinary study of the brain activity linked with cognition (including perception, thinking, memory, and language). (pp. 4, 78)

cognitive therapy therapy that teaches people new, more adaptive ways of thinking; based on the assumption that thoughts intervene between events and our emotional reactions. (p. 554)

cognitive-behavioral therapy a popular integrative therapy that combines cognitive therapy (changing self-defeating thinking) with behavior therapy (changing behavior). (p. 556)

collective unconscious Carl Jung's concept of a shared, inherited reservoir of memory traces from our species' history. (p. 428)

collectivism giving priority to the goals of one's group (often one's extended family or work group) and defining one's identity accordingly. (p. 451)

color constancy perceiving familiar objects as having consistent color, even if changing illumination alters the wavelengths reflected by the object. (p. 212)

companionate love the deep affectionate attachment we feel for those with whom our lives are intertwined. (p. 492)

concept a mental grouping of similar objects, events, ideas, and people. (p. 306)

concrete operational stage in Piaget's theory, the stage of cognitive development (from about 6 or 7 to 11 years of age) during which children gain the mental operations that enable them to think logically about concrete events. (p. 128)

conditioned reinforcer a stimulus that gains its reinforcing power through its association with a primary reinforcer; also known as a *secondary reinforcer*. (p. 248)

conditioned response (CR) in classical conditioning, a learned response to a previously neutral (but now conditioned) stimulus (CS). (p. 240)

conditioned stimulus (CS) in classical conditioning, an originally irrelevant stimulus that, after association with an unconditioned stimulus (US), comes to trigger a conditioned response (CR). (p. 240)

conduction hearing loss hearing loss caused by damage to the mechanical system that conducts sound waves to the cochlea. (p. 217)

cones retinal receptor cells that are concentrated near the center of the retina and that function in daylight or in well-lit conditions. The cones detect fine detail and give rise to color sensations. (p. 202)

confirmation bias a tendency to search for information that supports our preconceptions and to ignore or distort contradictory evidence. (p. 307)

conflict a perceived incompatibility of actions, goals, or ideas. (p. 497)

conformity adjusting our behavior or thinking to coincide with a group standard. (p. 466)

confounding variable a factor other than the independent variable that might produce an effect in an experiment. (p. 24)

consciousness our awareness of ourselves and our environment. (p. 78)

conservation the principle (which Piaget believed to be a part of concrete operational reasoning) that properties such as mass, volume, and number remain the same despite changes in the forms of objects. (p. 127)

content validity the extent to which a test samples the behavior that is of interest. (p. 337)

continuous reinforcement reinforcing the desired response every time it occurs. (p. 249)

control group in an experiment, the group *not* exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment. (p. 22)

convergent thinking narrows the available problem solutions to determine the single best solution. (p. 314)

copng alleviating stress using emotional, cognitive, or behavioral methods. (p. 401)

coronary heart disease the clogging of the vessels that nourish the heart muscle; the leading cause of death in many developed countries. (p. 397)

corpus callosum [KOR-pus kah-LOW-sum] the large band of neural fibers connecting the two brain hemispheres and carrying messages between them. (p. 59)

correlation a measure of the extent to which two factors vary together, and thus of how well either factor predicts the other. (p. 20)

correlation coefficient a statistical index of the relationship between two things (from 1 to +1). (pp. 20, A-4)

counseling psychology a branch of psychology that assists people with problems in living (often related to school, work, or relationships) and in achieving greater well-being. (p. 9)

counterconditioning behavior therapy procedures that use classical conditioning to evoke new responses to stimuli that are triggering unwanted behaviors; include *exposure therapies* and *aversive conditioning*. (p. 551)

creativity the ability to produce novel and valuable ideas. (p. 314)

critical period an optimal period early in the life of an organism when exposure to certain stimuli or experiences produces normal development. (p. 123)

critical thinking thinking that does not blindly accept arguments and conclusions. Rather, it examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions. (p. 15)

cross-sectional study a study in which people of different ages are compared with one another. (pp. 153, A-7)

crystallized intelligence our accumulated knowledge and verbal skills; tends to increase with age. (p. 337)

culture the enduring behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next. (pp. 26, 463)

D

debriefing the postexperimental explanation of a study, including its purpose and any deceptions, to its participants. (p. 28)

deep processing encoding semantically, based on the meaning of the words; tends to yield the best retention. (p. 278)

defense mechanisms in psychoanalytic theory, the ego's protective methods of reducing anxiety by unconsciously distorting reality. (p. 427)

deindividuation the loss of self-awareness and self-restraint occurring in group situations that foster arousal and anonymity. (p. 472)

déjà vu that eerie sense that "I've experienced this before." Cues from the current situation may subconsciously trigger retrieval of an earlier experience. (p. 296)

delta waves the large, slow brain waves associated with deep sleep. (p. 85)

delusions false beliefs, often of persecution or grandeur, that may accompany psychotic disorders. (p. 528)

dendrites a neuron's bushy, branching extensions that receive messages and conduct impulses toward the cell body. (p. 36)

dependent variable the outcome factor; the variable that may change in response to manipulations of the independent variable. (p. 24)

depressants drugs (such as alcohol, barbiturates, and opiates) that reduce neural activity and slow body functions. (p. 102)

depth perception the ability to see objects in three dimensions although the images that strike the retina are two-dimensional; allows us to judge distance. (p. 210)

developmental psychology a branch of psychology that studies physical, cognitive, and social change throughout the life span. (p. 118)

difference threshold the minimum difference between two stimuli required for detection 50 percent of the time. We experience the difference threshold as a *just noticeable difference* (or *jnd*). (p. 194)

discrimination (1) in classical conditioning, the learned ability to distinguish between a conditioned stimulus and stimuli that do not signal an unconditioned stimulus. (2) in social psychology, unjustifiable negative behavior toward a group and its members. (pp. 244, 476)

dissociation a split in consciousness, which allows some thoughts and behaviors to occur simultaneously with others. (p. 99)

dissociative disorders disorders in which conscious awareness becomes separated (dissociated) from previous memories, thoughts, and feelings. (p. 534)

dissociative identity disorder (DID) a rare dissociative disorder in which a person exhibits two or more distinct and alternating

personalities. Formerly called multiple personality disorder. (p. 534)

divergent thinking expands the number of possible problem solutions (creative thinking that diverges in different directions). (p. 314)

DNA (deoxyribonucleic acid) a complex molecule containing the genetic information that makes up the chromosomes. (p. 62)

double-blind procedure an experimental procedure in which both the research participants and the research staff are ignorant (blind) about whether the research participants have received the treatment or a placebo. Commonly used in drug-evaluation studies. (p. 23)

Down syndrome a condition of mild to severe intellectual disability and associated physical disorders caused by an extra copy of chromosome 21. (p. 338)

dream a sequence of images, emotions, and thoughts passing through a sleeping person's mind. Dreams are notable for their hallucinatory imagery, discontinuities, and incongruities, and for the dreamer's delusional acceptance of the content and later difficulties remembering it. (p. 93)

drive-reduction theory the idea that a physiological need creates an aroused tension state (a drive) that motivates an organism to satisfy the need. (p. 353)

DSM-IV-TR the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, with an updated "text revision"; a widely used system for classifying psychological disorders. (p. 509)

dual processing the principle that information is often simultaneously processed on separate conscious and unconscious tracks. (p. 79)

E

echoic memory a momentary sensory memory of auditory stimuli; if attention is elsewhere, sounds and words can still be recalled within 3 or 4 seconds. (p. 276)

eclectic approach an approach to psychotherapy that, depending on the client's problems, uses techniques from various forms of therapy. (p. 546)

Ecstasy (MDMA) a synthetic stimulant and mild hallucinogen. Produces euphoria and social intimacy, but with short-term health risks and longer-term harm to serotonin-producing neurons and to mood and cognition. (p. 107)

effortful processing encoding that requires attention and conscious effort. (p. 274)

ego the largely conscious, "executive" part of personality that, according to Freud, mediates among the demands of the id, superego, and reality. The ego operates on the *reality principle*, satisfying the id's desires in ways that will realistically bring pleasure rather than pain. (p. 425)

egocentrism in Piaget's theory, the pre-operational child's difficulty taking another's point of view. (p. 128)

electroconvulsive therapy (ECT) a biomedical therapy for severely depressed patients in which a brief electric current is sent through the brain of an anesthetized patient. (p. 571)

electroencephalogram (EEG) an amplified recording of the waves of electrical activity sweeping across the brain's surface. These waves are measured by electrodes placed on the scalp. (p. 48)

embodied cognition the influence of bodily sensations, gestures, and other states on cognitive preferences and judgments. (p. 229)

embryo the developing human organism from about 2 weeks after fertilization through the second month. (p. 119)

emerging adulthood for some people in modern cultures, a period from the late teens to mid-twenties, bridging the gap between adolescent dependence and full independence and responsible adulthood. (p. 149)

emotion a response of the whole organism, involving (1) physiological arousal, (2) expressive behaviors, and (3) conscious experience. (p. 372)

emotional intelligence the ability to perceive, understand, manage, and use emotions. (p. 333)

emotion-focused coping attempting to alleviate stress by avoiding or ignoring a stressor and attending to emotional needs related to one's stress reaction. (p. 401)

empirically derived test a test (such as the MMPI) developed by testing a pool of items and then selecting those that discriminate between groups. (p. 437)

encoding the processing of information into the memory system—for example, by extracting meaning. (p. 273)

endocrine [EN-duh-krin] system the body's "slow" chemical communication system; a set of glands that secrete hormones into the bloodstream. (p. 45)

endorphins [en-DOR-fins] "morphine within"—natural, opiate-like neurotransmitters linked to pain control and to pleasure. (p. 40)

environment every nongenetic influence, from prenatal nutrition to the people and things around us. (p. 62)

epigenetics the study of environmental influences on gene expression that occur without a DNA change. (p. 67)

equity a condition in which people receive from a relationship in proportion to what they give to it. (p. 492)

estrogens sex hormones, such as estradiol, secreted in greater amounts by females than by males and contributing to female sex characteristics. In nonhuman female mammals, estrogen levels peak during ovulation, promoting sexual receptivity. (p. 171)

evidence-based practice clinical decision making that integrates the best available research with clinical expertise and patient characteristics and preferences. (p. 562)

evolutionary psychology the study of the evolution of behavior and the mind, using principles of natural selection. (p. 68)

experiment a research method in which an investigator manipulates one or more factors (independent variables) to observe the effect on some behavior or mental process (the dependent variable). By *random assignment* of participants, the experimenter aims to control other relevant factors. (p. 22)

experimental group in an experiment, the group exposed to the treatment, that is, to one version of the independent variable. (p. 22)

explicit memory memory of facts and experiences that one can consciously know and "declare." (Also called *declarative memory*.) (p. 274)

exposure therapies behavioral techniques, such as *systematic desensitization* and *virtual reality exposure therapy*, that treat anxieties by exposing people (in imagination or actual situations) to the things they fear and avoid. (p. 551)

external locus of control the perception that chance or outside forces beyond our personal control determine our fate. (p. 403)

extinction the diminishing of a conditioned response; occurs in classical conditioning when an unconditioned stimulus does not follow a conditioned stimulus; occurs in operant conditioning when a response is no longer reinforced. (p. 242)

extrasensory perception (ESP) the controversial claim that perception can occur apart from sensory input; includes telepathy, clairvoyance, and precognition. (p. 230)

extrinsic motivation a desire to perform a behavior to receive promised rewards or avoid threatened punishment. (p. 260)

F

facial feedback effect the tendency of facial muscle states to trigger corresponding feelings, such as fear, anger, or happiness. (p. 384)

family therapy therapy that treats the family as a system. Views an individual's unwanted behaviors as influenced by, or directed at, other family members. (p. 558)

feature detectors nerve cells in the brain that respond to specific features of the stimulus, such as shape, angle, or movement. (p. 204)

feel-good, do-good phenomenon people's tendency to be helpful when already in a good mood. (p. 413)

fetal alcohol syndrome (FAS) physical and cognitive abnormalities in children caused by a pregnant woman's heavy drinking. In severe cases, symptoms include noticeable facial misproportions. (p. 120)

fetus the developing human organism from 9 weeks after conception to birth. (p. 119)

figure-ground the organization of the visual field into objects (the *figures*) that stand out from their surroundings (the *ground*). (p. 209)

fixation according to Freud, a lingering focus of pleasure-seeking energies at an earlier psychosexual stage, in which conflicts were unresolved. (p. 426)

fixed-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed. (p. 250)

fixed-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified number of responses. (p. 249)

flashbulb memory a clear memory of an emotionally significant moment or event. (p. 283)

flow a completely involved, focused state of consciousness, with diminished awareness of self and time, resulting from optimal engagement of one's skills. (p. B-1)

fluid intelligence our ability to reason speedily and abstractly; tends to decrease during late adulthood. (p. 337)

fMRI (functional MRI) a technique for revealing bloodflow and, therefore, brain activity by comparing successive MRI scans. fMRI scans show brain function. (p. 48)

foot-in-the-door phenomenon the tendency for people who have first agreed to a small request to comply later with a larger request. (p. 461)

formal operational stage in Piaget's theory, the stage of cognitive development (normally beginning about age 12) during which people begin to think logically about abstract concepts. (p. 129)

fovea the central focal point in the retina, around which the eye's cones cluster. (p. 203)

framing the way an issue is posed; how an issue is framed can significantly affect decisions and judgments. (p. 312)

fraternal twins twins who develop from separate (dizygotic) fertilized eggs. They are genetically no closer than ordinary brothers and sisters, but they share a fetal environment. (p. 63)

free association in psychoanalysis, a method of exploring the unconscious in which the person relaxes and says whatever comes to mind, no matter how trivial or embarrassing. (p. 424)

frequency the number of complete wavelengths that pass a point in a given time (for example, per second). (p. 216)

frequency theory in hearing, the theory that the rate of nerve impulses traveling up the auditory nerve matches the frequency of a tone, thus enabling us to sense its pitch. (p. 219)

frontal lobes portion of the cerebral cortex lying just behind the forehead; involved in speaking and muscle movements and in making plans and judgments. (p. 53)

frustration-aggression principle the principle that frustration—the blocking of an attempt to achieve some goal—creates anger, which can generate aggression. (p. 483)

functionalism early school of thought promoted by James and influenced by Darwin; explored how mental and behavioral processes function—how they enable the organism to adapt, survive, and flourish. (p. 3)

fundamental attribution error the tendency for observers, when analyzing another's behavior, to underestimate the impact of the situation and to overestimate the impact of personal disposition. (p. 458)

G

gate-control theory the theory that the spinal cord contains a neurological "gate" that blocks pain signals or allows them to pass on to the brain. The "gate" is opened by the activity of pain signals traveling up small nerve fibers and is closed by activity in larger fibers or by information coming from the brain. (p. 221)

gender the socially constructed roles and characteristics by which a culture defines *male* and *female*. (p. 164)

gender identity our sense of being male or female. (p. 170)

gender role a set of expected behaviors for males or for females. (p. 169)

gender-typing the acquisition of a traditional masculine or feminine role. (p. 170)

general adaptation syndrome (GAS) Selye's concept of the body's adaptive

response to stress in three phases—alarm, resistance, exhaustion. (p. 393)

general intelligence (*g*) a general intelligence factor that, according to Spearman and others, underlies specific mental abilities and is therefore measured by every task on an intelligence test. (p. 330)

generalization the tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to elicit similar responses. (p. 243)

generalized anxiety disorder an anxiety disorder in which a person is continually tense, apprehensive, and in a state of autonomic nervous system arousal. (p. 513)

genes the biochemical units of heredity that make up the chromosomes; segments of DNA capable of synthesizing proteins. (p. 62)

gestalt an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes. (p. 208)

glial cells (glia) cells in the nervous system that support, nourish, and protect neurons; they may also play a role in learning and thinking. (p. 37)

glucose the form of sugar that circulates in the blood and provides the major source of energy for body tissues. When its level is low, we feel hunger. (p. 357)

grammar in a language, a system of rules that enables us to communicate with and understand others. In a given language, *semantics* is the set of rules for deriving meaning from sounds, and *syntax* is the set of rules for combining words into grammatically sensible sentences. (p. 319)

GRIT Graduated and Reciprocated Initiatives in Tension-Reduction—a strategy designed to decrease international tensions. (p. 500)

group polarization the enhancement of a group's prevailing inclinations through discussion within the group. (p. 473)

group therapy therapy conducted with groups rather than individuals, permitting therapeutic benefits from group interaction. (p. 557)

grouping the perceptual tendency to organize stimuli into coherent groups. (p. 209)

groupthink the mode of thinking that occurs when the desire for harmony in a decision-making group overrides a realistic appraisal of alternatives. (p. 474)

H

habituation decreasing responsiveness with repeated stimulation. As infants gain familiarity with repeated exposure to a visual stimulus, their interest wanes and they look away sooner. (p. 121)

hallucinations false sensory experiences, such as seeing something in the absence of an external visual stimulus. (p. 85)

hallucinogens psychedelic (“mind-manifesting”) drugs, such as LSD, that distort perceptions and evoke sensory images in the absence of sensory input. (p. 107)

health psychology a subfield of psychology that provides psychology’s contribution to behavioral medicine. (p. 394)

heritability the proportion of variation among individuals that we can attribute to genes. The heritability of a trait may vary, depending on the range of populations and environments studied. (p. 340)

heuristic a simple thinking strategy that often allows us to make judgments and solve problems efficiently; usually speedier but also more error prone than *algorithms*. (p. 307)

hierarchy of needs Maslow’s pyramid of human needs, beginning at the base with physiological needs that must first be satisfied before higher-level safety needs and then psychological needs become active. (p. 355)

hindsight bias the tendency to believe, after learning an outcome, that one would have foreseen it. (Also known as the *I-knew-it-all-along phenomenon*.) (p. 11)

hippocampus a neural center located in the limbic system; helps process explicit memories for storage. (p. 281)

homeostasis a tendency to maintain a balanced or constant internal state; the regulation of any aspect of body chemistry, such as blood glucose, around a particular level. (p. 353)

hormones chemical messengers that are manufactured by the endocrine glands, travel through the bloodstream, and affect other tissues. (p. 45)

hue the dimension of color that is determined by the wavelength of light; what we know as the color names *blue*, *green*, and so forth. (p. 200)

human factors psychology an I/O psychology subfield that explores how people and machines interact and how machines and physical environments can be made safe and easy to use. (p. B-3)

humanistic psychology historically significant perspective that emphasized the growth potential of healthy people. (p. 4)

humanistic theories view personality with a focus on the potential for healthy personal growth. (p. 432)

hypnosis a social interaction in which one person (the hypnotist) suggests to another (the subject) that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur. (p. 97)

hypothalamus [hi-po-THAL-uh-muss] a neural structure lying below (*hypo*) the thala-

mus; it directs several maintenance activities (eating, drinking, body temperature), helps govern the endocrine system via the pituitary gland, and is linked to emotion and reward. (p. 51)

hypothesis a testable prediction, often implied by a theory. (p. 16)

I

iconic memory a momentary sensory memory of visual stimuli; a photographic or picture-image memory lasting no more than a few tenths of a second. (p. 276)

id a reservoir of unconscious psychic energy that, according to Freud, strives to satisfy basic sexual and aggressive drives. The id operates on the *pleasure principle*, demanding immediate gratification. (p. 425)

identical twins twins who develop from a single (monozygotic) fertilized egg that splits in two, creating two genetically identical organisms. (p. 63)

identification the process by which, according to Freud, children incorporate their parents’ values into their developing superegos. (p. 426)

identity our sense of self; according to Erikson, the adolescent’s task is to solidify a sense of self by testing and integrating various roles. (p. 144)

implicit memory retention independent of conscious recollection. (Also called *nondeclarative memory*.) (p. 274)

imprinting the process by which certain animals form attachments during a critical period very early in life. (p. 133)

inattentional blindness failing to see visible objects when our attention is directed elsewhere. (p. 81)

incentive a positive or negative environmental stimulus that motivates behavior. (p. 353)

independent variable the experimental factor that is manipulated; the variable whose effect is being studied. (p. 24)

individualism giving priority to one’s own goals over group goals and defining one’s identity in terms of personal attributes rather than group identifications. (p. 451)

industrial-organizational (I/O) psychology the application of psychological concepts and methods to optimizing human behavior in workplaces. (p. B-2)

informational social influence influence resulting from one’s willingness to accept others’ opinions about reality. (p. 467)

informed consent giving potential participants enough information about a study to enable them to decide whether they wish to participate. (p. 28)

ingroup “Us”—people with whom we share a common identity. (p. 478)

ingroup bias the tendency to favor our own group. (p. 478)

inner ear the innermost part of the ear, containing the cochlea, semicircular canals, and vestibular sacs. (p. 216)

insight a sudden realization of a problem’s solution; contrasts with strategy-based solutions. (p. 307)

insight therapies a variety of therapies that aim to improve psychological functioning by increasing a person’s awareness of underlying motives and defenses. (p. 548)

insomnia recurring problems in falling or staying asleep. (p. 91)

instinct a complex behavior that is rigidly patterned throughout a species and is unlearned. (p. 352)

intellectual disability a condition of limited mental ability, indicated by an intelligence test score of 70 or below and difficulty in adapting to the demands of life. (Formerly referred to as *mental retardation*.) (p. 338)

intelligence mental quality consisting of the ability to learn from experience, solve problems, and use knowledge to adapt to new situations. (p. 329)

intelligence quotient (IQ) defined originally as the ratio of mental age (*ma*) to chronological age (*ca*) multiplied by 100 (thus, $IQ = ma/ca \times 100$). On contemporary intelligence tests, the average performance for a given age is assigned a score of 100. (p. 334)

intelligence test a method for assessing an individual’s mental aptitudes and comparing them with those of others, using numerical scores. (p. 333)

intensity the amount of energy in a light or sound wave, which we perceive as brightness or loudness, as determined by the wave’s amplitude. (p. 200)

interaction the interplay that occurs when the effect of one factor (such as environment) depends on another factor (such as heredity). (p. 67)

internal locus of control the perception that you control your own fate. (p. 403)

interneurons neurons within the brain and spinal cord that communicate internally and intervene between the sensory inputs and motor outputs. (p. 41)

interpretation in psychoanalysis, the analyst’s noting supposed dream meanings, resistances, and other significant behaviors and events in order to promote insight. (p. 547)

intimacy in Erikson’s theory, the ability to form close, loving relationships; a primary developmental task in late adolescence and early adulthood. (p. 145)

intrinsic motivation a desire to perform a behavior effectively for its own sake. (p. 260)

intuition an effortless, immediate, automatic feeling or thought, as contrasted with explicit, conscious reasoning. (p. 308)

J

James-Lange theory the theory that our experience of emotion is our awareness of our physiological responses to emotion-arousing stimuli. (p. 372)

just-world phenomenon the tendency for people to believe the world is just and that people therefore get what they deserve and deserve what they get. (p. 478)

K

kinesthesia [kin-ehs-THÉE-sehs] the system for sensing the position and movement of individual body parts. (p. 227)

L

language our spoken, written, or signed words and the ways we combine them to communicate meaning. (p. 318)

latent content according to Freud, the underlying meaning of a dream (as distinct from its manifest content). (p. 95)

latent learning learning that occurs but is not apparent until there is an incentive to demonstrate it. (p. 260)

law of effect Thorndike's principle that behaviors followed by favorable consequences become more likely, and that behaviors followed by unfavorable consequences become less likely. (p. 246)

learned helplessness the hopelessness and passive resignation an animal or human learns when unable to avoid repeated aversive events. (p. 402)

learning the process of acquiring through experience new and relatively enduring information or behaviors. (p. 238)

lesion [LEE-zhuhn] tissue destruction. A brain lesion is a naturally or experimentally caused destruction of brain tissue. (p. 46)

levels of analysis the differing complementary views, from biological to psychological to social-cultural, for analyzing any given phenomenon. (p. 6)

limbic system neural system (including the *hippocampus*, *amygdala*, and *hypothalamus*) located below the cerebral hemispheres; associated with emotions and drives. (p. 50)

linguistic determinism Whorf's hypothesis that language determines the way we think. (p. 326)

lobotomy a psychosurgical procedure once used to calm uncontrollably emotional or violent patients. The procedure cut the nerves connecting the frontal lobes to the

emotion-controlling centers of the inner brain. (p. 574)

longitudinal study research in which the same people are restudied and retested over a long period of time. (pp. 153, A-7)

long-term memory the relatively permanent and limitless storehouse of the memory system. Includes knowledge, skills, and experiences. (p. 273)

long-term potentiation (LTP) an increase in a cell's firing potential after brief, rapid stimulation. Believed to be a neural basis for learning and memory. (p. 284)

LSD a powerful hallucinogenic drug; also known as acid (*lysergic acid diethylamide*). (p. 107)

M

major depressive disorder a mood disorder in which a person experiences, in the absence of drugs or another medical condition, two or more weeks of significantly depressed moods or diminished interest or pleasure in most activities, along with at least four other symptoms. (p. 520)

mania a hyperactive, wildly optimistic state in which dangerously poor judgment is common. (p. 520)

manifest content according to Freud, the remembered story line of a dream (as distinct from its latent, or hidden, content). (p. 94)

maturation biological growth processes that enable orderly changes in behavior, relatively uninfluenced by experience. (p. 121)

mean the arithmetic average of a distribution, obtained by adding the scores and then dividing by the number of scores. (p. A-2)

median the middle score in a distribution; half the scores are above it and half are below it. (p. A-2)

medical model the concept that diseases, in this case psychological disorders, have physical causes that can be diagnosed, treated, and, in most cases, cured, often through treatment in a hospital. (p. 507)

medulla [muh-DUL-uh] the base of the brainstem; controls heartbeat and breathing. (p. 47)

memory the persistence of learning over time through the storage and retrieval of information. (p. 272)

menarche [meh-NAR-key] the first menstrual period. (p. 167)

menopause the time of natural cessation of menstruation; also refers to the biological changes a woman experiences as her ability to reproduce declines. (p. 151)

mental age a measure of intelligence test performance devised by Binet; the chronological age that most typically corresponds to a given level of performance. Thus, a child

who does as well as an average 8-year-old is said to have a mental age of 8. (p. 334)

mental set a tendency to approach a problem in one particular way, often a way that has been successful in the past. (p. 308)

mere exposure effect the phenomenon that repeated exposure to novel stimuli increases liking of them. (p. 488)

methamphetamine a powerfully addictive drug that stimulates the central nervous system, with speeded-up body functions and associated energy and mood changes; over time, appears to reduce baseline dopamine levels. (p. 106)

middle ear the chamber between the eardrum and cochlea containing three tiny bones (hammer, anvil, and stirrup) that concentrate the vibrations of the eardrum on the cochlea's oval window. (p. 216)

Minnesota Multiphasic Personality Inventory (MMPI) the most widely researched and clinically used of all personality tests. Originally developed to identify emotional disorders (still considered its most appropriate use), this test is now used for many other screening purposes. (p. 437)

mirror neurons frontal lobe neurons that some scientists believe fire when performing certain actions or when observing another doing so. The brain's mirroring of another's action may enable imitation and empathy. (p. 262)

mirror-image perceptions mutual views often held by conflicting people, as when each side sees itself as ethical and peaceful and views the other side as evil and aggressive. (p. 498)

misinformation effect incorporating misleading information into one's memory of an event. (p. 295)

mnemonics [nih-MON-iks] memory aids, especially those techniques that use vivid imagery and organizational devices. (p. 277)

mode the most frequently occurring score(s) in a distribution. (p. A-2)

modeling the process of observing and imitating a specific behavior. (p. 261)

monocular cues depth cues, such as interposition and linear perspective, available to either eye alone. (p. 211)

mood disorders psychological disorders characterized by emotional extremes. See major depressive disorder, mania, and bipolar disorder. (p. 519)

mood-congruent memory the tendency to recall experiences that are consistent with one's current good or bad mood. (p. 288)

morpheme in a language, the smallest unit that carries meaning; may be a word or a part of a word (such as a prefix). (p. 319)

motivation a need or desire that energizes and directs behavior. (p. 352)

motor cortex an area at the rear of the frontal lobes that controls voluntary movements. (p. 54)

motor (efferent) neurons neurons that carry outgoing information from the brain and spinal cord to the muscles and glands. (p. 41)

MRI (magnetic resonance imaging) a technique that uses magnetic fields and radio waves to produce computer-generated images of soft tissue. MRI scans show brain anatomy. (p. 48)

mutation a random error in gene replication that leads to a change. (p. 69)

myelin [MY-uh-lin] sheath a fatty tissue layer segmentally encasing the axons of some neurons; enables vastly greater transmission speed as neural impulses hop from one node to the next. (p. 37)

N

narcissism excessive self-love and self-absorption. (p. 449)

narcolepsy a sleep disorder characterized by uncontrollable sleep attacks. The sufferer may lapse directly into REM sleep, often at inopportune times. (p. 92)

natural selection the principle that, among the range of inherited trait variations, those contributing to reproduction and survival will most likely be passed on to succeeding generations. (pp. 6, 68)

naturalistic observation observing and recording behavior in naturally occurring situations without trying to manipulate and control the situation. (p. 18)

nature–nurture issue the longstanding controversy over the relative contributions that genes and experience make to the development of psychological traits and behaviors. Today's psychological science sees traits and behaviors arising from the interaction of nature and nurture. (p. 5)

near–death experience an altered state of consciousness reported after a close brush with death (such as through cardiac arrest); often similar to drug-induced hallucinations. (p. 107)

negative reinforcement increasing behaviors by stopping or reducing negative stimuli. A negative reinforcer is any stimulus that, when *removed* after a response, strengthens the response. (*Note:* Negative reinforcement is not punishment.) (p. 248)

nerves bundled axons that form neural “cables” connecting the central nervous system with muscles, glands, and sense organs. (p. 41)

nervous system the body's speedy, electrochemical communication network, con-

sisting of all the nerve cells of the peripheral and central nervous systems. (p. 41)

neurogenesis the formation of new neurons. (p. 58)

neuron a nerve cell; the basic building block of the nervous system. (p. 36)

neurotransmitters chemical messengers that cross the synaptic gaps between neurons. When released by the sending neuron, neurotransmitters travel across the synapse and bind to receptor sites on the receiving neuron, thereby influencing whether that neuron will generate a neural impulse. (p. 39)

neutral stimulus (NS) in classical conditioning, a stimulus that elicits no response before conditioning. (p. 240)

nicotine a stimulating and highly addictive psychoactive drug in tobacco. (p. 104)

night terrors a sleep disorder characterized by high arousal and an appearance of being terrified; unlike nightmares, night terrors occur during NREM-3 sleep, within two or three hours of falling asleep, and are seldom remembered. (p. 93)

norm an understood rule for accepted and expected behavior. Norms prescribe “proper” behavior. (p. 464)

normal curve (*normal distribution*) a symmetrical, bell-shaped curve that describes the distribution of many types of data; most scores fall near the mean (about 68 percent fall within one standard deviation of it) and fewer and fewer near the extremes. (pp. 336, A-4)

normative social influence influence resulting from a person's desire to gain approval or avoid disapproval. (p. 467)

O

object permanence the awareness that things continue to exist even when not perceived. (p. 126)

observational learning learning by observing others. (p. 261)

obsessive–compulsive disorder (OCD) an anxiety disorder characterized by unwanted repetitive thoughts (obsessions), actions (compulsions), or both. (p. 514)

occipital [ahk-SIP-uh-tuhl] lobes portion of the cerebral cortex lying at the back of the head; includes areas that receive information from the visual fields. (p. 53)

Oedipus [ED-uh-puss] complex according to Freud, a boy's sexual desires toward his mother and feelings of jealousy and hatred for the rival father. (p. 426)

one-word stage the stage in speech development, from about age 1 to 2, during which a child speaks mostly in single words. (p. 320)

operant behavior behavior that operates on the environment, producing consequences. (p. 256)

operant chamber in operant conditioning research, a chamber (also known as a *Skinner box*) containing a bar or key that an animal can manipulate to obtain a food or water reinforcer; attached devices record the animal's rate of bar pressing or key pecking. (p. 246)

operant conditioning a type of learning in which behavior is strengthened if followed by a reinforcer or diminished if followed by a punisher. (p. 246)

operational definition a statement of the procedures (operations) used to define research variables. For example, *human intelligence* may be operationally defined as “what an intelligence test measures.” (p. 16)

opiates opium and its derivatives, such as morphine and heroin; they depress neural activity, temporarily lessening pain and anxiety. (p. 103)

opponent–process theory the theory that opposing retinal processes (red–green, yellow–blue, white–black) enable color vision. For example, some cells are stimulated by green and inhibited by red; others are stimulated by red and inhibited by green. (p. 207)

optic nerve the nerve that carries neural impulses from the eye to the brain. (p. 202)

organizational psychology an I/O psychology subfield that examines organizational influences on worker satisfaction and productivity and facilitates organizational change. (p. B-2)

other-race effect the tendency to recall faces of one's own race more accurately than faces of other races. Also called the *cross-race effect* and the *own-race bias*. (p. 480)

outgroup “Them”—those perceived as different or apart from our ingroup. (p. 478)

overconfidence the tendency to be more confident than correct—to overestimate the accuracy of our beliefs and judgments. (p. 311)

P

panic disorder an anxiety disorder marked by unpredictable, minutes-long episodes of intense dread in which a person experiences terror and accompanying chest pain, choking, or other frightening sensations. (p. 513)

parallel processing the processing of many aspects of a problem simultaneously; the brain's natural mode of information processing for many functions, including vision. Contrasts with the step-by-step (serial) processing of most computers and of conscious problem solving. (p. 205)

- parapsychology** the study of paranormal phenomena, including ESP and psychokinesis. (p. 230)
- parasympathetic nervous system** the division of the autonomic nervous system that calms the body, conserving its energy. (p. 42)
- parietal** [puh-RYE-uh-tuhl] **lobes** portion of the cerebral cortex lying at the top of the head and toward the rear; receives sensory input for touch and body position. (p. 53)
- partial (intermittent) reinforcement** reinforcing a response only part of the time; results in slower acquisition of a response but much greater resistance to extinction than does continuous reinforcement. (p. 249)
- passionate love** an aroused state of intense positive absorption in another, usually present at the beginning of a love relationship. (p. 492)
- perception** the process of organizing and interpreting sensory information, enabling us to recognize meaningful objects and events. (p. 192)
- perceptual adaptation** in vision, the ability to adjust to an artificially displaced or even inverted visual field. (p. 215)
- perceptual constancy** perceiving objects as unchanging (having consistent color, brightness, shape, and size) even as illumination and retinal images change. (p. 212)
- perceptual set** a mental predisposition to perceive one thing and not another. (p. 197)
- peripheral nervous system (PNS)** the sensory and motor neurons that connect the central nervous system (CNS) to the rest of the body. (p. 41)
- peripheral route persuasion** occurs when people are influenced by incidental cues, such as a speaker's attractiveness. (p. 460)
- personality** an individual's characteristic pattern of thinking, feeling, and acting. (p. 423)
- personality disorders** psychological disorders characterized by inflexible and enduring behavior patterns that impair social functioning. (p. 537)
- personality inventory** a questionnaire (often with *true-false* or *agree-disagree* items) on which people respond to items designed to gauge a wide range of feelings and behaviors; used to assess selected personality traits. (p. 437)
- personnel psychology** an I/O psychology subfield that focuses on employee recruitment, selection, placement, training, appraisal, and development. (p. B-2)
- PET (positron emission tomography) scan** a visual display of brain activity that detects where a radioactive form of glucose goes while the brain performs a given task. (p. 48)
- phobia** an anxiety disorder marked by a persistent, irrational fear and avoidance of a specific object, activity, or situation. (p. 513)
- phoneme** in a language, the smallest distinctive sound unit. (p. 319)
- physical dependence** a physiological need for a drug, marked by unpleasant withdrawal symptoms when the drug is discontinued. (p. 102)
- pitch** a tone's experienced highness or lowness; depends on frequency. (p. 216)
- pituitary gland** the endocrine system's most influential gland. Under the influence of the hypothalamus, the pituitary regulates growth and controls other endocrine glands. (p. 45)
- place theory** in hearing, the theory that links the pitch we hear with the place where the cochlea's membrane is stimulated. (p. 219)
- placebo** [pluh-SEE-bo; Latin for "I shall please"] **effect** experimental results caused by expectations alone; any effect on behavior caused by the administration of an inert substance or condition, which the recipient assumes is an active agent. (p. 23)
- plasticity** the brain's ability to change, especially during childhood, by reorganizing after damage or by building new pathways based on experience. (p. 57)
- polygraph** a machine, commonly used in attempts to detect lies, that measures several of the physiological responses (such as perspiration and cardiovascular and breathing changes) accompanying emotion. (p. 379)
- population** all those in a group being studied, from which samples may be drawn. (*Note:* Except for national studies, this does *not* refer to a country's whole population.) (p. 20)
- positive psychology** the scientific study of human functioning, with the goals of discovering and promoting strengths and virtues that help individuals and communities to thrive. (pp. 9, 413)
- positive reinforcement** increasing behaviors by presenting positive reinforcers. A positive reinforcer is any stimulus that, when *presented* after a response, strengthens the response. (p. 248)
- posthypnotic suggestion** a suggestion, made during a hypnosis session, to be carried out after the subject is no longer hypnotized; used by some clinicians to help control undesired symptoms and behaviors. (p. 98)
- post-traumatic stress disorder (PTSD)** an anxiety disorder characterized by haunting memories, nightmares, social withdrawal, jumpy anxiety, and/or insomnia that lingers for four weeks or more after a traumatic experience. (p. 515)
- predictive validity** the success with which a test predicts the behavior it is designed to predict; it is assessed by computing the correlation between test scores and the criterion behavior. (Also called *criterion-related validity*.) (p. 337)
- prejudice** an unjustifiable and usually negative attitude toward a group and its members. Prejudice generally involves stereotyped beliefs, negative feelings, and a predisposition to discriminatory action. (p. 476)
- preoperational stage** in Piaget's theory, the stage (from about 2 to about 6 or 7 years of age) during which a child learns to use language but does not yet comprehend the mental operations of concrete logic. (p. 127)
- primary reinforcer** an innately reinforcing stimulus, such as one that satisfies a biological need. (p. 248)
- primary sex characteristics** the body structures (ovaries, testes, and external genitalia) that make sexual reproduction possible. (p. 167)
- priming** the activation, often unconsciously, of certain associations, thus predisposing one's perception, memory, or response. (pp. 194, 287)
- proactive interference** the disruptive effect of prior learning on the recall of new information. (p. 292)
- problem-focused coping** attempting to alleviate stress directly—by changing the stressor or the way we interact with that stressor. (p. 401)
- projective test** a personality test, such as the Rorschach, that provides ambiguous stimuli designed to trigger projection of one's inner dynamics. (p. 429)
- prosocial behavior** positive, constructive, helpful behavior. The opposite of antisocial behavior. (p. 263)
- prototype** a mental image or best example of a category. Matching new items to a prototype provides a quick and easy method for sorting items into categories (as when comparing feathered creatures to a prototypical bird, such as a robin). (p. 306)
- psychiatry** a branch of medicine dealing with psychological disorders; practiced by physicians who sometimes provide medical (for example, drug) treatments as well as psychological therapy. (p. 9)
- psychoactive drug** a chemical substance that alters perceptions and moods. (p. 100)
- psychoanalysis** (1) Sigmund Freud's theory of personality that attributes thoughts and actions to unconscious motives and conflicts. (2) Freud's therapeutic technique used in treating psychological disorders. Freud believed that the patient's free associations, resistances, dreams, and transferences—and the therapist's interpretations of them—released previously repressed feelings, allowing the patient to gain self-insight. (pp. 424, 547)

psychodynamic theories view personality with a focus on the unconscious and the importance of childhood experiences. (p. 424)

psychodynamic therapy therapy deriving from the psychoanalytic tradition; views individuals as responding to unconscious forces and childhood experiences, and seeks to enhance self-insight. (p. 548)

psychological dependence a psychological need to use a drug, such as to relieve negative emotions. (p. 102)

psychological disorder a significant dysfunction in a person's thoughts, feelings, or behaviors. (p. 506)

psychology the science of behavior and mental processes. (p. 4)

psychoneuroimmunology the study of how psychological, neural, and endocrine processes together affect the immune system and resulting health. (p. 394)

psychopharmacology the study of the effects of drugs on mind and behavior. (p. 568)

psychosexual stages the childhood stages of development (oral, anal, phallic, latency, genital) during which, according to Freud, the id's pleasure-seeking energies focus on distinct erogenous zones. (p. 426)

psychosis a psychological disorder in which a person loses contact with reality, experiencing irrational ideas and distorted perceptions. (p. 528)

psychosurgery surgery that removes or destroys brain tissue in an effort to change behavior. (p. 574)

psychotherapy treatment involving psychological techniques; consists of interactions between a trained therapist and someone seeking to overcome psychological difficulties or achieve personal growth. (p. 546)

puberty the period of sexual maturation, during which a person becomes capable of reproducing. (pp. 140, 167)

punishment an event that tends to *decrease* the behavior it follows. (p. 251)

R

random assignment assigning participants to experimental and control groups by chance, thus minimizing preexisting differences between the different groups. (p. 22)

random sample a sample that fairly represents a population because each member has an equal chance of inclusion. (p. 20)

range the difference between the highest and lowest scores in a distribution. (p. A-3)

recall a measure of memory in which the person must retrieve information learned earlier, as on a fill-in-the-blank test. (p. 272)

reciprocal determinism the interacting influences of behavior, internal cognition, and environment. (p. 443)

reciprocity norm an expectation that people will help, not hurt, those who have helped them. (p. 496)

recognition a measure of memory in which the person need only identify items previously learned, as on a multiple-choice test. (p. 272)

reflex a simple, automatic response to a sensory stimulus, such as the knee-jerk response. (p. 44)

refractory period a resting period after orgasm, during which a man cannot achieve another orgasm. (p. 173)

regression toward the mean the tendency for extreme or unusual scores or events to fall back (regress) toward the average. (p. A-6)

reinforcement in operant conditioning, any event that *strengthens* the behavior it follows. (p. 247)

reinforcement schedule a pattern that defines how often a desired response will be reinforced. (p. 249)

relative deprivation the perception that one is worse off relative to those with whom one compares oneself. (p. 417)

relearning a measure of memory that assesses the amount of time saved when learning material again. (p. 272)

reliability the extent to which a test yields consistent results, as assessed by the consistency of scores on two halves of the test, or on retesting. (p. 336)

REM rebound the tendency for REM sleep to increase following REM sleep deprivation (created by repeated awakenings during REM sleep). (p. 96)

REM sleep rapid eye movement sleep; a recurring sleep stage during which vivid dreams commonly occur. Also known as *paradoxical sleep*, because the muscles are relaxed (except for minor twitches) but other body systems are active. (p. 84)

repetitive transcranial magnetic stimulation (rTMS) the application of repeated pulses of magnetic energy to the brain; used to stimulate or suppress brain activity. (p. 573)

replication repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding extends to other participants and circumstances. (p. 16)

repression in psychoanalytic theory, the basic defense mechanism that banishes from consciousness anxiety-arousing thoughts, feelings, and memories. (pp. 294, 427)

resilience the personal strength that helps most people cope with stress and recover from adversity and even trauma. (p. 576)

resistance in psychoanalysis, the blocking from consciousness of anxiety-laden material. (p. 547)

respondent behavior behavior that occurs as an automatic response to some stimulus. (p. 254)

reticular formation a nerve network that travels through the brainstem and plays an important role in controlling arousal. (p. 49)

retina the light-sensitive inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information. (p. 201)

retinal disparity a binocular cue for perceiving depth: By comparing images from the retinas in the two eyes, the brain computes distance—the greater the disparity (difference) between the two images, the closer the object. (p. 210)

retrieval the process of getting information out of memory storage. (p. 273)

retroactive interference the disruptive effect of new learning on the recall of old information. (p. 293)

retrograde amnesia an inability to retrieve information from one's past. (p. 290)

rods retinal receptors that detect black, white, and gray; necessary for peripheral and twilight vision, when cones don't respond. (p. 202)

role a set of expectations (norms) about a social position, defining how those in the position ought to behave. (pp. 169, 461)

Rorschach inkblot test the most widely used projective test, a set of 10 inkblots, designed by Hermann Rorschach; seeks to identify people's inner feelings by analyzing their interpretations of the blots. (p. 429)

S

savant syndrome a condition in which a person otherwise limited in mental ability has an exceptional specific skill, such as in computation or drawing. (p. 330)

scapegoat theory the theory that prejudice offers an outlet for anger by providing someone to blame. (p. 479)

scatterplot a graphed cluster of dots, each of which represents the values of two variables. The slope of the points suggests the direction of the relationship between the two variables. The amount of scatter suggests the strength of the correlation (little scatter indicates high correlation). (p. A-4)

schema a concept or framework that organizes and interprets information. (p. 125)

schizophrenia a group of severe disorders characterized by disorganized and delusional

thinking, disturbed perceptions, and inappropriate emotions and behaviors. (p. 528)

secondary sex characteristics nonreproductive sexual traits, such as female breasts and hips, male voice quality, and body hair. (p. 167)

selective attention the focusing of conscious awareness on a particular stimulus. (p. 80)

self in contemporary psychology, assumed to be the center of personality, the organizer of our thoughts, feelings, and actions. (p. 447)

self-actualization according to Maslow, one of the ultimate psychological needs that arises after basic physical and psychological needs are met and self-esteem is achieved; the motivation to fulfill one's potential. (p. 433)

self-concept all our thoughts and feelings about ourselves, in answer to the question, "Who am I?" (p. 434)

self-control the ability to control impulses and delay short-term gratification for greater long-term rewards. (p. 403)

self-disclosure revealing intimate aspects of oneself to others. (p. 492)

self-efficacy one's sense of competence and effectiveness. (p. 447)

self-esteem one's feelings of high or low self-worth. (p. 447)

self-serving bias a readiness to perceive oneself favorably. (p. 448)

sensation the process by which our sensory receptors and nervous system receive and represent stimulus energies from our environment. (p. 192)

sensorimotor stage in Piaget's theory, the stage (from birth to about 2 years of age) during which infants know the world mostly in terms of their sensory impressions and motor activities. (p. 126)

sensorineural hearing loss hearing loss caused by damage to the cochlea's receptor cells or to the auditory nerves; also called *nerve deafness*. (p. 217)

sensory (afferent) neurons neurons that carry incoming information from the sensory receptors to the brain and spinal cord. (p. 41)

sensory adaptation diminished sensitivity as a consequence of constant stimulation. (p. 196)

sensory cortex area at the front of the parietal lobes that registers and processes body touch and movement sensations. (p. 55)

sensory interaction the principle that one sense may influence another, as when the smell of food influences its taste. (p. 228)

sensory memory the immediate, very brief recording of sensory information in the memory system. (p. 273)

serial position effect our tendency to recall best the last (*a recency effect*) and first items (*a primacy effect*) in a list. (p. 288)

set point the point at which your "weight thermostat" is supposedly set. When your body falls below this weight, increased hunger and a lowered metabolic rate may combine to restore the lost weight. (p. 358)

sexual dysfunction a problem that consistently impairs sexual arousal or functioning. (p. 173)

sexual orientation an enduring sexual attraction toward members of either one's own sex (homosexual orientation), the other sex (heterosexual orientation), or both sexes (bisexual orientation). (p. 178)

sexual response cycle the four stages of sexual responding described by Masters and Johnson—excitement, plateau, orgasm, and resolution. (p. 173)

shallow processing encoding on a basic level based on the structure or appearance of words. (p. 278)

shaping an operant conditioning procedure in which reinforcers guide behavior toward closer and closer approximations of the desired behavior. (p. 247)

short-term memory activated memory that holds a few items briefly, such as seven digits of a phone number while dialing, before the information is stored or forgotten. (p. 273)

signal detection theory a theory predicting how and when we detect the presence of a faint stimulus (*signal*) amid background stimulation (*noise*). Assumes there is no single absolute threshold and that detection depends partly on a person's experience, expectations, motivation, and alertness. (p. 193)

sleep periodic, natural loss of consciousness—as distinct from unconsciousness resulting from a coma, general anesthesia, or hibernation. (Adapted from Dement, 1999.) (p. 85)

sleep apnea a sleep disorder characterized by temporary cessations of breathing during sleep and repeated momentary awakenings. (p. 92)

social clock the culturally preferred timing of social events such as marriage, parenthood, and retirement. (p. 154)

social exchange theory the theory that our social behavior is an exchange process, the aim of which is to maximize benefits and minimize costs. (p. 496)

social facilitation improved performance on simple or well-learned tasks in the presence of others. (p. 471)

social identity the "we" aspect of our self-concept; the part of our answer to "Who am I?" that comes from our group memberships. (p. 144)

social leadership group-oriented leadership that builds teamwork, mediates conflict, and offers support. (p. B-11)

social learning theory the theory that we learn social behavior by observing and imitating and by being rewarded or punished. (p. 170)

social loafing the tendency for people in a group to exert less effort when pooling their efforts toward attaining a common goal than when individually accountable. (p. 472)

social psychology the scientific study of how we think about, influence, and relate to one another. (p. 458)

social script culturally modeled guide for how to act in various situations. (p. 484)

social trap a situation in which the conflicting parties, by each rationally pursuing their self-interest, become caught in mutually destructive behavior. (p. 497)

social-cognitive perspective views behavior as influenced by the interaction between people's traits (including their thinking) and their social context. (p. 443)

social-responsibility norm an expectation that people will help those dependent upon them. (p. 496)

somatic nervous system the division of the peripheral nervous system that controls the body's skeletal muscles. Also called the *skeletal nervous system*. (p. 42)

source amnesia attributing to the wrong source an event we have experienced, heard about, read about, or imagined. (Also called *source misattribution*.) Source amnesia, along with the misinformation effect, is at the heart of many false memories. (p. 296)

spacing effect the tendency for distributed study or practice to yield better long-term retention than is achieved through massed study or practice. (p. 278)

split brain a condition resulting from surgery that isolates the brain's two hemispheres by cutting the fibers (mainly those of the corpus callosum) connecting them. (p. 59)

spontaneous recovery the reappearance, after a pause, of an extinguished conditioned response. (p. 242)

spotlight effect overestimating others' noticing and evaluating our appearance, performance, and blunders (as if we presume a spotlight shines on us). (p. 447)

SQ3R a study method incorporating five steps: Survey, Question, Read, Retrieve, Review. (p. 29)

standard deviation a computed measure of how much scores vary around the mean score. (p. A-3)

standardization defining uniform testing procedures and meaningful scores by comparison with the performance of a pretested group. (p. 336)

Stanford-Binet the widely used American revision (by Terman at Stanford University) of Binet's original intelligence test. (p. 334)

statistical significance a statistical statement of how likely it is that an obtained result occurred by chance. (p. A-8)

stereotype a generalized (sometimes accurate but often overgeneralized) belief about a group of people. (p. 476)

stereotype threat a self-confirming concern that one will be evaluated based on a negative stereotype. (p. 346)

stimulants drugs (such as caffeine, nicotine, and the more powerful amphetamines, cocaine, Ecstasy, and methamphetamine) that excite neural activity and speed up body functions. (p. 104)

stimulus any event or situation that evokes a response. (p. 238)

storage the retention of encoded information over time. (p. 273)

stranger anxiety the fear of strangers that infants commonly display, beginning by about 8 months of age. (p. 132)

stress the process by which we perceive and respond to certain events, called *stressors*, that we appraise as threatening or challenging. (p. 390)

structuralism early school of thought promoted by Wundt and Titchener; used introspection to reveal the structure of the human mind. (p. 3)

structured interview interview process that asks the same job-relevant questions of all applicants, each of whom is rated on established scales. (p. B-5)

subjective well-being self-perceived happiness or satisfaction with life. Used along with measures of objective well-being (for example, physical and economic indicators) to evaluate people's quality of life. (p. 413)

subliminal below one's absolute threshold for conscious awareness. (p. 194)

superego the part of personality that, according to Freud, represents internalized ideals and provides standards for judgment (the conscience) and for future aspirations. (p. 425)

superordinate goals shared goals that override differences among people and require their cooperation. (p. 499)

suprachiasmatic nucleus (SCN) a pair of cell clusters in the hypothalamus that responds to light-sensitive retinal proteins; causes pineal gland to increase or decrease production of melatonin, thus modifying our feelings of sleepiness. (p. 87)

survey a technique for ascertaining the self-reported attitudes or behaviors of a particular group, usually by questioning a representative, random sample of the group. (p. 19)

sympathetic nervous system the division of the autonomic nervous system that arouses the body, mobilizing its energy in stressful situations. (p. 42)

synapse [SIN-aps] the junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron. The tiny gap at this junction is called the *synaptic gap* or *synaptic cleft*. (p. 39)

systematic desensitization a type of exposure therapy that associates a pleasant relaxed state with gradually increasing anxiety-triggering stimuli. Commonly used to treat phobias. (p. 551)

T

task leadership goal-oriented leadership that sets standards, organizes work, and focuses attention on goals. (p. B-11)

telegraphic speech early speech stage in which a child speaks like a telegram—"go car"—using mostly nouns and verbs. (p. 320)

temperament a person's characteristic emotional reactivity and intensity. (p. 134)

temporal lobes portion of the cerebral cortex lying roughly above the ears; includes the auditory areas, each receiving information primarily from the opposite ear. (p. 53)

tend and befriend under stress, people (especially women) often provide support to others (tend) and bond with and seek support from others (befriend). (p. 393)

teratogens (literally, "monster maker") agents, such as toxins, chemicals, and viruses, that can reach the embryo or fetus during prenatal development and cause harm. (p. 120)

testing effect enhanced memory after retrieving, rather than simply rereading, information. Also sometimes referred to as a *retrieval practice effect* or *test-enhanced learning*. (pp. 29, 278)

testosterone the most important of the male sex hormones. Both males and females have it, but the additional testosterone in males stimulates the growth of the male sex organs in the fetus and the development of the male sex characteristics during puberty. (p. 167)

thalamus [THAL-uh-muss] the brain's sensory router, located on top of the brainstem; it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla. (p. 48)

THC the major active ingredient in marijuana; triggers a variety of effects, including mild hallucinations. (p. 108)

theory an explanation using an integrated set of principles that organizes observations and predicts behaviors or events. (p. 15)

theory of mind people's ideas about their own and others' mental states—about their feelings, perceptions, and thoughts, and the behaviors these might predict. (p. 128)

threshold the level of stimulation required to trigger a neural impulse. (p. 37)

token economy an operant conditioning procedure in which people earn a token of some sort for exhibiting a desired behavior and can later exchange the tokens for various privileges or treats. (p. 553)

tolerance with repeated use, achieving the desired effect requires larger doses. (p. 100)

top-down processing information processing guided by higher-level mental processes, as when we construct perceptions drawing on our experience and expectations. (p. 192)

trait a characteristic pattern of behavior or a disposition to feel and act, as assessed by self-report inventories and peer reports. (p. 435)

transduction conversion of one form of energy into another. In sensation, the transforming of stimulus energies, such as sights, sounds, and smells, into neural impulses our brain can interpret. (p. 192)

transference in psychoanalysis, the patient's transfer to the analyst of emotions linked with other relationships (such as love or hatred for a parent). (p. 547)

transgender an umbrella term describing people whose gender identity or expression differs from that associated with their birth sex. (p. 170)

two-factor theory the Schachter-Singer theory that to experience emotion one must (1) be physically aroused and (2) cognitively label the arousal. (p. 373)

two-word stage beginning about age 2, the stage in speech development during which a child speaks mostly in two-word statements. (p. 320)

Type A Friedman and Rosenman's term for competitive, hard-driving, impatient, verbally aggressive, and anger-prone people. (p. 398)

Type B Friedman and Rosenman's term for easygoing, relaxed people. (p. 398)

U

unconditional positive regard a caring, accepting, nonjudgmental attitude, which Carl Rogers believed would help clients develop self-awareness and self-acceptance. (pp. 433, 550)

unconditioned response (UR) in classical conditioning, an unlearned, naturally occurring response (such as salivation) to an unconditioned stimulus (US) (such as food in the mouth). (p. 240)

unconditioned stimulus (US) in classical conditioning, a stimulus that unconditionally—naturally and automatically—triggers a response (UR). (p. 240)

unconscious according to Freud, a reservoir of mostly unacceptable thoughts, wishes, feelings, and memories. According to contemporary psychologists, information processing of which we are unaware. (p. 424)

V

validity the extent to which a test measures or predicts what it is supposed to. (See also *content validity* and *predictive validity*.) (p. 337)

variable-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals. (p. 250)

variable-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response after an unpredictable number of responses. (p. 249)

vestibular sense the sense of body movement and position, including the sense of balance. (p. 227)

virtual reality exposure therapy an anxiety treatment that progressively exposes people to electronic simulations of their greatest fears, such as airplane flying, spiders, or public speaking. (p. 552)

visual cliff a laboratory device for testing depth perception in infants and young animals. (p. 210)

W

wavelength the distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of cosmic rays to the long pulses of radio transmission. (p. 200)

Weber's law the principle that, to be perceived as different, two stimuli must differ by a constant minimum percentage (rather than a constant amount). (p. 195)

Wechsler Adult Intelligence Scale (WAIS) the WAIS is the most widely used intelligence test; contains verbal and performance (nonverbal) subtests. (p. 334)

Wernicke's area controls language reception—a brain area involved in language comprehension and expression; usually in the left temporal lobe. (p. 323)

withdrawal the discomfort and distress that follow discontinuing the use of an addictive drug. (p. 102)

working memory a newer understanding of short-term memory that focuses on conscious, active processing of incoming auditory and visual-spatial information, and of information retrieved from long-term memory. (p. 273)

X

X chromosome the sex chromosome found in both men and women. Females have two X chromosomes; males have one. An X chromosome from each parent produces a female child. (p. 167)

Y

Y chromosome the sex chromosome found only in males. When paired with an X chromosome from the mother, it produces a male child. (p. 167)

Yerkes-Dodson law the principle that performance increases with arousal only up to a point, beyond which performance decreases. (p. 354)

Young-Helmholtz trichromatic (three-color) theory the theory that the retina contains three different color receptors—one most sensitive to red, one to green, one to blue—which, when stimulated in combination, can produce the perception of any color. (p. 207)

Z

zygote the fertilized egg; it enters a 2-week period of rapid cell division and develops into an embryo. (p. 119)

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- ## X
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- ## Y
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- ## Z
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A

A. J. (Price, J.), 289
Aarts, H., 313, 380
Abel, E. L., 400
Abel, K. M., 529
Abelson, R. P., 511
Abrams, D. B., 103
Abrams, L., 292
Abrams, M., 215
Abramson, L. Y., 526
Abrevaya, J., 476
Abutalebi, J., 323
Acevedo, B. P., 492
Ackerman, D., 39
Ackerman, J. M., 229
Adams, E. M., 13
Adams, P. F., 90
Adams, S., 514
Adelmann, P. K., 156
Ader, R., 245
Adler, A., 364, 428, 429, 446, 454
Adolphs, R., 450
Affleck, G., 414
Agassi, A., 68
Agassi, J., 68
Agrillo, C., 107
Ai, A. L., 412
Aiello, J. R., 471
Aimone, J. B., 58
Ainsworth, M. D. S., 134
Airan, R. D., 525
Aird, E. G., 155
Åkerstedt, T., 92
Akhter, S. A., 326
Alanko, K., 181
Albee, G. W., 577
Albert ("Little"), 4, 245, 268
Albery, I. P., 103
Alcock, J., 232
Aldao, A., 556
Aldrich, M. S., 92
Aldridge-Morris, R., 534
Aleman, A., 529
Alexander, C. J., 45
Alexander, L., 499
Alicke, M. D., 417
Allard, F., 277
Allen, J. R., 174
Allen, K., 406
Allen, M. W., 225
Allen, W., 92, 547
Allesøe, K., 400
Allik, J., 449
Alloy, L. B., 527
Allport, G. W., 17, 435, 436, 446, 478
Almas, I., 141
Altamirano, L. J., 526
Alter, A., 251
Altman, L. K., 396
Alwin, D. F., 138
Amabile, T. M., 314, 315, 448, B-12
Amato, P. R., 169
Ambady, N., 381, 383, 443
Ambrose, C. T., 123
Amedi, A., 58
Amen, D. G., 483
Ames, A., 214, 379
Ames, D. R., B-11
Ames, M. A., 181
Amsterdam, J. D., 570
Andersen, R. A., 54, 317
Andersen, S. M., 143

Anderson, A. K., 51
Anderson, B. L., 397
Anderson, C. A., 26, 265, 281, 483, 485, 486
Anderson, E. R., 513
Anderson, I. M., 570
Anderson, J. R., 465
Anderson, K. G., 185
Anderson, R. C., 292
Anderson, S., 524
Anderson, S. E., 167
Anderson, S. R., 324
Andreasen, N. C., 531
Andrew, M., 564
Andrews, P. W., 519, 526
Angelsen, N. K., 22
Angier, N., 171
Anisman, H., 397
Annan, K., 499
Annese, J., 290
Antoni, M. H., 397
Antony, M. M., 517
Antrobus, J., 95
Archer, J., 164
Archer, R., 431
Arendt, H., 143
Ariely, D., 287, A-1
Aries, E., 165
Aristotle, 2, 5, 146, 364, 489
Arjamaa, O., 359
Arkowitz, H., 130, 512, 562, 564
Armony, J. L., 375, 518
Arnett, J. J., 140, 149
Arnone, D., 531
Aron, A. P., 492, 493
Aronson, E., 146, 293
Aronson, J., 346
Artiga, A. L., 359
Asch, S. E., 466, 467
Aselage, J., 260
Aserinsky, A., 84
Aserinsky, E., 84
Ashbery, J., 529
Askay, S. W., 98
Aspinwall, L. G., 404
Aspy, C. B., 176
Assanand, S., 359
Astin, A. W., 144, 145
Astin, H. A., 145
Astington, J. W., 128
Atkins, L., 184
Atkinson, R. C., 273, 274
Auden, W. H., 364
Austin, E. J., 339
Auyeung, B., 130
Averill, J. R., 372
Aviezer, H., 384
Ax, A. F., 378
Axel, R., 226
Ayan, S., 405
Aydin, N., 366
Ayres, M. M., 165
Azar, B., 227
Azevedo, F. A., 44

B

Baas, M., 412
Babad, E., 380
Babyak, M., 408
Bach, J. S., 71, 247
Bachman, J., 111
Back, M. D., 368, 442
Bacon, F., 308
Baddeley, A. D., 273, 274, 276, 286, 287
Baddeley, J. L., 158
Baer, J., 520
Bagemihl, B., 180
Baguma, P., 361
Bahrnick, H. P., 278, 285, 291, 292
Bailenson, J. N., 489
Bailey, J. M., 181, 184
Bailey, R. E., 258
Bailine, S., 571
Baillargeon, R., 127
Bain, J., 172
Baker, E. L., 98
Baker, T. B., 248, 562
Bakermans-Kranenburg, M. J., 135
Balçetis, E., 199
Baldwin, S. A., 562
Balsam, K. F., 155
Balter, M., 324, 342
Bambico, F. R., 108
Bancroft, J., 174
Bandura, A., 154, 261, 263, 266, 269, 443, 445, 446
Bar-Haim, Y., 516
Barak, A., 557
Barash, D. P., 78
Barbaresi, W. J., 507
Barber, T. X., 99
Barbieri, M., 205
Bard, P., 372
Bargh, J. A., 80, 228, 432, 465, 488
Barinaga, M. B., 58, 407
Barkley, R. A., 507
Barlow, D. H., 557, 562
Barnes, M. L., 381
Barnier, A. J., 97
Barnum, P. T., 439
Baron-Cohen, S., 130, 131
Baron, R. S., 306
Barrett, L. C., 404
Barrett, L. F., 372, 377, 381
Barrick, M. R., B-4
Barrow, J., 46
Barry, D., 27, 104, 151, 220, 438, 536
Bartels, M., 418
Bartholow, B. C., 486
Bashore, T. R., 152
Baskind, D. E., 552
Bates, L. A., 262
Bathje, G. J., 510
Bauer, P. J., 124, 282
Baum, A., 396
Baumann, J., 199
Baumeister, H., 505
Baumeister, R. F., 97, 148, 179, 183, 312, 364, 366, 403, 404, 432, 447, 449, 463, 464, 493
Baumgardner, A. H., 448
Baumrind, D., 138, 252
Bausback, V., 84
Bavelier, D., 321
Beach, S. R., 488
Beaman, A. L., 490
Beardsley, L. M., 508
Bearzi, M., 318
Beatles (group), 12
Beauchamp, G. K., 359
Beck, A. T., 555
Beck, H. P., 245
Becker, D. V., 381, 382
Becker, I. M., 245

Becker, S., 570
Beckham, D., 514
Becklen, R., 81
Beckman, M., 141
Beecher, H. W., 327
Beeman, M., 307
Bègue, L., 482
Beilin, H., 129
Beilock, S. L., 385
Beitel, P., 328
Bell, A. P., 179
Bellows, G., 508
Belluck, P., 130
Belot, M., 489
Belsher, G., 522
Belsky, J., 167
Belyaev, D., 69
Bem, D. J., 231, 232
Bem, S. L., 170
Ben-Shakhar, G., 379
Ben-Zeev, T., 346
Benjamin, L. T., Jr., 467
Benjamins, M. R., 411
Benjet, C., 251
Bennett, W. I., 363
Benson, H., 410
Bentall, R., 572
Berghuis, P., 108
Bergin, A. E., 566, 567
Berk, L. E., 129
Berk, L. S., 405
Berkowitz, L., 483
Berman, M., 482
Berman, M. G., 369
Bernal, S., 321
Bernieri, F., 263
Bernstein, A., 513
Bernstein, D. M., 294, 295
Bernstein, M. J., 477
Berra, Y., 11
Berridge, K. C., 101, 374
Berry, J. W., 391
Berscheid, E., 364, 490, 492
Bersoff, D. M., 142
Berti, A., 61
Best, D. L., 165
Beyerstein, B., 438
Beyerstein, D., 438
Bhatt, R. S., 247
Bhattacharya, J., 307
Bialystock, E., 327
Bianchi, K., 534
Bianchi, S. M., 186
Biederman, I., 354
Bienvu, O. J., 523
Bierut, L. J., 110
Bilefsky, D., 172
bin Laden, O., 230
Binet, A., 334, 335, 336, 346, 437
Bird, C. D., 318
Birnbaum, G. E., 135
Birnbaum, S. G., 283
Biro, D., 317
Biro, F. M., 167
Bishop, D. I., 110, 145

Bishop, G. D., 306, 473
 Bisson, J., 564
 Biswas-Diener, R., 415
 Bjerkedal, T., A-8
 Bjork, E. L., 30
 Bjork, R. A., 30, 97, 98
 Bjorklund, D. F., 131
 Blackhart, G. C., 365
 Blackwell, E., 400
 Blaine, D., 404
 Blair, G., 151
 Blajda, V. M., 134
 Blakemore, S-J., 140, 220
 Blakeslee, S., 58, 222, 262
 Blanchard, R., 182
 Blanchard-Fields, F., 338
 Blankenburg, F., 194
 Blanton, H., 477
 Blascovich, J., 391
 Blass, T., 468, 469
 Blatt, S. J., 565
 Bliss, C., 120
 Bliss-Moreau, E., 381
 Block, J., 143, 440
 Blocker, A., 221
 Bloom, B. C., 371
 Bloom, F. E., 40
 Bloom, P., 319
 Blum, K., 52
 Boag, S., 431
 Bobby, S. E., 521
 Bock, L., B-4
 Bocklandt, S., 181
 Bodenhausen, G. V., 477, 500
 Bodkin, J. A., 570
 Bodner, G. E., 564
 Boehm, K. E., 146
 Boehm-Davis, D. A., B-14
 Boer, D. P., 430
 Boesch, C., 317
 Boesch-Achermann, H., 317
 Bogaert, A. F., 171, 182
 Bogen, J., 59
 Boggiano, A. K., 260
 Boggiano, M. M., 359
 Bohman, M., 66
 Bolger, N., 414
 Bolt, R., 461
 Bolwig, T. G., 572
 Bonanno, G. A., 158, 515, 516, 576
 Bond, C. F., Jr., 380
 Bond, M. H., 451
 Bond, R., 467
 Bonetti, L., 368
 Bonezzi, A., 370
 Bono, J. E., B-12
 Boomsma, D. I., 418
 Boot, W. R., 338
 Booth, D. A., 357
 Bootzin, R. R., 94, 293
 Bor, D., 78
 Boring, E. G., 197
 Born, J., 88, 293
 Bornstein, M. H., 139, 321
 Bornstein, R. F., 133, 288, 488
 Boroditsky, L., 318, 326
 Bos, H., 180
 Boscarino, J. A., 391
 Bosma, H., 402
 Bostwick, J. M., 524
 Bosworth, R. G., 58
 Bothwell, R. K., 480

Bouchard, T. J., Jr., 65, 66
 Bouton, M. E., 516
 Bowen, C., 154
 Bower, B., 488
 Bower, G. H., 278, 279, 287
 Bower, J. E., 396
 Bower, J. M., 50
 Bowers, J. S., 124, 205
 Bowers, K. S., 97
 Bowler, M. C., 445
 Bowling, N. A., B-7
 Boxer, P., 265
 Boyatzis, C. J., 265
 Boyce, W. T., 518
 Boyle, D. E., 137
 Bradbury, T. N., 459
 Braden, J. P., 343
 Bradley, D. R., 208
 Bradley, R. B., 137
 Bradshaw, C., 184
 Braffman, W., 97
 Bragger, J. D., B-6
 Brahms, J., 92
 Braiker, B., 123
 Brainerd, C. J., 125
 Branas, C. C., 481
 Brandon, S., 299
 Brang, D., 229
 Brannon, E. M., 127
 Brannon, L. A., 174
 Branscombe, N. R., 327
 Bransford, J. D., 279
 Bratslavsky, E., 493
 Braun, S., 107
 Braunstein, G. D., 172
 Bray, D. W., 445
 Brayne, C., A-7
 Breedlove, S. M., 180
 Brees, B., 218
 Brees, D., 218
 Brehm, J. W., 474
 Brehm, S., 309, 474
 Breivik, A. B., 486
 Breland, K., 258, 259
 Breland, M., 258, 259
 Brescoll, V. L., 165
 Breslau, J., 540
 Brewer, C. L., 6, 67
 Brewer, M. B., 451
 Brewer, W. F., 279
 Brewin, C. R., 283, 515
 Breyer, S., 486
 Brief, A. P., B-7
 Brilliant, A., 230
 Briñol, P., 412
 Briscoe, D., 170
 Brislin, R. W., 463
 Brissette, I., 92
 Broca, P., 323
 Broch, H., 231
 Brock, T. C., 174
 Brockmann, H., 415
 Brody, J. E., 90, 101
 Brody, S., 178
 Bromet, E., 522
 Brontë, E., 521
 Brown, A. S., 296, 531, 532
 Brown, E. L., 219
 Brown, G. W., 566
 Brown, J. A., 276
 Brown, J. D., 176
 Brown, L., B-10
 Brown, R., 326

Brown, R. P., 484
 Brown, S. L., 158
 Brown, S. W., 294
 Browning, C., 469
 Browning, R., 495
 Brownson, K., B-2
 Bruce-Keller, A. J., 361
 Bruce, D., 124
 Bruck, M., 297
 Bruer, J. T., 341
 Brumberg, J. J., 536
 Brune, C., B-2
 Bruno, M-A., 415
 Brunwasser, S. M., 556, 577
 Bruun, S. E., 472
 Bryant, A. N., 145
 Bryant, G. A., 172
 Bryant, J., 485
 Bryant, R. A., 299
 Buchan, J., 250
 Buchanan, A., 135
 Buchanan, R. W., 568
 Buchanan, T. W., 283
 Buchtel, E. E., 440
 Buchwald, A., 418
 Buck, L. B., 226
 Buckholtz, J. W., 539
 Buckingham, M., B-3, B-4, B-9
 Buckley, K. E., 365
 Buckner, R. L., 290
 Bucy, P., 50
 Buddha, The, 399
 Buehler, R., 312
 Buffardi, L. E., 370
 Bugelski, B. R., 277
 Bugental, D. B., 380
 Buka, S. L., 531
 Bulia, S., 511
 Buller, D. J., 185
 Bullough, V., 178
 Bumstead, C. H., 475
 Bunde, M., 399
 Buquet, R., 93
 Burcusa, S. L., 522
 Burger, J. M., 468
 Burgess, M., B-11
 Buri, J. R., 138
 Burish, T. G., 258
 Burk, W. J., 146
 Burke, D. M., 153
 Burks, N., 492
 Burlingame, G. M., 557
 Burman, B., 155
 Burnett, N., 277
 Burns, B. C., 313
 Burns, J. M., 35
 Burris, C. T., 327
 Burt, A., 507
 Burton, C. M., 407
 Burton, T., 521
 Busby, D. M., 178
 Bush, G. H. W., 500
 Bush, G. W., 10, 489
 Bushman, B. J., 265, 398, 399, 434, 449, 482, 483, 486
 Busnel, M. C., 119
 Buss, A. H., 443
 Buss, D. M., 175, 184
 Buster, J. E., 172
 Butcher, L. M., 340
 Butler, R. A., 353
 Buunk, B. P., 492
 Byck, R., 106

Byers-Heinlein, K., 119
 Byham, W. C., 445
 Bynum, R., 221
 Byrne, D., 172, 242, 491
 Byrne, R. W., 18, 262, 317, 323, 324

C

Cable, D. M., B-5
 Cacioppo, J. T., 365, 366
 Cade, J., 571
 Caesar, J., 417, 524
 Cahill, L., 283
 Cahn, B. R., 410
 Cale, E. M., 538
 Calhoun, L. G., 576
 Calkins, M. W., 3
 Call, J., 317
 Call, K. T., 176
 Callaghan, T., 128
 Calvo-Merino, B., 328
 Camerer, C. F., B-15
 Cameron, D., 488
 Cameron, L., 499
 Campbell, A., 393
 Campbell, D. T., 416, 435
 Campbell, M. W., 479
 Campbell, P. A., 65
 Campbell, R., 65
 Campbell, S., 197
 Campbell, S. S., 87
 Campbell, W. K., 370
 Camperio-Ciani, A., 181
 Campos, J. J., 210
 Canli, T., 382, 518
 Cannon, W. B., 357, 372, 392, 393
 Cantalupo, C., 61
 Cantor, N., 333
 Cantril, H., 475
 Caplan, N., 147, 345
 Caponigro, J. M., 529
 Card, N. A., 164
 Carducci, B. J., 83
 Carere, C., 437
 Carey, B., 385, 521, 574
 Carey, G., 481, 517
 Carey, M. P., 258
 Carli, L. L., 165, 481
 Carlin, G., 105, 296
 Carlson, C. L., 507
 Carlson, J., 345
 Carlson, M., 495
 Carlson, S., 438
 Carmeli, A., B-12
 Carnahan, T., 462
 Carpenter, B., 390
 Carpusor, A., 24
 Carr, T. H., 323
 Carrier, J. M., 158
 Carroll, D., 402
 Carroll, J. M., 383
 Carroll, J. S., 484
 Carroll, L., 511
 Carskadon, M. A., 90, 95
 Carstensen, L. L., 156, 338
 Carter, R., 41
 Carter, T. J., 418
 Carver, C. S., 404, 524
 Casey, B. J., 140
 Cash, T., 489
 Caspi, A., 134, 539
 Cassidy, J., 133
 Castillo, R. J., 508

- Castonguay, L. G., 562
 Cattell, R. B., 337
 Cavalli-Sforza, L., 344
 Cavallin, M. K., 339
 Cavanaugh, K., 557
 Cavigelli, S. A., 393
 Cawley, B. D., B-11
 Ceausescu, N., 136, 137
 Ceci, S. J., 297, 298, 342, 344
 Centerwall, B. S., 265
 Cepeda, N. J., 278
 Cerella, J., 152
 Cervone, D., 81
 Chabris, C. F., 82
 Chambless, D. L., 562, 564
 Chamove, A. S., 264
 Champagne, F. A., 67, 68
 Chan, M., 399
 Chandler, J., 385
 Chandra, A., 178
 Chaplin, W. F., 379
 Charles, S. T., 156
 Charness, N., 338
 Charpak, G., 231
 Chartrand, T. L., 80, 465
 Chase, W. G., 332
 Chatard, A., 524
 Chater, N., 321
 Chaucer, G., 464
 Check, J. V. P., 175
 Cheek, J. M., 451
 Cheit, R. E., 431
 Chekhov, A., 521
 Chen, A. W., 566
 Chen, E., 402
 Chen, S-Y., 369
 Chen, X., 90
 Chen, Y-R., 451
 Cheng, K., 281, 404
 Chentsova-Dutton, Y., 384
 Cherkas, L. F., 152
 Chermack, S. T., 482
 Cherniss, C., 333
 Chess, S., 134, 159
 Chesterfield (Lord), 48, 261
 Cheung, B. Y., 321
 Chida, Y., 397, 398, 412
 Chiles, J. A., 561
 Chivers, M. L., 175, 179
 Choi, C. Q., 58
 Choi, I., 451
 Choi, Y., 451
 Chomsky, N., 321, 322, 323, 349
 Christakis, N. A., 112, 362, 407
 Christensen, A., 566
 Christensen, D. D., 331
 Christie, A., 17, 98
 Christina (Grand Duchess of Tuscany), 71
 Christmas, Levinia, 64
 Christmas, Lorraine, 64
 Christophersen, E. R., 551
 Chua, H. F., 458
 Chugani, H. T., 122
 Church, T. S., 362
 Churchill, W., 527
 Cialdini, R. B., 461, 479
 Ciarrochi, J., 333
 Cicero, 344
 Cin, S. D., 111
 Clack, B., 499
 Clancy, S. A., 85, 136
 Clark, A., 405
 Clark, K. B., 29
 Clark, M. P., 29
 Clarke, P. R. F., 95
 Claudius (Emperor), 571
 Clay, R. A., 509
 Cleary, A. M., 296
 Clemens, S., 521
 Clementi, T., 179
 Cleveland, H. H., 66
 Cleveland, J. N., B-7
 Clifton, D. O., B-3, B-4
 Clinton, H. R., 186
 Clinton, W. ("Bill"), 436
 Coan, J. A., 405
 Coe, W. C., 99
 Coelho, C. M., 518
 Coffey, C. E., 157, 523
 Cohen, A. B., 452, 463
 Cohen, D., 280, 484, 534
 Cohen, N., 166, 245
 Cohen, P., 149, 424
 Cohen, R., 419
 Cohen, S., 90, 92, 394, 395, 402, 406
 Cohn, D., 170
 Colapinto, J., 169
 Colarelli, S. M., 70, 165
 Colbert, S., 436
 Colcombe, S. J., 152
 Cole, K. C., 104
 Coley, R. L., 177
 Collings, V. B., 213, 214
 Collins, D. W., 342
 Collins, F., 62, 70, 71
 Collins, G., 28
 Collins, N. L., 492, 493
 Collins, R. L., 21
 Collins, W. A., 145
 Collinson, S. L., 531
 Collishaw, S., 522
 Colombo, J., 133
 Comfort, A., 151
 Comstock, G., 265
 Confer, J. C., 185, 186
 Confucius, 27, 67, 312
 Conley, C. S., 140
 Conn, V. S., 408
 Connor, C. E., 204
 Connor-Smith, J. K., 401
 Conway, A. R. A., 283
 Conway, M. A., 153
 Cooke, D. J., 538
 Cooke, L. J., 224
 Cooper, H., 417
 Cooper, K. J., 465
 Cooper, M., 479
 Cooper, M. L., 102
 Cooper, W. H., 443
 Coopersmith, S., 138
 Copeland, W., 140
 Copernicus, N., 14, 315
 Coppola, M., 321
 Corballis, M. C., 324
 Corbett, S. W., 358
 Coren, S., 89, 90, 91
 Corey, D. P., 217
 Corina, D. P., 61
 Corkin, S., 290
 Corman, M. D., 482
 Corneille, O., 306
 Corp, N., 18
 Correll, J., 477
 Corrigan, E., 294
 Costa, P. T., Jr., 154, 381, 439, 441, 446
 Costello, C. G., 522
 Costello, E. J., 21, 540
 Coughlin, J. F., 152
 Couli, J. T., B-1
 Courtney, J. G., 397
 Covin, R., 557
 Cowan, G., 484
 Cowan, N., 273, 276
 Cowart, B. J., 224, 225
 Cox, J. J., 222
 Coyle, J. T., 529
 Coyne, J. C., 397
 Crabbe, J. C., 110
 Crabtree, S., 156, 496, B-9
 Craik, F. I. M., 279, 327
 Crandall, J. E., 435
 Cranford, W., 135
 Crano, W. D., 111
 Craven, R. G., 447
 Crawford, E. F., 515
 Crawley, J. N., 131
 Credé, M., 342
 Crews, F. T., 102, 141
 Crick, F., 37
 Crocker, J., 450, 479
 Croft, R. J., 107
 Crofton, C., 490
 Cromwell, C., 461
 Cronshaw, S. P., B-6
 Crook, T. H., 153
 Cross, S., 447
 Crowell, J. A., 133
 Crowther, J. H., 537
 Csikszentmihalyi, M., 146, 264, B-1
 Cuijpers, P., 570
 Culbert, K. M., 536
 Cullen, F. T., 484
 Cullum, J., 467
 Cummings, R. A., 415
 Cunningham, M. R., 490
 Cunningham, W. A., 477
 Currie, T. E., 490
 Curry, J., 522
 Curtis, G. C., 514
 Curtis, R. C., 491
 Custers, R., 313
 Cyders, M. A., 371
 Czeisler, C. A., 87, 88
D
 Dabbs, J. M., Jr., 482, 495
 Dahmer, J., 512
 Dallenbach, K. M., 293
 Damasio, A. R., 48, 372, 447
 Damasio, H., 48, 57
 Damon, W., 145
 Daniels, D., 147
 Danner, D. D., 405
 Danso, H., 346
 Dante, 154
 Danziger, S., 326
 Dapretto, M., 131
 D'Aquili, E., 410
 Darley, J. M., 143, 251, 494, 495
 Darrach, B., 538
 Darwin, C., 3, 6, 68, 70, 71, 223, 256, 257, 269, 352, 383, 384, 514
 Dasgupta, N., 366
 Daskalakis, Z. J., 572, 573
 Dattilio, F. M., 557
 Daum, I., 282
 D'Auria, S., 524
 Davey, G. C. L., 258, 518
 Davidoff, J., 326
 Davidson, R. J., 378, 410, 483, 523
 Davies, M. F., 439
 Davies, P., 72
 Davis, B., 289, C-5
 Davis, B. E., 123
 Davis, B. L., 320
 Davis, J. O., 532
 Davis, M., 569
 Davis-Beaty, K., 174
 Davison, K. P., 558
 Davydow, D. S., 523
 Dawkins, R., 69, 71
 Dean, G. A., 438
 Deary, I. J., 340, 342, 442
 de Boysson-Bardies, B., 320
 de Bruine, L. M., 489
 DeCasper, A. J., 119
 Decety, J., 328
 Deci, E. L., 260, 364, 450
 de Courten-Myers, G. M., 44, 53
 De Dreu, C. K. W., 45
 de Fermat, P., 314
 Deffenbacher, K., 219
 DeFries, J. C., 181, 341
 De Gelder, B., 80
 de Gonzales, A. B., 361
 Dehaene, S., 194
 Dehne, K. L., 174
 de Hoogh, A. H. B., B-12
 De Koninck, J., 93
 Del-Prete, S., 192
 DeLamater, J. D., 151
 Delaney, H. D., 566
 Delargy, M., 415
 Delaunay-El Allam, M., 121
 Delgado, J. M. R., 54
 DeLoache, J. S., 125, 128, 341, 518
 De Los Reyes, A., 562
 DelVecchio, W. F., 441
 Dement, W. C., 84, 85, 87, 89, 90, 92, 94
 Demir, E., 181
 de Montaigne, M. E., 143, 441
 de Moraes, L., 468
 DeNeve, K. M., 417
 Dennett, D. C., 259
 Denson, T. F., 482
 Denton, K., 102
 Denton, R., 467
 DePaulo, B. M., 380
 Der, G., 22
 De Raad, B., 440
 Dermer, M., 417
 Derrick, D., 228
 DeSteno, D., 199, 288, 450
 Dettman, J. R., 70
 Dettman, S. J., 218
 Deutsch, J. A., 52
 DeValois, K. K., 207
 DeValois, R. L., 207
 Devilly, G. J., 564
 De Vogli, R., 405
 Dew, M. A., 90
 de Waal, F. B. M., 18, 324, 356, 465, 479
 DeWall, C. N., 366, 403, 449, 483
 de Wit, L., 361
 De Wolff, M. S., 134
 DeYoung, C. G., 440

- Di Tella, R., 415, 416
 Diaconis, P., 13
 Diallo, A., 477
 Diamond, J., 70
 Diamond, L., 179
 Diaz, F. J., 529
 DiBiasi, P., 65
 DiCarlo, J. J., 213
 Dick, D. M., 538
 Dickens, C., 20
 Dickens, W. T., 343
 Dickerson, S. S., 401
 Dickinson, H. O., 414
 Dickson, B. J., 181
 Diekelmann, S., 293
 Diener, E., 19, 134, 355, 364, 399, 413, 414, 415, 416, 417, 418, 419, 490
 DiFranza, J. R., 104
 DiGiulio, G., 562
 Dijksterhuis, A., 380
 DiLalla, D. L., 523
 Dill, K. E., 486
 Dillard, A., 295
 Dimberg, U., 375, 385
 Dimidjian, S., 562
 Dindo, L., 538
 Dinges, D. F., 90
 Dinges, N. G., 326
 Dingfelder, S. F., 257
 Dion, K. K., 452
 Dion, K. L., 452, B-11
 Dipboye, R. L., B-5
 Dirix, C. E. H., 120
 DiSalvo, D., 368
 Dittrich, L., 290
 Dix, D., 356, 387, 546
 Dixon, J., 498
 Dobbs, D., 516
 Dobkins, K. R., 58
 Dodge, K. A., 538
 Dodman, N. H., 517
 Dodson, J. D., 354
 Doherty, E. W., 105
 Doherty, W. J., 105
 Dohrenwend, B. P., 392, 515, 540
 Dolezal, H., 215
 Domhoff, G. W., 93, 95, 96
 Domjan, M., 242
 Donlea, J. M., 87
 Donnellan, M. B., 159, 418, 444
 Donnerstein, E., 264, 265
 Donovan, J., 130
 D'Orlando, F., 485
 Doss, B. D., 155
 Dostoevsky, F., 521
 Dotan-Eliasz, O., 365, 366
 Doucette, M., 89
 Douglas, K. S., 511
 Douthat, R., 479
 Dovidio, J. F., 478, 499
 Dowlati, Y., 525
 Downing, P. E., 204
 Downs, A. C., 168
 Downs, E., 177
 Doyle, A. C., 46, 231, 280
 Doyle, R., 184
 Draguns, J. G., 505, 527
 Drews, F. A., 81
 Driessen, E., 562
 Druckman, D., 97, 98
 Duckworth, A. L., 342, 370, 371, 447
 Duclos, S. E., 384
 Duffy, M., 462
 Duggan, J. P., 357
 Dumont, K. A., 136
 Dunbar, R. I. M., 369
 Dunn, E. J., 172
 Dunn, E. W., 495
 Dunn, M., 184
 Dunning, D., 199, 449
 Dunson, D. B., 151
 Durm, M. W., 230
 Dutton, D. G., 492
 Dutton, J. E., B-1
 Dvorak, R. D., 404
 Dweck, C. S., 346
 Dye, M. W. G., 486
 Dyrdal, G. M., 154
- E**
 Eagleman, D., 79
 Eagly, A. H., 163, 165, 166, 185, 489, B-12
 Eastman, C. L., 88, 564
 Eastwick, P. W., 488, 489
 Ebbesen, E. B., 291
 Ebbinghaus, H., 278, 280, 286, 291, 294, 302
 Ebel-Lam, A. P., 102
 Eberhardt, J. L., 477
 Eckensberger, L. H., 142
 Ecker, C., 131
 Eckert, E. D., 517
 Eckholm, E., 338
 Ecklund-Flores, L., 119
 Edelman, M. W., 463
 Edelman, R., 398
 Edison, T. A., 307, 370
 Edwards, C. P., 139
 Edwards, J., 156
 Edwards, K. J., 551
 Edwards, R. R., 223
 Ehrmann, M., 450
 Eibl-Eibesfeldt, I., 383
 Eich, E., 94
 Eichmann, A., 470
 Ein-Dor, T., 135
 Einstein, A., 37, 71, 328, 346
 Eippert, F., 223
 Eisenberg, N., 382
 Eisenberger, N. I., 365, 366
 Eisenberger, R., 260
 Ekman, P., 380, 383
 El Greco, 521
 Elaad, E., 379
 Elbert, T., 122, 518
 Elbogen, E. B., 511
 Elfenbein, H. A., 383
 Eliot, C., 10
 Eliot, T. S., 305, B-5
 Elizabeth (Queen), 230
 Elkind, D., 141
 Ellenbogen, J. M., 88, 89
 Ellin, A., 488
 Elliot, A. J., 257, B-10
 Ellis, A., 245, 556, 567
 Ellis, B. J., 177, 518
 Ellis, L., 164, 181
 Ellison-Wright, I., 531
 Else-Quest, N. M., 342
 Elzinga, B. M., 535
 Emery, N. J., 318
 Emmelkamp, P. M., 552
 Emmons, R. A., 418
 Emmons, S., 505, 529
 Emory, G., Jr., 230
 Empson, J. A. C., 95
 Endler, N. S., 526, 572
 Engemann, K. M., 489
 Engen, T., 226
 Engle, R. W., 273
 Epel, E. S., 152
 Epicharmus, 206
 Epley, N., 128, 449
 Epstein, J., 530
 Epstein, L. H., 359
 Epstein, S., 442
 Erdberg, P., 430
 Erdelyi, M. H., 431
 Erel, O., 155
 Erickson, K. I., 151, 152, 408
 Erickson, M. F., 155
 Ericsson, E., 349
 Ericsson, K. A., 332, 346, 371
 Erikson, E. H., 134, 135, 143, 144, 145, 149, 150, 154, 158, 161
 Erikson, J., 135
 Erol, R. Y., 145
 Ertmer, D. J., 321
 Escobar-Chaves, S. L., 177
 Escobedo, J. R., 450
 Eskine, K. J., 142
 Esser, J. K., 474
 Esses, V., 346
 Esterson, A., 430
 Estrin, J., 414
 Etkin, A., 518
 Ettinger, M. G., 93
 Eurich, T. L., 445
 Euston, D. R., 282
 Evans, C. R., B-11
 Evans, F. J., 98
 Evans, G. W., 398
 Evans, N., 321
 Everson, S. A., 405
 Exline, J. J., 403
 Exner, J. E., 430
 Eysenck, H. J., 410, 436, 437, 439, 510, 561
 Eysenck, M. W., 444, 446
 Eysenck, S. B. G., 436, 437, 439
- F**
 Fabiano, G. A., 507
 Fagan, J. F., 344, 345
 Falk, C. F., 449
 Falk, R., 12
 Fanti, K. A., 265
 Farah, M. J., 58
 Faraone, S. V., 523
 Farina, A., 506
 Farley, F., 141
 Farley, M., 515
 Farrington, D. P., 538
 Fatemi, S. H., 531
 Favre, B., 222
 Fazel, S., 511, 512
 Fechner, G., 193
 Feder, H. H., 171
 Feeney, D. M., 27
 Feeney, J. A., 135
 Feigenson, L., 127
 Feingold, A., 489, 537
 Feinstein, J. S., 283
 Feldman, D. C., B-5
 Feldman, M. B., 537
 Feng, J., 215, 342
 Fenton, W. S., 530
 Ferguson, C. J., 158, 265, 332, 486
 Ferguson, D. M., 21
 Ferguson, E. D., 364, 428
 Ferguson, M. J., 194
 Ferguson, T. J., 265
 Fergusson, D. M., 522, 525
 Fernández-Dols, J.-M., 383
 Fernyhough, C., 129
 Ferri, M., 558
 Ferriman, K., 166
 Ferris, C. F., 136
 Festinger, L., 462
 Feyen, K., B-2
 Fiedler, F. E., B-11
 Fiedler, K., 288
 Field, A. P., 516
 Field, T., 122, 137
 Fields, R. D., 37
 Fikke, L. T., 525
 Fincham, F. D., 459
 Finchilescu, G., 498
 Fingelkurts, Alexander A., 57
 Fingelkurts, Andrew A., 57
 Fingerhut, A. W., 155
 Fingerman, K. L., 156
 Fink, G. R., 281
 Fink, M., 571
 Finkel, E. J., 488, 489
 Finlay, S. W., 558, 559
 Finn, B., 30
 Finzi, E., 385
 Fiore, M. C., 105
 Fischer, P., 484
 Fischhoff, B., 311, 312
 Fischtein, D. S., 184
 Fishbach, A., B-11
 Fisher, G. H., 199
 Fisher, H. E., 154, 173
 Fisher, H. T., 551
 Fisher, K., 169
 Fitzgerald, J. A., 180
 Flachsbar, C., 401
 Flack, W. F., 385
 Flegal, K. M., 361
 Fleming, I., 403
 Fleming, J. H., 382, B-10
 Fleming, N., B-2
 Fletcher, E., 407
 Fletcher, G. J. O., 459
 Flipper, H., 366
 Flockhart, C., 185
 Flood, M., 484
 Flora, S. R., 253, 521
 Flory, R., 564
 Flouri, E., 135
 Flynn, J. R., 343
 Foa, E. B., 517, 552
 Foerster, O., 54
 Folsom, T. D., 531
 Ford, E. S., 407
 Ford, H., 185, 430
 Foree, D. D., 258
 Forehand, R., 254
 Forer, B. R., 439
 Forgas, J. P., 288, 412, 519
 Forhan, S. E., 174
 Forman, D. R., 264
 Foss, D. J., 430
 Foster, J. D., 449
 Foulkes, D., 96
 Fournier, J. C., 570
 Fouts, R. S., 324

- Fowler, J. H., 112, 362, 407
 Fowles, D. C., 530, 538
 Fox, D., 531
 Fox, J. L., 58
 Fox, N. A., 134
 Fox, R., 259
 Fozard, J. L., 151
 Fracassini, C., 226
 Fraley, R. C., 135, 365
 Francesconi, M., 488, 489
 Frank, J. D., 565, 566
 Frankel, A., 438
 Frankenburg, W., 123
 Franklin, M., 517
 Franz, E. A., 61
 Fraser, S. C., 461
 Frasure-Smith, N., 400
 Frattaroli, J., 406
 Frech, D., 84
 Frederick, D. A., 490
 Fredrickson, B. L., 412
 Freedman, D. H., 363
 Freedman, D. J., 317
 Freedman, J. L., 265, 461, 471
 Freeman, E. C., 370
 Freeman, W. J., 216
 Freud, S., 4, 5, 17, 32, 94, 95, 96,
 154, 156, 161, 294, 299, 303, 423,
 424, 425, 426, 427, 428, 429, 430,
 431, 432, 434, 435, 436, 446, 453,
 454, 455, 513, 516, 543, 547, 548
 Freyd, J. J., 137, 298
 Fridlund, A. J., 245
 Friedman, K., 177
 Friedman, M., 397, 399, 409, 410,
 411
 Friedman, R., 158
 Friedman, S. L., 137
 Frijda, N. H., 416
 Frisch, M., 182
 Frith, C., 130
 Frith, U., 130
 Fritsch, G., 54
 Fritz, T., 383
 Fromkin, V., 321
 Fry, A. F., 152
 Fry, R., 170
 Fu, Y.-C., 369
 Fuhrihan, A., 557
 Fuller, M. J., 168
 Fulmer, C. A., 444
 Fulmer, I. S., B-8
 Fulton, R., 475
 Funder, D. C., 143, 440, 442, 444,
 527
 Furlow, F. B., 173
 Furnham, A., 361, 459, 476
 Furr, R. M., 527
 Furukawa, T. A., 522
 Furumoto, L., 3
- G**
 Gable, S. L., 156
 Gabriel, M., 51
 Gabrieli, J. D. E., 281
 Gaertner, S. L., 499
 Gage, P., 56, 57
 Gailliot, M. T., 403
 Galambos, N. L., 146
 Galanter, E., 193
 Galati, D., 383
 Gale, C. R., 403
 Galileo, 71
 Galinsky, E., 448
 Gallese, V., 131, 262
 Gallo, W. T., 391, 400
 Gallup, G. G., Jr., 490
 Gallup, G. H., 498
 Gallup, G. H., Jr., 264, 558
 Galton, F., 118
 Gambrell, L. B., 260
 Gándara, P., 327
 Gandhi, I., 499
 Gandhi, M., 27, 263, 475
 Gandhi, S., 26
 Gangestad, S. W., 184, 490
 Gangwisch, J. E., 89
 Gao, Y., 539
 Garb, H. N., 430
 Garber, K., 131
 Garcia, J., 256, 257, 258, 268
 Gardner, B. I., 324
 Gardner, H., 147, 330, 331, 332,
 333, 334, 347, 349
 Gardner, J., 416
 Gardner, J. W., B-12
 Gardner, M., 298
 Gardner, R. A., 324
 Garfield, C., 328
 Garner, W. R., 345
 Garnets, L. D., 179
 Garon, N., 122
 Garrett, B. L., 297
 Garry, M., 295, 431
 Gartrell, N., 180
 Gatchel, R. J., 221
 Gates, W. ("Bill"), 186, 311, 331,
 A-2
 Gawande, A., 222
 Gawin, F. H., 106
 Gazzaniga, M. S., 59, 60, 61, 101
 Ge, X., 140
 Gearhart, J. P., 169
 Geary, D. C., 167, 184, 342, 344
 Geen, R. G., 265, 398
 Gehring, W. J., 518
 Geier, A. B., 360
 Geiser, C., 529
 Geiwitz, J., A-7
 Geller, D., 470
 Gelles, R. J., 252
 Gelman, D., 383
 Gelman, S. A., 127
 Genain, H., 533
 Genain, I., 533
 Genain, M., 533
 Genain, N., 533
 Genesee, F., 327
 Genovese, K., 494, 496
 Gent, J. F., 224
 Gentile, B., 449
 Gentile, D. A., 101, 265, 485, 486
 George, L. K., 412
 George, M. S., 573
 Geraerts, E., 295, 299
 Gerard, R., 570
 Gerbner, G., 311
 Gerhart, K. A., 414
 Germanotta, S. (Lady Gaga), 57
 Gernsbacher, M. A., 130
 Gerrard, M., 176
 Gershoff, E. T., 251, 252
 Gerstorff, D., 156
 Gertner, J., 419
 Geschwind, N., 323
 Gfeller, J. D., 99
 Giancola, P. R., 103, 482
 Gibbons, F. X., 417
 Gibbs, S., 150
 Gibbs, W. W., 54
 Gibran, K., 139
 Gibson, E. J., 210
 Gibson, H. B., 97
 Gick, B., 228
 Giesbrecht, T., 534
 Giffords, G., 512
 Gigerenzer, G., 310, A-1
 Gilbert, D. T., 11, 156, 257, 294,
 368, 373, 414, 449, 519, B-2
 Giles, D. E., 93
 Gilestro, G. F., 88
 Gill, A. J., 443
 Gill, C., 445, 446
 Gillaspay, J. A., Jr., 258
 Gillham, J. E., 577
 Gillison, M. L., 174
 Gilovich, T., 13, 156, 418, 447, B-15
 Giltay, E. J., 404
 Gingerich, O., 71
 Glaberson, W., 445
 Gladue, B. A., 181
 Gladwell, M., 491, B-6
 Glaser, R., 396
 Glasman, L. R., 460
 Glass, R. I., 311
 Glass, R. M., 571
 Gleaves, D. H., 535
 Glick, P., 439
 Gluszek, A., 478
 Godden, D. R., 287
 Goethals, G. R., 458
 Goff, D. C., 534
 Golan, O., 131
 Gold, M., 146
 Goldberg, J., 217
 Goldberg, W. A., 137
 Golden, R. N., 564
 Golder, S. A., 414
 Goldfried, M. R., 524, 565
 Golding, J. M., 484, 515
 Goldin-Meadow, S., 385
 Goldman, A. L., 531
 Goldstein, A. P., 484
 Goldstein, D., 313
 Goldstein, H., 362
 Goldstein, I., 23, 45
 Goleman, D., 333, 370
 Gomblich, E. H., 198
 Gonsalkorale, K., 366
 Gonzáles-Vallejo, C., 313
 Goodale, M. A., 79
 Goodall, J., 18, 147, 436, 479
 Goode, E., 222
 Goodman, G. S., 298, 299
 Goodstein, L., 445
 Goodwin, P. Y., 155
 Goodyer, I., 525
 Gopnik, A., 155, 327
 Goranson, R. E., 12
 Gorchoff, S. M., 156
 Gordon, A. H., 382
 Gordon, P., 326
 Gore-Felton, C., 299
 Gosling, S. D., 437, 442, 443
 Gossage, J. P., 120
 Gotlib, I. H., 527
 Gottesman, I. I., 532
 Gottfredson, L. S., 332
 Gottfried, J. A., 240
 Gottman, J., 155, 493
 Gould, E., 58
 Gould, S. J., 185, 334
 Grabe, S., 537
 Grace, A. A., 530
 Grady, C. L., 291
 Graf, P., 153
 Graf, S., 68
 Graham, J. E., 405
 Grajek, S., 492
 Granott, N., 129
 Grant, N., 408
 Gray, P. B., 172, 185, 507
 Gray-Little, B., 492
 Green, B., B-7
 Green, B. L., 131
 Green, C. S., 486
 Green, D. M., 219
 Green, J. D., 431
 Green, J. T., 282
 Green, M. F., 529
 Greenberg, J., 447
 Greene, J., 143
 Greenfield, P., 146
 Greenwald, A. G., 195, 477
 Gregory of Nyssa, 521
 Gregory of Sinai, 410
 Gregory, A. M., 90
 Gregory, R. L., 198, 215
 Greif, E. B., 168
 Greist, J. H., 513
 Greitemeyer, T., 484, 485, 486
 Greyson, B., 107
 Grèzes, J., 328
 Griffiths, M., 101
 Grilo, C. M., 361
 Grinker, R. R., 130
 Grobstein, C., 119
 Grogan-Kaylor, A., 252
 Groothuis, T. G. G., 437
 Gross, A. E., 490
 Gross, J. J., 156
 Gross, T. F., 480
 Grossarth-Maticek, R., 410
 Grossberg, S., 199
 Grossman, I., 338
 Gruder, C. L., 417
 Grusec, J. E., 264
 Guerin, B., 318, 471
 Guiso, L., 343
 Gunstad, J., 361
 Gunter, R. W., 564
 Gunter, T. D., 538
 Guo, X., 569
 Gustavson, A. R., 257
 Gustavson, C. R., 257
 Gutierrez, S. E., 176
 Gutsell, J. N., 404
- H**
 H. M. (Molaison, H.), 290
 H., Sally, 431
 Ha, Y.-W., 307
 Haas, A. P., 524
 Haase, C. M., 138
 Haavio-Mannila, E., 151
 Haber, R. N., 272
 Hagger, M. S., 403
 Haidt, J., 142
 Hakes, D. T., 430
 Hakuta, K., 321
 Halberstadt, J., 480
 Haldeman, D. C., 179

- Hale, S., 152
 Hall, C. S., 93, 431
 Hall, G., 258
 Hall, G. S., 140
 Hall, J. A., 381, 490
 Hall, J. G., 64
 Hall, L. K., 273
 Hall, P. A., 536
 Hall, S. S., 119
 Hall, V. C., 260
 Hall, W., 108
 Halpern, B. P., 224
 Halpern, C. T., 177
 Halpern, D. F., 342
 Halsey, A., III, 81
 Hamamura, T., 449
 Hamer, M., 398
 Hammen, C. L., 527
 Hammer, E., C-5
 Hammersmith, S. K., 179
 Hammerstein, O., 384, 490
 Hammond, D. C., 98
 Hampson, R., 362
 Hancock, K. J., 480
 Handel, G. F., 520
 Hankin, B. L., 526
 Hans ("Little"), 17
 Hansen, C. H., 380
 Hansen, R. D., 380
 Harbaugh, W. T., 495
 Harber, K. D., 477
 Hardeveld, H. S., 522
 Hardt, O., 294
 Hare, R. D., 539
 Harenski, C. L., 539
 Harjo, J., 327
 Harkins, S. G., 472
 Harlow, H. F., 132, 133, 134, 136, 161
 Harlow, L. L., 110
 Harlow, M. K., 132, 133, 134, 136, 161
 Harmon-Jones, E., 378
 Harper, C., 484
 Harris, B., 245
 Harris, J. A., 482
 Harris, J. R., 65, 135, 146
 Harris, R. J., 485
 Harris, S., 328
 Harriston, K. A., 445
 Harrow, M., 528
 Harrower, M., 431
 Harter, J. K., B-8, B-9, B-12
 Härter, M., 505
 Hartmann, E., 93
 Harton, H. C., 467
 Hartsuiker, R. J., 319
 Hartwig, M., 380
 Harvey, P. D., 529
 Hasan, N. T., 562, 563
 Haselton, M. G., 172
 Hasher, L., 83
 Haslam, S. A., 462
 Hassan, B., 183
 Hatfield, E., 489, 491, 492
 Hathaway, S. R., 437, 438
 Hatzenbuehler, M. L., 524
 Havas, D. A., 385
 Hawkley, L. C., 365
 Haworth, C. M. A., 339, 340
 Haxby, J. V., 204
 Hayes, T. L., B-8
 Haynes, J.-D., 194
 Hazan, C., 137
 Hazelrigg, M. D., 558
 He, Y., 87
 Headey, B., 417
 Heavey, C. L., 326
 Hedström, P., 524
 Heider, F., 458
 Heiman, J. R., 175
 Heine, S. J., 26, 440, 449, 458
 Hejmadi, A., 380
 Helfand, D., 232
 Helfand, M., 176
 Heller, A. S., 523
 Heller, W., 61
 Helmreich, W. B., 136, 431
 Helms, J. E., 344
 Helmuth, L., 573
 Helson, H., 416
 Helton, W. S., 332
 Hembree, R., 354
 Hemenover, S. H., 407
 Henderlong, J., 260
 Henderson, J. M., 196
 Henig, R. M., 148
 Henkel, L. A., 296
 Henley, N. M., 327
 Hennenlotter, A., 385
 Hennessey, B. A., 314, 315, B-12
 Henning, K., 172, 176
 Henninger, P., 535
 Henrich, J., 26
 Herbenick, D., 178
 Herbert, J. D., 563
 Herdt, G., 167
 Hering, E., 207, 208
 Herman, C. P., 360, 363, 536
 Herman-Giddens, M. E., 168
 Hernandez, A. E., 321
 Herodotus, 479
 Herrmann, E., 262, 325
 Herrnstein, R. J., 247
 Hershenson, M., 213
 Hertenstein, M. J., 133, 158, 159, 220
 Herz, R. S., 226
 Herzog, H., 406
 Herzog, H. A., 27
 Herz-Sommer, A., 404
 Hess, E. H., 215
 Hess, U., 383
 Hetherington, M. M., 360
 Hettema, J. M., 517
 Hezlett, S. A., 332
 Hickok, G., 61
 Hilgard, E. R., 99, 100, 114
 Hill, C. E., 549
 Hinckley, J., 512
 Hines, M., 167
 Hingson, R. W., 111
 Hintzman, D. L., 277
 Hinz, L. D., 536
 Hippocrates, 392
 Hitzig, E., 54
 Hjelmborg, J. v. B., 362
 Hobaiter, C., 324
 Hobson, J. A., 95
 Hochberg, L. R., 54
 Hodgkinson, V. A., 496
 Hoebel, B. G., 357
 Hoefft, F., 101
 Hoffman, C., 478
 Hoffman, D. D., 205
 Hoffman, H. G., 223, 552
 Hofmann, A., 107
 Hofmann, S. G., 410
 Hogan, R., 442
 Hogarth, W., 546
 Hoge, C. W., 515
 Hogg, M. A., 478
 Hohmann, G. W., 372
 Hokanson, J. E., 398
 Holahan, C. K., 339
 Holden, C., 65, 509, 520, 538
 Holland, C. R., 344, 345
 Holliday, R. E., 298
 Hollingworth, S. A., 570
 Hollis, K. L., 242
 Hollon, S. D., 562, 570
 Holmes, D. S., 408
 Holson, L. M., 146
 Holstege, G., 173
 Holt-Lunstad, J., 405
 Holt, L., 319
 Holtgraves, T., 440
 Homer, 521
 Homer, B. D., 106
 Honzik, C. H., 260
 Hooley, J. M., 528
 Hooper, J., 52
 Hopkins, E. D., 61
 Hopwood, C. J., 158
 Hor, H., 87
 Horan, W. P., 529
 Horn, J. L., 337
 Horney, K., 428, 429, 446, 454, 560
 Horwood, L. J., 21
 Hostetter, A. B., 324
 Hou, W.-H., 410
 Houdini, H., 231
 House, R. J., B-12
 Houser-Marko, L., B-11
 Houts, A. C., 551
 Hovatta, I., 517
 Howe, M. L., 298
 Howell, A. J., 346
 Howell, C. J., 415
 Howell, R. T., 415
 Hoy, W., 324
 Hoyer, G., 524
 Hsee, C. K., B-2
 Hu, X.-Z., 517
 Huang, C., 156
 Huang, X., B-12
 Huart, J., 306
 Hubbard, E. M., 229
 Hubel, D. H., 196, 204, 205
 Hublin, C., 93
 Hucker, S. J., 172
 Hudson, J. I., 536
 Huey, E. D., 56
 Huffcutt, A. I., B-6
 Hugdahl, K., 516
 Hugenberg, K., 477, 480
 Hughes, J. R., 105
 Hugick, L., 166
 Huizink, A. C., 108
 Hulbert, A., 339
 Hull, H. R., 90
 Hull, J. G., 103
 Hull, J. M., 287, 489
 Hull, P., 326
 Hülshager, U. R., 315
 Hume, D., 474
 Hummer, R. A., 411
 Humphrey, S. E., 402
 Hunsberger, J. G., 408
 Hunsley, J., 562
 Hunt, C., 513
 Hunt, E., 345
 Hunt, J. M., 341
 Hunt, M., 2, 5, 28, 245, 339, 427
 Hunter, J., 146
 Hunter, J. E., 445, B-4, B-6
 Hunter, S., 154
 Hurlburt, R. T., 326
 Hurst, M., 87
 Hurst, N., 478
 Hussein, S., 308, 462, 479, 500
 Huston, A. C., 264
 Hutchinson, R., 370
 Hvistendahl, M., 476, 477
 Hyde, J. S., 164, 172, 184, 342, 521
 Hyman, I. E., Jr., 82
 Hyman, M., 452
 Hyman, R., 438, 439
 Hynie, M., 176
- I**
 Iacoboni, M., 262
 Iacono, W. G., 522
 Ickes, W., 444
 Idson, L. C., 459
 IJzerman, H., 228
 Ikonomidou, C., 120
 Ilardi, S. S., 524, 575
 Inbar, Y., 226, 313
 Ingham, A. G., 472
 Inglehart, R., 365
 Ingram, N., 469
 Inman, M. L., 306
 Insana, R., B-10
 Insel, T. R., 518
 Inzlicht, M., 346, 404
 Ireland, M. E., 263
 Ironson, G., 412
 Irvine, A. A., 459
 Irwin, M. R., 90, 91
 Isaacson, W., 346
 Ishai, A., 181
 Ishida, A., 564
 Iso, H., 58
 Ito, T. A., 482
 Izard, C. E., 376, 383
- J**
 Jablensky, A., 531
 Jackson, G., 173
 Jackson, J. M., 472
 Jackson, J. S., 476
 Jackson, S. W., 566
 Jacobi, C., 536
 Jacobs, B. L., 408, 524, 525, 570
 Jacobson, N. S., 566
 Jacques-Tiura, A. J., 459
 Jacques, C., 191
 Jago, A. G., B-11
 James, J. W., 158
 James, K., 287
 James, W., 3, 4, 5, 30, 32, 45, 99, 120, 220, 287, 289, 300, 372, 384, 413, 446, 463
 Jameson, D., 212
 Jamieson, J. P., 471
 Jamison, K. R., 520, 545, 546, 560, 570
 Janda, L. H., 489
 Jang, K. L., 538
 Janis, I. L., 308, 474

- Janoff-Bulman, R., 481
 Jaremka, L. M., 365
 Jarrett, B., 361
 Javitt, D. C., 529
 Jenkins, J. G., 293
 Jenkins, J. M., 128
 Jennings, J. R., 399
 Jensen, J. P., 566
 Jensen, M. P., 98
 Jepson, C., A-9
 Jessberger, S., 58
 Jiang, Y., 194
 Job, V., 403
 Jobe, T. H., 528
 John Paul II (Pope), 71
 Johnson, B. T., 280, 511
 Johnson, D. L., 437
 Johnson, E. J., 313
 Johnson, J. A., 462
 Johnson, J. G., 536
 Johnson, J. S., 321, 322
 Johnson, M. H., 121, 133
 Johnson, M. K., 279
 Johnson, R. E., B-10
 Johnson, S. C., 511
 Johnson, V. E., 173, 188
 Johnson, W., 64, 332, 340, 342
 Johnston, L. D., 106, 109, 110, 211
 Johnston, R. E., 383
 Joiner, T. E., Jr., 524
 Jokela, M., 402
 Jones, A. C., 437
 Jones, J. M., 105, 476
 Jones, J. T., 488
 Jones, L., 439
 Jones, M. C., 551
 Jones, M. V., 200
 Jones, S. S., 262, 383
 Jones, W. H., 26
 Jordan, A. H., 519
 Jose, A., 155
 Joseph, D. L., 333
 Joseph, J., 65
 Josephs, R. A., 103
 Jost, J. T., 481
 Joubert, J., 262, 467
 Jovanovic, T., 136
 Judd, L., 522
 Judge, T. A., B-7, B-12
 Juffer, F., 66, 340
 Jung, C., 139, 428, 429, 446
 Jung-Beeman, M., 308
 Just, M. A., 81
 Juvenal, 151
- K**
- Kagan, J., 132, 134, 135, 158, 437
 Kahlor, L., 484
 Kahneman, D., 222, 308, 309, 414, 415, 416, 449, A-6
 Kail, R., 152, 273
 Kaltman, S., 158
 Kalush, W., 231
 Kamarck, T., 399
 Kamel, N. S., 86
 Kamil, A. C., 281
 Kaminski, J., 325
 Kanaya, T., 338
 Kandel, D. B., 112
 Kandel, E. R., 41, 283, 284
 Kandler, C., 158
 Kane, G. D., 537
 Kang, S. K., 346
- Kanner, L., 130
 Kant, I., 214
 Kaplan, H. I., 568
 Kaplan, R. M., 405
 Kaplan, S., B-7
 Kaprio, J., 392
 Karacan, I., 86
 Karau, S. J., 472
 Kark, J. D., 410
 Karlsgodt, K. H., 531
 Karni, A., 95, 123
 Karno, M., 515
 Karpicke, J. D., 29, 278
 Karraker, K. H., 198
 Karremans, J. C., 195, 490
 Kasen, S., 166
 Kashima, Y., 451
 Kasser, T., 415
 Katz-Wise, S. L., 166
 Kaufman, J., 136
 Kaufman, J. C., 329, 520
 Kaufman, J. H., 213
 Kaufman, L., 213
 Kawakami, K., 476
 Kay, A. C., 481
 Kayser, C., 228
 Kazantzis, N., 557
 Kazdin, A. E., 251, 562
 Keats, J., 71
 Keeseey, R. E., 358
 Keillor, G., 449
 Keith, S. W., 362
 Kekulé, A., 88
 Keller, H., 121
 Keller, J., 92
 Keller, M. B., 570
 Kellerman, J., 379
 Kellermann, A. L., 481
 Kelling, S. T., 224
 Kellner, C. H., 571, 572
 Kelly, A. E., 555
 Kelly, D. J., 480
 Kelly, I. W., 438, 539
 Kelly, M. H., 484
 Kelly, S. D., 324
 Kelly, T. A., 566
 Kemeny, M. E., 401
 Kempe, C. C., 136
 Kempe, R. S., 136
 Kendall-Tackett, K. A., 137, 298
 Kandler, K. S., 110, 444, 517, 522, 523
 Kennedy, J., 574
 Kennedy, J. F., 474, 500, 574
 Kennedy, R., 574
 Kennedy, S., 45
 Kennedy, S. H., 573
 Kenrick, D. T., 122, 176, 184, 355, 442
 Kensinger, E. A., 283
 Keough, K. A., 425
 Kern, P., 65
 Kernis, M. H., 450
 Kerr, N. L., 472
 Kerr, R. A., 460
 Kerry, J., 489
 Kessing, L. V., 571
 Kessler, D., 557
 Kessler, M., 577
 Kessler, R. C., 397, 507, 510, 515, 522, 525, 540, 563
 Ketcham, K., 93, 281
 Keyes, E., 146
- Keynes, M., 520
 Keys, A., 356, 357, 358
 Kiecolt-Glaser, J. K., 394, 395, 396
 Kiehl, K. A., 539
 Kierkegaard, S., 11
 Kihlstrom, J. F., 333, 431, 535
 Kilburn, J., 486
 Killham, E., B-10
 Killingsworth, M. A., 368, B-2
 Kilmann, P. R., 176
 Kim, B. S. K., 566
 Kim, G., 362
 Kim, H., 451
 Kimata, H., 405
 Kimble, G. A., 256, 258
 Kimura, D., 342
 King, L. A., 407
 King, M. L., Jr., 263
 King, R. ("Suki"), 313
 King, R. N., 438
 King, S., 531
 Kingston, D. W., 485
 Kinkel, K., 512
 Kinnier, R. T., 156
 Kinzler, K. D., 127, 478
 Kirby, D., 177
 Kirkpatrick, B., 530
 Kirsch, I., 23, 97, 98, 563, 570
 Kisley, M. A., 157
 Kistler, D. J., 380
 Kitayama, S., 326, 398, 418, 451, 452, 458
 Kivimaki, M., 402
 Klayman, J., 307
 Kleck, R. E., 406
 Klein, D. N., 522, 565
 Kleinke, C. L., 379
 Kleinmuntz, B., 379
 Kleitman, N., 84
 Klemm, W. R., 47
 Klentz, B., 490
 Klimstra, T. A., 145
 Kline, D., 151
 Kline, N. S., 527
 Kline, S. L., 451
 Klinke, R., 218
 Kluff, R. P., 534
 Klump, K. L., 536
 Klüver, H., 50
 Knapp, S., 299
 Knickmeyer, E., 537
 Knight, R. T., 57
 Knight, W., 228
 Knoblich, G., 307
 Knutson, K. L., 90
 Ko, C-K., 101
 Koehler, D. J., 438
 Koelling, R. A., 256, 257, 258, 268
 Koenig, K. C., 339
 Koenig, H. G., 410, 412
 Koenig, L. B., 66, 411
 Koenig, O., 44
 Koenigs, M., 57
 Koerting, J., 182, 183
 Koestner, R., B-11
 Kohlberg, L., 141, 142, 143, 149, 150, 160
 Kohler, C. G., 529
 Kohler, I., 215
 Köhler, W., 317
 Kohn, P. M., 392
 Kokkalis, J., 107
 Kolarz, D. M., 154
- Kolassa, I-T., 518
 Kolata, G., 363
 Kolb, B., 58, 122
 Kolker, K., 485
 Kolodziej, M. E., 511
 Koltko-Rivera, M. E., 355
 Konkle, T., 272
 Kontula, O., 151
 Koob, G. F., 530
 Kornell, N., 30
 Kosfeld, M., 45
 Kosslyn, S. M., 44, 99, 516
 Kotchick, B., 176
 Koten, J. W., Jr., 340
 Kotkin, M., 560
 Koulack, D., 293
 Kounios, J., 307
 Kozak, M. J., 552
 Kposowa, A. J., 524
 Kraft, C., B-14
 Kraft, R. N., 299
 Krahé, B. A., 486
 Kramer, A., 414
 Kramer, A. F., 408
 Kramer, M. S., 23
 Kramer, P. D., 570
 Kranz, F., 181
 Kraul, C., 230
 Kraut, R. E., 368, 383
 Krebs, D. L., 102, 143
 Krech, D., 122
 Kring, A. M., 382, 529
 Kristensen, P., A-8
 Kristof, N. D., 493
 Kronick, R. G., 405
 Kroonenberg, P. M., 134
 Kross, E., 366
 Krueger, J., B-10
 Kruger, J., 128, 381
 Kruger, M. L., 400
 Krull, D. S., 11
 Krupa, D. J., 282
 Krützen, M., 318
 Ksir, C., 106
 Kubey, R., 264
 Kübler, A., 414
 Kubzansky, L. D., 399, 400
 Kuehn, T., B-2
 Kuester, L. W., 157
 Kuhl, P. K., 320
 Kuhn, B. R., 252
 Kuhn, C. M., 110
 Kuhn, D., 140
 Kujala, U. M., 407
 Kuncel, N. R., 332, 342
 Kung, L. C., 328
 Kunkel, D., 176
 Kuntsche, E., 111
 Kuppens, P., 526
 Kupper, S., 409
 Kuse, A. R., 343
 Kushner, M. G., 569
 Kutas, M., 83
 Kutcher, E. J., B-6
- L**
- Labouvie-Vief, G., 153
 Lac, A., 111
 Lacey, H. P., 156
 Lacey, M., 496
 Lachman, M. E., 154
 Ladd, G. T., 78
 Lady Gaga (Germanotta, S.), 57

- Lafleur, D. L., 518
 Laird, J. D., 384
 Lally, P., 238
 Lalumière, M. L., 182
 Lam, R. W., 564
 Lambert, A. J., 491
 Lambert, N. M., 485
 Lambert, W. E., 327
 Lambird, K. H., 450
 Landauer, T., 300
 Landauer, T. K., 391
 Landberg, J., 482
 Landry, M. J., 107
 Lange, C., 372
 Langer, E. J., 402, 511
 Langlois, J. H., 489, 490
 Långström, N. H., 181
 Lankford, A., 470
 Lanzetta, J. T., 385
 Larkin, K., 181
 Larrick, R. P., 483
 Larsen, R. J., 134, 375
 Larson, D. B., 412
 Larson, J., 158
 Larson, R. W., 344
 Larsson, H., 538
 Larzelere, R. E., 252
 Lashley, K. S., 281
 Lassiter, G. D., 313, 459
 Latané, B., 472, 494, 495
 Latham, G. P., B-10
 Laudenslager, M. L., 401
 Laumann, E. O., 184
 Laws, K. R., 107
 Lazaruk, W., 327
 Lazarus, R. S., 374, 375, 376, 387, 390
 Lazer, D., 474
 Lea, S. E. G., 27
 Leaper, C., 165
 Leary, M. R., 364, 365, 366, 447
 LeBoeuf, R. A., 313
 LeDoux, J. E., 123, 282, 294, 374, 375, 376, 387
 Lee, J. D., B-14
 Lee, L., 198
 Lee, P. S. N., 368
 Lee, S. W. S., 310
 Lefcourt, H. M., 403
 Legrand, L. N., 111
 Lehavot, K., 491
 Lehman, A. F., 568
 Lehman, D. R., 157
 Leichsenring, F., 562
 Leitenberg, H., 172, 176
 Lemonick, M. D., 358
 Lena, M. L., 56
 L'Engle, M., 10, 346, 521
 Lenhart, A., 165, 367
 Lennon, R., 382
 Lennox, B. R., 56
 Lenton, A. P., 488
 Lenzenweger, M. F., 568
 Leonard, J. B., 481
 Leonardelli, G. J., 228
 Leonhard, C., 84
 Lepper, M. R., 260
 Leserman, J., 396
 Lesperance, F., 400
 Lester, W., 476
 Leucht, S., 569
 Leung, A. K.-Y., 315
 Levant, R. F., 562, 563
 LeVay, S., 180, 181, 182, 183
 Levenson, R. W., 378
 Levin, D. T., 82
 Levin, R., 94
 Levine, J. A., 361
 Levine, R. V., 19, 492
 Levinson, D. F., 532
 Levinson, S. C., 321
 Levy, P. E., B-6
 Lewandowski, G. W., Jr., 490
 Lewinsohn, P. M., 288, 521
 Lewis, B., 64
 Lewis, C. S., 4, 144, 290, 378, 431
 Lewis, D. O., 136, 535
 Lewis, J., 64, 65
 Lewis, J. A., 64, 65
 Lewis, L., 64
 Lewis, M., 288
 Lewis, T., 338
 Lewontin, R., 343
 Li, J., 157
 Li, J. C., 480
 Li, N., 213
 Li, P., 321
 Li, Y., 310
 Li, Z. H., 145
 Liang, K. Y., 152
 Liberman, V., 412
 Libertus, M. E., 127
 Licata, A., 106
 Lichtenstein, P., 105, 130
 Licoppe, C., 165
 Lieberman, M. D., 366, 406
 Lievens, F., 445, B-4
 Lilienfeld, S. O., 130, 231, 430, 512, 535, 538, 539, 562, 564
 Lim, J., 90
 Lincoln, A., 331, 433, 527
 Lindberg, S. M., 342
 Lindbergh, C., 230
 Linder, D., 498
 Lindner, I., 263
 Lindoerfer, J. S., 474
 Lindsay, D. S., 296
 Lindsfold, S., 500
 Lindson, N., 105
 Lindzey, G., 431
 Linz, D., 265, 484
 Lippa, R. A., 166, 184, 489
 Lippmann, W., 491
 Lipps, H. M., 476
 Lipsitt, L. P., 123
 Little, A. C., 490
 Liu, H., 405
 Liu, Y., 120
 Livesley, W. J., 538
 Livingstone, M., 205
 Lobel, A., 491
 LoBue, V., 518
 Locke, E. A., B-10
 Locke, J., 214
 Loehlin, J. C., 64, 66, 440
 Loftus, E. F., 93, 97, 281, 294, 295
 Loftus, G. R., 281
 Logan, T. K., 110
 Loges, W. E., 24
 Logue, A. W., 249
 LoLordo, V. M., 258
 Lombardi, V., B-7
 London, P., 263, 399
 Looy, H., 185
 Lopes, P. N., 333
 Lopez, A. D., 505
 López-Ibor, J. J., 573
 Lord, C. G., 312
 Lorenz, K., 133
 Loughner, J. L., 512
 Louie, K., 95
 Lourenco, O., 129
 Lovaas, O. I., 553
 Loveland, D. H., 247
 Lowry, P. E., 445
 Lozano, A., 572
 Lu, Z.-L., 276
 Lubart, T. I., 314
 Lubinski, D., 339
 Luborsky, L., 562
 Lucas, H. L., 538
 Lucas, R. E., 154, 159, 414, 415, 417, 418
 Lucas-Thompson, R. G., 137
 Lucero, S. M., 177
 Ludwig, A. M., 520
 Lumeng, J. C., 361
 Lund, E., 524
 Luo, F., 524
 Luo, M., 21
 Luppino, F. S., 361
 Luria, A. M., 272
 Lustig, C., 290
 Lutfey, K. E., 174
 Lutgendorf, S. K., 397, 412
 Luus, C. A. E., 176
 Luyken, J., 458
 Lyall, S., 152
 Lykken, D. T., 339, 379, 418, 482, 539
 Lynch, G., 284
 Lynch, J. G., Jr., 312
 Lynch, S., 284
 Lynn, M., 102
 Lynn, S. J., 98, 99
 Lynne, S. D., 140
 Lyons, D. E., 262
 Lyons, L., 144, 146
 Lytton, H., 170
 Lyubomirsky, S., 389, 407, 413, 417, 418
M
 Ma, L., 514
 Ma, Y.-Y., 290
 Maas, J. B., 89, 90
 Maass, A., 346, 452
 Macaluso, E., 228
 Macan, T. H., B-5
 MacCabe, J. H., 530
 Maccoby, E. E., 165, 166, 169, 473
 MacCulloch, R., 415, 416
 MacDonald, G., 288, 366
 MacDonald, J., 228
 Macdonald, J. E., 392
 MacDonald, N., 529
 MacDonald, S. W. S., 153
 MacDonald, T. K., 102, 176
 MacFarlane, A., 121
 Macfarlane, J. W., 140
 Machado, A., 129
 Machin, S., 342
 Maciejewski, P. K., 158
 Mack, A., 81
 MacLeod, M. ("Calum"), 370
 Macmillan, M., 56
 MacNeilage, P. F., 61, 320
 Macy, M. W., 414
 Maddi, S. R., 371
 Maddieson, I., 319
 Maddux, W. W., 315
 Madonna (Ciccione, M. L.), 230, 517
 Madsen, T. M., 572
 Maes, H. H. M., 362
 Maestripieri, D., 66, 136
 Magellan, F., 5, 49
 Maglaty, J., 164
 Magnusson, D., 539
 Magoun, H. W., 49, 50
 Maguire, E. A., 277, 281
 Mahowald, M. W., 93
 Maier, S. F., 394
 Major, B., 165, 490
 Malamuth, N. M., 175, 485
 Maldonado-Molina, M. M., 540
 Malkiel, B., 13, 311
 Malle, B. F., 459
 Mallory, G., 353
 Malmquist, C. P., 431
 Malnic, B., 226
 Maltby, N., 518
 Mamow, M., B-8
 Mampe, B., 120
 Maner, J. K., 172
 Manilow, B., 447
 Mann, T., 363, 450
 Manson, J. E., 407
 Maquet, P., 95
 Mar, R. A., 263
 Marcus, B., 442
 Marcus, S. C., 570
 Maren, S., 518
 Marentette, P. F., 320
 Margolis, M. L., 92
 Marinak, B. A., 260
 Markovitzky, G., 391
 Markovitsch, H. J., 281
 Marks, I., 557
 Markus, G. B., A-8
 Markus, H. R., 326, 398, 447, 451, 452
 Marley, J., 511
 Marmot, M. G., 402
 Marsalis, B., 66
 Marsalis, D., 66
 Marsalis, W., 66
 Marsh, A. A., 383
 Marsh, H. W., 417, 447
 Marshall, M. J., 251
 Marshall, R. D., 309
 Marta, 205
 Marteau, T. M., 312
 Marti, M. W., 306
 Martin, C. K., 363
 Martin, C. L., 170
 Martin, R. J., 358
 Martin, R. M., 22
 Martin, S., 87, 264, 339, B-2
 Martino, S. C., 177
 Martin, S. J., 539
 Martins, Y., 181
 Marx, D. M., 346
 Mashoodh, R., 68
 Masicampo, E. J., 404
 Maslow, A. H., 4, 32, 352, 355, 356, 387, 432, 433, 434, 435, 446, 448, 455, B-1
 Mason, A. E., 381
 Mason, C., 41
 Mason, H., 27, 89, 90
 Masse, L. C., 110
 Massimini, M., 84
 Mast, M. S., 490
 Masten, A. S., 136

- Masters, K. S., 566
 Masters, W. H., 173, 188
 Mastroianni, G. R., 462, 469
 Masuda, T., 383
 Mataix-Cols, D., 518
 Matheny, A. P., Jr., 134
 Mather, M., 157
 Matisse, H., B-3
 Matsumoto, D., 326, 383
 Matthews, G., 442
 Matthews, K. A., 400
 Matthews, R. N., 242
 Maurer, C., 121
 Maurer, D., 121
 Mauss, I. B., 412
 May, C., 83
 May, M., 215
 May, P. A., 120
 May, R., 62, 435
 Mayberg, H. S., 572, 573
 Mayberry, R. I., 322
 Mayer, D., 404
 Mayer, J. D., 333
 Mays, V. M., 392
 Mazure, C., 526
 Mazzella, R., 537
 Mazzoni, G., 295, 297
 McAndrew, F. T., 482
 McAneny, L., 296
 McBurney, D. H., 56, 213, 214, 224
 McCabe, G., 13
 McCabe, M. P., 536
 McCain, N. L., 396
 McCann, I. L., 408
 McCann, U. D., 107
 McCarthy, P., 225
 McCauley, C. R., 473
 McClearn, G. E., 181
 McClendon, B. T., 460
 McClintock, M. K., 167, 393
 McClure, M. J., 194
 McConkey, K. M., 97
 McConnell, A. R., 406
 McConnell, R. A., 230
 McCool, G., 490
 McCrae, R. R., 134, 154, 439, 440, 441, 446
 McCrink, K., 127
 McCullough, M. E., 411
 McDaniel, M. A., 29, 31, 72, 113, 159, 187, 232, 267, 293, 301, 347, 386, 419, 453, 501, 541, 578, A-9, B-15
 McDermott, K. B., 297
 McDermott, R., 482
 McEvoy, S. P., 81
 McFarland, C., 297
 McFarland, S., 462
 McGaugh, J. L., 283
 McGhee, P. E., 129
 McGlashan, T. H., 530
 McGowan, P. O., 68
 McGrath, J. J., 531
 McGregor, H. A., B-10
 McGue, M., 66, 68, 340
 McGuffin, P., 523
 McGuire, W. J., 265
 McGurk, H., 228
 McHugh, P. R., 534, 535
 McKay, J., 447
 McKellar, J., 558
 McKenna, K. Y. A., 488
 McKone, E., 204
 McLanahan, S., 484
 McLatchie, N., 486
 McLaughlin, M., 521
 McLean, C. P., 513
 McMurray, B., 319
 McMurray, C., 408
 McNally, R. J., 299, 516, 564
 McNeil, B. J., 312
 McWhorter, J., 367
 Mead, G. E., 408
 Meador, B. D., 550
 Mednick, S. A., 531
 Medvec, V. H., 156
 Mehl, M. R., 19, 418, 442
 Mehta, M. R., 282
 Meichenbaum, D., 556
 Meijer, E. H., 379
 Melchior, L. A., 451
 Meltzoff, A. N., 262, 265, 320, 327
 Melville, H., 20, 457
 Melzack, R., 101, 221, 222
 Memon, A., 295
 Menander of Athens, 94, 114
 Mendes, E., 361, 409
 Mendle, J., 140
 Mendolia, M., 406
 Menustik, C. E., 552
 Merari, A., 473
 Meriac, J. P., 445
 Merritte, D., 245
 Merskey, H., 534
 Mertz, J. E., 342
 Mesch, G., 368
 Mesmer, F. A., 563, 564
 Mesoudi, A., 464
 Messias, E., 484
 Messinis, L., 108
 Mestel, R., 94
 Meston, C. M., 175
 Metcalfe, J., 307, 311
 Metha, A. T., 156
 Metzler, D. K., 324
 Meyer, I. H., 537
 Meyer-Bahlburg, H. F. L., 181
 Meyerbroöker, K., 552
 Mezulis, A. M., 448
 Michaels, J. W., 471
 Michelangelo, 152
 Middlebrooks, J. C., 219
 Middleton, K., 289
 Miers, R., 370
 Mikels, J. A., 156, 338
 Mikulincer, M., 135, 479
 Milan, R. J., Jr., 176
 Miles, D. R., 481
 Milgram, S., 467, 468, 469, 470, 501, 502
 Miller, D. T., 112
 Miller, G., 37, 110, 226, 469, 509
 Miller, G. A., 276
 Miller, G. E., 400, 519
 Miller, G. F., 172
 Miller, H. C., 404
 Miller, J., 537
 Miller, J. G., 142
 Miller, K., 491
 Miller, K. I., 403
 Miller, L. C., 492, 493
 Miller, L. K., 330
 Miller, N. E., 409
 Miller, P. A., 143
 Miller, P. J. O., 83
 Miller, S. D., 535
 Miller, S. L., 172
 Milne, B. J., 539
 Milner, A. D., 79
 Milner, P., 51
 Milyavskaya, M., 364
 Mineka, S., 516, 517, 518, 576
 Ming, S.-M., 199
 Minsky, M., 46, 78
 Mischel, W., 143, 249, 442, 445, 459
 Miserandino, M., 285
 Mishkin, M., 282
 Mishra, A., 327
 Mishra, H., 327
 Mita, T. H., 488
 Mitani, J. C., 317
 Mitchell, D. B., 272
 Mitchell, F., 480
 Mitchell, J. P., 447
 Mitchell, K. J., 532
 Mitchell, P., 130
 Mitte, K., 513, 557
 M'Naughten, D., 512
 Mobbs, D., 261
 Mocellin, J. S. P., 107
 Moffitt, T. E., 158, 159, 513
 Moghaddam, F. M., 473
 Mohr, H., 311
 Moises, H. W., 532
 Molaison, H. (H. M.), 290
 Möller, I., 486
 Molyneux, W., 214, 215
 Mondloch, C. J., 121
 Money, J., 172, 181
 Monge, P. R., 403
 Moniz, E., 574
 Monroe, M., 466, 490
 Monroe, S., 522
 Mooallem, J., 133
 Mook, D. G., 26
 Moorcroft, W. H., 84, 95
 Moore, B., 157
 Moore, D. W., 87, 111, 230, 476
 Moore, M. K., 262, 265
 Moore, S., 490
 Moos, B. S., 558, 559
 Moos, R. H., 558, 559
 Mor, N., 526
 Morales, L., 178
 More, H. L., 37
 Moreira, M. T., 112
 Moreland, R. L., 488
 Morell, V., 394
 Morelli, G. A., 139
 Moreno, C., 521
 Morewedge, C. K., 230
 Morey, R. A., 530
 Morgan, A. B., 539
 Morgan, T., B-2
 Mori, H., 385
 Mori, K., 385
 Morin, R., 499
 Morris, A. S., 138, 146
 Morris, G., 124
 Morris, J., 171
 Morris, R., 482
 Morris, S. C., 323
 Morrison, A. R., 86
 Morrison, C., 465
 Morrison, D., 484
 Morrison, K., 562
 Morrow, D. G., 279
 Morsella, E., 432
 Mortensen, E. L., 22
 Mortensen, P. B., 531
 Morton, J., 121
 Moruzzi, G., 49
 Moscovici, S., 475
 Moses, E. B., 557
 Mosher, W. D., 179
 Mosing, M. A., 405
 Moss, A. C., 103
 Moss, H. A., 158
 Mosteller, F., 13
 Motivala, S. J., 90
 Mowrer, O. H., 551
 Moyer, K. E., 482
 Mozart, W. A., 521
 Mroczek, D. K., 154
 Muhlnickel, W., 56
 Mukamel, R., 262
 Mulcahy, N. J., 317
 Mulder, E. J., 108
 Muller, J. E., 173, 391
 Mullin, C. R., 265
 Mulrow, C. D., 570
 Munsey, C., 108
 Murachver, T., 165
 Murnen, S. K., 175, 537
 Murphy, G. E., 524
 Murphy, K., 130
 Murphy, K. R., B-7
 Murphy, S. T., 374
 Murray, B., B-14
 Murray, C. J., 505
 Murray, H., 370
 Murray, H. A., 17, 230
 Murray, J. P., 265
 Murray, R. M., 108, 531, 529
 Murray, S. L., 200
 Musick, M. A., 411
 Mustanski, B. S., 181
 Mycielska, K., 198
 Mydans, S., 481
 Myers, A., 293
 Myers, C., 293
 Myers, D. G., 13, 155, 179, 310, 417, 448, 473, 578
 Myers, L., 129, 293
 Myers, M., 68
 Myers, P., 293, 371, 372
 Myers, R., 59
 Myers, T. A., 537
N
 Nagourney, A., 460
 Nairn, R. G., 511
 Nakayama, E. Y., 549
 Napoleon, 417, 435
 Napolitan, D. A., 458
 Narvaez, D., 143
 Nash, M. R., 98
 Natsuaki, M. N., 140
 Nave, C. S., 158
 Nayak, M. B., 484
 Naylor, T. H., B-12
 Nazimek, J., 152
 Neal, D. T., 238
 Neale, J. M., 414
 Nedeltcheva, A. V., 362
 Neese, R. M., 220, 257
 Neidorf, S., 499
 Neimeyer, R. A., 158
 Neisser, U., 81, 283, 340, 345
 Neitz, J., 206, 207
 Nelson, C. A., III, 136, 341
 Nelson, M. D., 531

Nemeth, C. J., 474
 Nes, R. B., 418
 Nesca, M., 293
 Nestadt, G., 515
 Nestoriuc, Y., 409
 Neubauer, D. N., 86
 Neumann, R., 385, 465
 Neuringer, A., 247
 Newberg, A., 410
 Newcomb, M. D., 110
 Newell, B. R., 313
 Newman, D. A., 333
 Newman, L. S., 97
 Newport, E. L., 321, 322
 Newport, F., 71, 165, 381, 392, 411, 460, 462, 499
 Newton, E. L., B-15
 Newton, I., 71, 14, 206, 315
 Nezlek, J. B., 403
 Ng, S. H., 327
 Ng, T. W. H., B-5, B-7
 Ng, W. W. H., 403
 Nguyen, H-H. D., 346
 Nichols, R. C., 64
 Nickell, J., 97, 230
 Nickerson, R. S., 12, B-14, B-15
 Nicolaus, L. K., 257
 Nida, S., 472
 Nie, N. H., 368
 Nielsen, K. M., 405
 Nielsen, M., 262
 Nielsen, R., 94
 Nielsen, T. A., 94
 Niemiec, C. P., 364, 415
 Nier, J. A., 449
 Niesta, D., 257
 Nightingale, F., 406
 Nikolas, M. A., 507
 Nir, Y., 96
 Nisbett, R. E., 342, 343, 344, 458, 484, B-5
 Nixon, G. M., 90
 Nixon, R. M., 382
 Nock, M. K., 525
 Noel, J. G., 404
 Noice, H., 280
 Noice, T., 280
 Nolen-Hoeksema, S., 145, 158, 398, 526, 556
 Noller, P., 135
 Nordgren, L. F., 356
 Norenzayan, A., 19, 26
 Norman, D. A., B-13
 Norman, E., 431
 Norris, J., 538
 Norström, T., 482
 Northall, G. F., 258
 Norton, K. L., 537
 Norton, M. I., 230, A-1
 Norton, P. J., 557
 Nostradamus, 230
 Nowak, R., 104
 Nurius, P., 447
 Nurmikko, A. V., 54
 Nurnberger, J. I., Jr., 110
 Nuttin, J. M., Jr., 488

O

Oakley, D. A., 99
 Oaten, M., 404
 Oates, J. C., 289
 Oatley, K., 263
 Obama, B. H., 308, 346, 474, 477, 479

Oberlander, J., 443
 Oberman, L. M., 131
 O'Brien, R. M., 254
 Ochsner, K. N., 374
 O'Connor, P., 566
 Odbert, H. S., 436
 Odgers, C. L., 111
 O'Donnell, L., 177
 Oehlberg, K., 516
 Oellinger, M., 307
 Oettingen, G., 404
 Offer, D., 146
 O'Heeron, R. C., 406
 Ohgami, H., 571
 Öhman, A., 518
 Oishi, S., 355, 365, 416, 419, 484
 Okimoto, T. G., 165
 Olatunji, B. O., 514
 Olds, J., 51
 Olff, M., 516
 Olfson, M., 507, 569, 570
 Oliner, P. M., 263
 Oliner, S. P., 263
 Olivola, C. Y., 380
 Olsson, A., 517
 Olweus, D., 482
 Oman, D., 411
 O'Neil, J., 22
 O'Neill, M. J., 402
 Ong, A. D., 392
 Oppenheimer, D. M., 229
 Oren, D. A., 88
 Ormerod, T. C., 314
 Ormiston, M., 474
 Orne, M. T., 98
 Orth, U., 145, 447, 522, 526
 Osborne, C., 155
 Osborne, L., 321
 Osburn, H. G., B-11
 Osgood, C. E., 500
 Oskarsson, A. T., 12
 Osswald, S., 485
 Ost, L. G., 516
 Ostfeld, A. M., 403
 O'Sullivan, M., 380
 Osvath, M., 318
 Oswald, A. J., 414, 416
 Ott, B., B-9
 Ott, C. H., 158
 Ouellette, J. A., 445, B-5
 Over, R., 45
 Owen, R., B-8
 Owens, J. A., 90
 Owyang, M. T., 489
 Ozer, E. J., 515, 516
 Özgen, E., 327

P

Pacifici, R., 107
 Padawer, W., 565
 Padgett, V. R., 469
 Pagani, L. S., 363
 Page, S. E., 474
 Paine, R., 37
 Palladino, J. J., 83
 Pallier, C., 320
 Palmer, J. C., 295
 Palmer, S., 209, 283
 Pandey, J., 459
 Pankratz, V. S., 524
 Panksepp, J., 378
 Panzarella, C., 526
 Park, C. L., 411
 Park, G., 314, 339
 Park, L. E., 450
 Park, R. L., 379
 Parker, C. P., B-7
 Parker, E. S., 289
 Parker, J. W., 417
 Parks, R., 475
 Parsons, L. M., 50
 Parsons, T. D., 552
 Pascal, 194
 Pasco, J. A., 524
 Pascoe, E. A., 392
 Pashler, H., 278
 Passell, P., 24
 Pastalkova, E., 284
 Pasteur, L., 315
 Patall, E. A., 260
 Pate, J. E., 536
 Patel, S. R., 90
 Patten, S. B., 520
 Patterson, D. R., 98
 Patterson, F., 324
 Patterson, G. R., 252, 483
 Patterson, M., B-8
 Patterson, P. H., 531
 Pattinson, R., 110
 Pauker, K., 344
 Paulesu, E., 26
 Paus, T., 122
 Pavlov, I., 5, 239, 240, 241, 242, 243, 244, 245, 256, 259, 266, 267, 268, 269, 551
 Payne, B. K., 294, 477
 Payne, J. W., 313
 Peace, K. A., 299
 Peckham, A. D., 521
 Pedersen, A., 395
 Pedersen, N. L., 65
 Peek, K., 331
 Peigneux, P., 88, 282
 Pekkanen, J., 89
 Pekkarinen, T., 342
 Pelham, B. W., 11, 392, 448, 496, 521
 Pendick, D., 482
 Penfield, W., 54
 Pennebaker, J. W., 19, 156, 263, 406, 407, 431, 499
 Peplau, L. A., 155, 179
 Peppard, P. E., 92
 Pepperberg, I. M., 317
 Perani, D., 323
 Pereira, A. C., 58, 151
 Pereira, G. M., 152, B-11
 Perilloux, H. K., 184, 490
 Perkins, A., 180
 Perlick, D., 471
 Perlmutter, M., 153
 Perra, O., 131
 Perrett, D. I., 204
 Perron, H., 532
 Person, C., 576
 Pert, C. B., 40, 52
 Perugini, E. M., 99
 Peschel, E. R., 172
 Peschel, R. E., 172
 Pescosolido, B. A., 533
 Peter, J., 146, 368
 Peters, M., 490
 Peters, T. J., 254
 Petersen, J. L., 172, 184
 Peterson, C., 141, 404
 Peterson, L. R., 276

Peterson, M. J., 276
 Petitto, L. A., 320
 Pettegrew, J. W., 530
 Petticrew, M., 397
 Pettigrew, T. F., 476, 498, 499
 Pfammatter, M., 562
 Phelps, E. A., 51
 Phelps, J. A., 532
 Phelps, M., 118
 Phelps, M. E., 122
 Phillips, A. C., 405
 Phillips, A. L., 575
 Phillips, D. P., 465
 Phillips, J. L., 128
 Piaget, J., 5, 17, 124, 125, 126, 127, 128, 129, 132, 141, 142, 149, 150, 159, 160, 161, 296, 339
 Piao, T-J., 404
 Picchioni, M. M., 529
 Pickett, K., 484
 Pido-Lopez, J., 394
 Pieters, G. L. M., 536
 Pike, K. M., 536
 Pilcher, J. J., 70
 Piliavin, J. A., 143
 Pillemer, D. B., 124, 153, 366
 Pilley, J. W., 325
 Pillsworth, E. G., 172
 Pillsworth, M. G., 172
 Pinel, P., 506, 508, 542, 543, 546
 Pinker, S., 80, 166, 184, 318, 324, 369, 486
 Pinkham, A. E., 380
 Pipe, M-E., 298
 Pipher, M., 66, 365, 391
 Pirandello, L., 441
 Pirsig, R. M., 15
 Pitcher, D., 204
 Pitt, B., 285
 Place, S. S., 380, 488
 Plassmann, H., 225
 Platek, S. M., 490
 Plato, 5, 109
 Plaud, J. J., 551
 Pleck, J. H., 184
 Pliner, P., 360
 Plomin, R., 63, 66, 67, 69, 147, 181, 330, 340, 341, 362, 523, 532
 Plotkin, H., 523
 Plous, S., 27
 Poelmans, G., 507
 Pogue-Geile, M. F., 361, 532
 Polanczyk, G., 507
 Poldrack, R. A., 49
 Polich, J., 410
 Poling, A., 247
 Polivy, J., 360, 363, 536
 Pollak, S. D., 136, 243, 380
 Pollard, R., 324
 Pollick, A. S., 324
 Poole, D. A., 296
 Poon, L. W., 152
 Popenoe, D., 155, 452
 Popkin, S. J., 151
 Poremba, A., 51
 Porteous, D. J., 532
 Porter, D., 247
 Porter, S., 299, 380
 Posluszny, D. M., 396
 Posner, M. I., 323
 Poulton, R., 539
 Powdthavee, N., 414
 Powell, K. E., 407

- Powell, R. A., 430
 Pratt, T. C., 484
 Premack, D. G., 128
 Prentice, D. A., 112
 Prentice-Dunn, S., 460
 Presley, E., 424
 Price, E. C., 557
 Price, J. (A. J.), 289
 Pridgen, P. R., 445
 Principe, G. F., 298
 Prioleau, L., 565
 Pritchard, R. M., 197
 Probert, B., B-2
 Probert, D., B-2
 Proffitt, D. R., 200
 Pronin, E., 449
 Propper, R. E., 94
 Provine, R. R., 18, 384
 Pryor, J. B., 510
 Pryor, J. H., 166, 184, 343, 367, 390, 526
 Przbylski, A. K., 486
 Puetz, T. W., 408
 Pulkkinen, L., 137
 Purkis, H., 518
 Putnam, F. W., 535
 Putnam, R., 464
 Pyszczynski, T. A., 479, 526
- Q**
 Qin, H-F., 404
 Qirko, H. N., 473
 Quanty, M. B., 398
 Quinn, P. C., 209
 Quinn, P. J., 22
 Quoidbach, J., 415
- R**
 Rabbitt, P., 153
 Rabins, P., 573
 Rabung, S., 562
 Racsmány, M., 88
 Rader, D., 538
 Radford, B., 101, 230
 Rahman, Q., 181, 182, 183
 Raine, A., 483, 539
 Rainie, L., 368
 Rainville, P., 100
 Raison, C. L., 539
 Rajendran, G., 130
 Ralston, A., 351, 353, 355
 Ramachandran, V. S., 58, 131, 222
 Ramírez-Esparza, N., 326
 Ramón y Cajal, S., 39
 Randall, P. K., 185
 Randi, J., 14, 232
 Randler, C., 84
 Rapoport, J. L., 515, 518
 Räsänen, S., 530
 Rasch, B., 88
 Rasmussen, H. N., 404
 Rassmussen, S., 171
 Rath, T., B-12
 Raveis, V. H., 112
 Rawlings, J., 141
 Ray, O., 106
 Rayner, R., 4, 245, 268
 Raynor, H. A., 359
 Read, J., 572
 Reagan, R., 479, 512
 Reason, J., 198, 474
 Reber, R., 307
 Reed, G., 462
 Reed, P., 288
 Rees, G., 194
 Rees, M., 71
 Regan, P. C., 184
 Regier, D. A., 541
 Reichardt, C. S., 438
 Reichenberg, A., 130, 529
 Reicher, S., 462
 Reichert, R. A., 341
 Reichle, E. D., 80
 Reid, A. K., 325
 Reid, M. W., 522
 Reifman, A. S., 66, 483
 Reimann, F., 221
 Reimer, D., 169
 Reiner, W. G., 169
 Reis, H. T., 364, 492
 Reis, S. M., 315
 Reizenzein, R., 373
 Reiser, M., 230
 Reite, M. L., 401
 Reitzle, M., 149
 Remick, A. K., 360
 Remington, A., 130
 Remley, A., 138
 Renner, C. H., 122
 Renner, M. J., 122
 Renninger, K. A., 129
 Renshon, J., 449
 Rentfrow, P. J., 442
 Repetti, R. L., 391, 392
 Rescorla, R. A., 259
 Resnick, M. D., 21, 82, 146
 Resnick, S. M., 530
 Rethorst, C. D., 408
 Reyna, V. F., 141
 Reynolds, C. R., 338
 Reynolds, G., 408
 Rhoades, G. K., 155
 Rhodes, G., 480
 Rholes, W. S., 135
 Ribeiro, R., 88
 Riber, K. A., 315
 Ricciardelli, L. A., 536
 Rice, M. E., 264
 Richardson, K. D., 479
 Richeson, J. A., 499
 Richman, L. S., 392
 Riedner, G., 174
 Rieff, P., 431
 Riis, J., 414
 Riley, L. D., 154
 Rindermann, H., 344
 Riskind, J. H., 509
 Ritzler, B., 431
 Rizzo, A. A., 552
 Rizzolatti, G., 262
 Robbins, R. S., 89, 90
 Roberson, D., 326
 Roberts, B. W., 159, 441, 442
 Roberts, L., 403
 Roberts, T-A., 165
 Robertson, B. A., 153
 Robertson, K. F., 314
 Robins, L. N., 112, 541
 Robins, R. W., 145, 156, 376
 Robinson, F. P., 29
 Robinson, J. P., 87, 264, B-2
 Robinson, T. E., 101
 Robinson, T. N., 198, 363
 Robinson, V. M., 405
 Rochat, F., 470
 Rock, I., 81, 209
 Rockefeller, J. D., Sr., 435
 Rodenburg, R., 564
 Rodgers, R., 384, 490
 Rodin, J., 402, 536
 Rodman, R., 321
 Roediger, H. L., III, 29, 30, 278, 297
 Roehling, P. V., B-12
 Roelofs, T., B-8
 Roenneberg, T., 84
 Roese, N. J., 156
 Roesser, R., 217
 Rogers, C. R., 4, 432, 433, 434, 435, 448, 455, 548, 549, 550, 559, 578
 Rogers, K., 392
 Rohan, K. J., 564
 Rohner, R. P., 135, 138, 139
 Rohrer, D., 30, 278
 Roiser, J. P., 107
 Rokach, A., 26
 Romney, D. M., 170
 Ronay, R., 172
 Roosevelt, E., 158
 Root, T. L., 536
 Rorschach, H., 428, 429
 Rosa-Alcázar, A. I., 551
 Rosch, E., 306
 Rose, A. J., 165
 Rose, J. S., 111, 146
 Rose, R. J., 137, 146
 Rose, S., 185
 Roselli, C. E., 181
 Rosenbaum, M., 288, 491
 Rosenberg, N. A., 344
 Rosenberg, T., 313
 Rosengren, K. S., 125
 Rosenhan, D. L., 510, 511, 542
 Rosenman, R., 397, 399, 411
 Rosenthal, R., 381, 443
 Rosenzweig, M. R., 122
 Roseth, C. J., 499
 Rosin, H., 170
 Ross, J., 88
 Ross, L., 458
 Ross, M., 165, 293, 297, 326, 450
 Rossi, P. J., 215
 Rossion, B., 191
 Rostovsky, S. S., 392
 Roth, T., 94
 Rothbart, M. K., 134, 480
 Rothbaum, F., 452
 Rothman, A. J., 312
 Rotter, J., 403
 Rotton, J., 539
 Rousseau, J-J., 131
 Rovee-Collier, B., 124
 Rovee-Collier, C., 124, 287
 Rowe, D. C., 340, 481
 Rowling, J. K., 342, 521
 Rozin, P., 244, 359
 Rubel-Lifschitz, T., 165
 Rubenstein, J. S., 81
 Rubin, D. C., 153, 283
 Rubin, J. Z., 500
 Rubin, L. B., 166
 Rubin, Z., 379
 Ruble, D., 170
 Ruby, M. B., 458
 Ruch, D., B-12
 Ruchlis, H., 307
 Rudner, R., 83
 Rudolph, K. D., 140, 165
 Rueckert, L., 382
 Ruesabagina, P., 493, 494
 Ruffin, C. L., 392
 Ruiz-Belda, M-A., 383
 Rule, B. G., 265
 Rumbaugh, D. M., 324
 Rush, B., 546
 Rushton, J. P., 264
 Russell, B., 93, 417
 Russell, J. A., 383
 Russell, P., 286
 Rusting, C. L., 398
 Rutland, A., 499
 Rutter, M., 181
 Ryan, A. M., 346
 Ryan, R. M., 260, 364, 415, 416, 450
 Rydell, R. J., 346
 Ryugo, D. K., 218
- S**
 S, (Shereshevskii), 272, 289
 Saad, L., 105
 Sabbagh, M. A., 128
 Sabini, J., 467
 Sachdev, J., 574
 Sachdev, P., 574
 Sackett, P. R., 346, B-4
 Sacks, D. P., 485
 Sacks, O., 227, 290
 Sadato, N., 58
 Saddock, B. J., 568
 Sadler, M. S., 510
 Sagan, C., 14, 231
 Sagi, D., 95
 Salk, J., 315
 Salmela-Aro, K., B-5
 Salmon, P., 408
 Salovey, P., 312, 413
 Salthouse, T. A., 152, 337
 Samid, Y., 391
 Sampson, E. E., 451
 Samuels, J., 515
 Samuels, S., 13
 Sánchez-Villegas, A., 525
 Sandfort, T. G. M., 178, 179
 Sandkühler, S., 307
 Sandler, W., 321
 Santos, A., 479
 Sanz, C., 317, 324
 Sapadin, L. A., 166
 Sapphire-Bernstein, S., 405
 Sapirstein, G., 563
 Sapolsky, B. S., 176
 Sapolsky, R., 378, 402
 Sartre, J-P., 187
 Sato, K., 498
 Saulny, S., 391
 Saunders, S., 104
 Savage-Rumbaugh, E. S., 325
 Savic, I., 181
 Savitsky, K., 447
 Savoy, C., 328
 Sawyer, M. G., 522
 Sayal, K., 120
 Sayette, M. A., 103, 104
 Sbarra, D. A., 405
 Scanzoni, L. D., 155, 179
 Scarborough, E., 3
 Scarr, S., 67, 137, 147, 332, 342
 Schab, F. R., 226
 Schachter, S., 373, 374, 375, 376
 Schacter, D. L., 152, 281, 290, 431

- Schafer, G., 320
 Schafer, J., 481
 Schaie, K. W., A-7
 Schallock, R. L., 338
 Scheibe, S., 156
 Schein, E. H., 461
 Schell, D. A., 153
 Scherer, K. R., 380
 Schiavi, R. C., 86
 Schiavo, R. S., 471
 Schick, V., 151
 Schieber, F., 151
 Schiffenbauer, A., 471
 Schiffrin, R. M., 273, 274
 Schilt, T., 107
 Schimel, J., 435
 Schimmack, U., 365, 415, 418, 419, 451
 Schlaug, G., 48
 Schmader, T., 345
 Schmidt, F. L., 445, B-4, B-6, B-8
 Schmitt, D. P., 70, 184, 440, 449
 Schnall, E., 411
 Schnall, S., 226
 Schneider, R. H., 410
 Schneiderman, N., 396
 Schneier, B., 311
 Schoenborn, C. A., 90
 Schoeneman, T. J., 452
 Schofield, J. W., 499
 Schonfield, D., 153
 Schooler, J. W., 297
 Schorr, E. A., 218
 Schrauzer, G. N., 571
 Schreiner-Engel, P., 86
 Schueller, S. M., 413
 Schugens, M. M., 282
 Schuman, H., 153
 Schumann, K., 165
 Schwartz, B., 244, 516
 Schwartz, J., 414
 Schwartz, J. H., 283, 284
 Schwartz, J. M., 557, 574
 Schwartz, S. H., 165
 Schwartz, S. J., 540
 Schwarz, N., 288, 385
 Sclafani, A., 360
 Scott, B. A., 382
 Scott, D. J., 104, 223
 Scott, E. S., 141
 Scott, G., 200
 Scott, J., 153
 Scott, K. M., 155
 Scott, W. A., 139
 Scullin, M. K., 293
 Sdorow, L. M., 429
 Seal, K. H., 515
 Searle, R., 184
 Sears, R. R., 339
 Sebat, J., 130
 Sechrest, L., 430
 Sedgwick, J., 12
 Seeman, P., 530
 Segal, M. E., 473
 Segall, M. H., 129, 169
 Segerstrom, S. C., 391, 404
 Seidler, G. H., 564
 Self, C. E., 112
 Seligman, M. E. P., 9, 78, 84, 147, 364, 370, 371, 402, 407, 413, 414, 418, 420, 447, 526, 527, 556, 560, 562
 Selimbegović, L., 524
 Sellers, H., 191, 192, 204
 Selye, H., 393, 420
 Semenya, C., 169
 Semin, G. R., 228
 Seneca, 151, 278, 416, 492
 Senghas, A., 321
 Sengupta, S., 499
 Senju, A., 130, 131
 Service, R. F., 284
 Setlow, V. P., 174
 Seto, M. C., 485
 Seuss, Dr. (Geisel, T. S.), 212
 Shadish, W. R., 558, 562
 Shafir, E., 313
 Shafto, M. A., 153
 Shakespeare, W., 83, 129, 229, 256, 305, 331, 378, 490, 521, 524
 Shamir, B., B-12
 Shanahan, L., 145, 146
 Shapiro, D., 548
 Shapiro, F., 563, 564
 Shapiro, K. A., 323
 Shargorodsky, J., 217
 Sharma, A. R., 66
 Shattuck, P. T., 130
 Shaver, P. R., 133, 135, 137, 376, 479
 Shaw, B. A., 159
 Shaw, G. B., 474, 492
 Shedler, J., 427, 548, 562
 Sheehan, S., 528
 Sheldon, K. M., 364, 368, B-11
 Sheldon, M. S., 172
 Shelton, J. N., 499
 Shenton, M. E., 531
 Shepard, R. N., 28, 199
 Shepherd, C., 64, 362
 Sher, L., 524
 Shereshevskii (S.), 272
 Shergill, S. S., 498
 Sherif, M., 499
 Sherman, S. J., 307
 Shermer, M., 14
 Sherrington, C., 38, 39
 Sherry, D., 281
 Sherry, S. B., 536
 Shettleworth, S. J., 258, 282
 Shifren, J. L., 174
 Shinkareva, S. V., 78
 Short, S. J., 531
 Shrestha, K. P., 571
 Shute, N., 130
 Siahpush, M., 399
 Siegel, J. M., 88, 95, 405, 407
 Siegel, R. K., 101, 106, 107, 108
 Siegel, S., 245
 Sigmund, B. B., 397
 Sigvardsson, S., 66
 Silber, M. H., 85
 Silbersweig, D. A., 530
 Sill, M., 151
 Silva, A. J., 284
 Silva, C. E., 97
 Silver, M., 470
 Silver, N., 311
 Silver, R. C., 158
 Silveri, M. M., 140
 Silverman, J., 367
 Silverman, K., 104
 Simek, T. C., 254
 Simms, C. A., 534
 Simon, H., 313, 371
 Simon, H. A., 332
 Simon, P., 265
 Simon, T., 334
 Simon, V., 507
 Simons, D. J., 82
 Simonton, D. K., 266, 315, 338
 Simpson, J. A., 135, 184, 467
 Sin, N. L., 413, 418
 Sinclair, R. C., 373
 Singelis, T. M., 451
 Singer, J. A., 158
 Singer, J. E., 373, 374, 375, 376
 Singer, J. L., 562
 Singer, T., 222, 263
 Singh, D., 184, 185, 490
 Singh, J. V., B-12
 Singh, S., 314, 315
 Singleton, C., 512
 Sio, U. N., 314
 Sipski, M. L., 45
 Sireteanu, R., 218
 Sizemore, C., 534
 Skeem, J. L., 538
 Skinner, B. F., 4, 5, 246, 247, 249, 250, 252, 253, 254, 258, 259, 266, 267, 321, 322, 432
 Sklar, L. S., 397
 Skoog, G., 515
 Skoog, I., 515
 Skov, R. B., 307
 Sloan, R. P., 411
 Sloman, L., 231
 Slopen, N., 400
 Slovic, P., 105, 310, 311
 Small, D. A., 311
 Small, M. F., 139
 Smedley, A., 344
 Smedley, B. D., 344
 Smelser, N. J., 480
 Smilek, D., 81
 Smith, A., 497, 530
 Smith, B. C., 228
 Smith, C., 107
 Smith, D. M., 414
 Smith, E., 415
 Smith, G. T., 371
 Smith, M. B., 435
 Smith, M. L., 561, 562
 Smith, P. B., 467, B-12
 Smith, S. J., 414, 499
 Smith, S. L., 177
 Smith, S. M., 489
 Smith, T. B., 566
 Smith, T. W., 179
 Smolak, L., 536
 Smoreda, Z., 165
 Snedeker, J., 321
 Snidman, N., 134
 Snodgrass, S. E., 385
 Snyder, S. H., 39, 40, 510, 571
 Solomon, D. A., 571
 Solomon, J., 511
 Solomon, M., 489
 Song, S., 98
 Sontag, S., 397
 Sorensen, H. J., 529
 Sorkhabi, N., 138
 Soussignan, R., 384, 385
 Sowell, T., 500
 Spanos, N. P., 98, 99, 535
 Sparrow, B., 274
 Spearman, C., 330, 331, 333, 334, 349
 Specht, J. C., 435
 Speer, N. K., 263, 323
 Spelke, E. S., 127
 Spence, I., 215
 Spencer, K. M., 530
 Spencer, S. J., 346
 Sperling, G., 275, 276
 Sperry, R. W., 59, 60, 61, 206
 Spiegel, D., 98, 535
 Spiegel, K., 90
 Spielberg, S., 318
 Spielberger, C., 399
 Spitzer, R. L., 516
 Sprecher, S., 489
 Spring, B., 363
 Springer, J., 65
 Springer, J. A., 65
 Spruijt, N., B-12
 Squire, L. R., 281, 282
 Srivastava, A., 415
 Srivastava, S., 404, 440
 St. Augustine, 71
 St. Clair, D., 531
 St. Jacques, P. L., 157
 St. John, 521
 Stack, S., 524
 Stafford, R. S., 570
 Stager, C. L., 320
 Stanford, C., 318
 Stanley, D., 477
 Stanley, J. C., 339
 Stanovich, K., 424
 Stark, R., 14
 Staub, E., 461, 576
 Staubli, U., 284
 Steel, P., 417
 Steele, C. M., 103, 343, 346
 Stein, S., 19
 Steinberg, L., 138, 141, 146
 Steinberg, N., 488
 Steinhauer, J., 64, 146
 Steinmetz, J. E., 282
 Stelzner, S. P., B-11
 Stengel, E., 524
 Stepanikova, I., 368
 Steptoe, A., 397, 398
 Stern, M., 198
 Stern, W., 335
 Sternberg, E. M., 315, 394
 Sternberg, R. J., 314, 329, 330, 331, 332, 333, 334, 347, 349, 381, 492
 Stetler, C., 137
 Stetter, F., 409
 Stevens, W., 12
 Stevenson, H. W., 344
 Stevenson, R. J., 229
 Stevenson, R. L., 534
 Stewart, J., 143
 Stewart, R. E., 562
 Stice, E., 536, 537, 556, 577
 Stickgold, R., 88, 94, 95
 Stiglitz, J., 419
 Stillman, T. F., 403
 Stinson, D. A., 407
 Stith, S. M., 264
 Stockton, M. C., 175
 Stoddart, R., C-1
 Stone, A. A., 156, 222, 414
 Stone, G., 534
 Stone, L. D., 156
 Stoolmiller, M., 66
 Storbeck, J., 375
 Storm, L., 230
 Storms, M. D., 179, 459, 471

- Stout, J. A., 366
 Stowell, J. R., 467
 Strack, F., 384, 385, 465
 Strahan, E. J., 195
 Stranahan, A. M., 58
 Strand, S., 342
 Strange, D., 295
 Strasburger, V. C., 264
 Stratton, G. M., 215
 Straub, R. O., 30, 324
 Straus, M. A., 252
 Stravinsky, I., 247
 Strawbridge, W. J., 411
 Strayer, D. L., 81
 Strick, M., 313
 Stroebe, W., 158, 471
 Stross, R., 557
 Strully, K. W., 392
 Strupp, H. H., 565
 Su, R., 166
 Subialu, F., 263
 Subrahmanyam, K., 146
 Suddath, R. L., 533
 Sue, S., 566
 Suedfeld, P., 107, 576
 Suinn, R. M., 328
 Sullenberger, C. ("Sully"), B-14
 Sullivan, A., 121
 Sullivan, D., 391
 Sullivan, K. T., 493
 Sullivan, P. F., 523
 Sullivan/Anderson, A., 176
 Suls, J. M., 399, 417
 Summers, M., 505
 Summerville, A., 156
 Sun, Q. I., 361
 Sundel, M., 154
 Sundstrom, E., B-12
 Sunstein, C. R., 309, 312, 473
 Suomi, S. J., 517
 Suppes, P., 129
 Susman, E. J., 158
 Susser, E. S., 531
 Sutcliffe, J. S., 130
 Sutherland, A., 255
 Swami, V., 361, 537
 Swann, W. B., Jr., 447
 Sweat, J. A., 230
 Swerdlow, N. R., 530
 Swerdlow, R. H., 35
 Swim, J. K., 392
 Symbaluk, D. G., 222
 Symond, M. B., 530
 Symons, C. S., 280
 Szucko, J. J., 379
 Szymanski, K., 472
- T**
 Tabarlet, J. O., 176
 Tafti, M., 87
 Taha, F. A., 93
 Taheri, S., 362
 Tajfel, H., 478
 Takahashi, N., 452
 Talal, N., 394
 Talarico, J. M., 283
 Tally, D., 496
 Tamres, L. K., 166
 Tang, S-H., 260
 Tangney, C. C., 525
 Tangney, J. P., 403
 Tannen, D., 27, 165
 Tannenbaum, P., 196
- Tanner, J. M., 168
 Tardif, T., 320
 Tatum, C., 68
 Taubes, G., 363
 Tavis, C., 293, 398, 430
 Tay, L., 355
 Tayeb, M., B-12
 Taylor, C. A., 252
 Taylor, K., 30
 Taylor, P. J., 263, 524
 Taylor, S., 515
 Taylor, S. E., 166, 312, 328, 393
 Taylor, S. P., 482
 Tchaikovsky, P. I., 328
 Tedeschi, R. G., 404, 576
 Teghtsoonian, R., 195
 Teicher, M. H., 137
 Teitelbaum, P., 357
 Tellegen, A., 418
 Teller, 82
 ten Brinke, L., 380
 Tennen, H., 397
 Tennyson, A. (Lord), 166
 Tenopir, M. L., B-3
 Terao, T., 571
 Teresa (Mother), 311
 Teresi, D., 52
 Terman, J. S., 564
 Terman, L., 335, 339
 Terman, M., 564
 Terrace, H. S., 324
 Terre, L., C-1
 Tertullian, 479
 Tesch, F., 417
 Tesser, A., 146
 Tetlock, P. E., 12, 500
 Thaler, R. H., 312
 Thatcher, R. W., 122, 149
 Thayer, R. E., 408
 Théoret, H., 131
 Thernstrom, M., 223
 Thibault, P., 383
 Thiel, A., 58
 Thomas, A., 134, 159
 Thomas, G. C., 471
 Thomas, L., 40, 71, 321, 560
 Thomas, S. L., 265
 Thompson, G., 232
 Thompson, J. K., 363
 Thompson, P. M., 122, 340
 Thompson, R., 292
 Thompson-Schill, S. L., 122
 Thomson, J. A., Jr., 519, 526
 Thomson, R., 165
 Thoreau, H. D., 198
 Thorndike, E. L., 246, 268, 333, 349
 Thorne, J., 505
 Thornhill, R., 173
 Thornton, B., 490
 Thorpe, W. H., 325
 Tice, D. M., 148
 Tickle, J. J., 111
 Tiedens, L. Z., 398
 Tiger, L., 259
 Tiggeman, M., 537
 Tiihonen, J., 568
 Tillmann, H. C., 178
 Timmerman, T. A., 483
 Tinbergen, N., 352
 Tirrell, M. E., 242
 Titchener, E. B., 3, 4, 32
 Todorov, A., 244, 380
- Toews, P., 457
 Tolin, D. F., 562
 Tolkien, J.R.R., 423, 441, 442
 Tolley-Schell, S. A., 380
 Tolman, E. C., 260
 Tolstoy, L., 28, 520
 Tomaselli, K., 262
 Tomiczek, C., 229
 Tondo, L., 571
 Tong, A., 362
 Toni, N., 284
 Tononi, G., 96
 Toole, O. E., 538
 Topolinski, S., 307
 Torrey, E. F., 530, 531, 566
 Totterdell, P., 465
 Tracy, J. L., 376, 450
 Trail, T. E., 229
 Traub, J., 154
 Trautwein, U., 447
 Tredoux, C., 498, 499
 Treffert, D. A., 330, 331
 Treisman, A., 209
 Tremblay, R. E., 110, 539
 Trewin, D., 169
 Triandis, H. C., 451, 452, 484
 Trillin, A., 434
 Trillin, C., 434
 Trimble, J. E., 111
 Triplett, D. G., 130
 Triplett, N., 471
 Tropp, L. R., 498
 Trump, D., 435, 445
 Trut, L. N., 69
 Trzesniewski, K. H., 156
 Tsai, J. L., 383, 384
 Tsang, B. Y-P., 452
 Tsang, Y. C., 357
 Tsuang, M. T., 523
 Tuber, D. S., 27
 Tucker, K. A., B-10
 Tucker-Drob, E. M., 340
 Tully, T., 240
 Tulving, E., 279
 Turkheimer, E., 340
 Turner, J. C., 478
 Turner, N., B-12
 Turpin, A., 230
 Tversky, A., 308, 309, A-6
 Twain, M., 20, 258, 295, 448, 521, 555
 Twenge, J. M., 145, 163, 366, 370, 403, 449, 452, 522
 Twiss, C., A-5
- U**
 Uchida, Y., 418
 Uchino, B. N., 405
 Udry, J. R., 167
 Uga, V., 94
 Ulman, K. J., 168
 Ulmer, D., 397, 409
 Urbina, I., 311
 Urry, H. L., 156, 378
 Ursu, S., 518
 Uttal, D. H., 125
- V**
 Vaccarino, A. L., 281
 Vacic, V., 532
 Vaidya, J. G., 440
 Vaillant, G. E., 367, 297, 405, 411
- Valenstein, E. S., 574
 Valkenburg, P. M., 146, 468
 van Anders, S. M., 172
 Van Baaren, R. B., 465
 van Boxtel, H. W., 449
 Van Cauter, E., 90
 Vance, E. B., 173
 VandeCreek, L., 299
 Vandell, D. L., 137
 Vandenberg, S. G., 343
 van den Boom, D., 135
 van den Bos, K., B-12
 Van den Bussche, E., 194
 van der Helm, E., 90
 VanderLaan, D. P., 181
 Van Dyke, C., 106
 van Engen, M. L., 165
 van Goozen, S. H. M., 539
 van Hemert, D. A., 383
 Van Hesteren, F., 143
 van Honk, J., 130
 van IJendoorn, M. H., 66, 134, 136, 340, 341
 Van Leeuwen, M. S., 169
 Vannucci, M., 297
 van Praag, H., 408
 Van Rooy, D. L., 333
 Van Yperen, N. W., 492
 Van Zeijl, J., 135
 Vasey, P. L., 181
 Vaughn, K. B., 385
 Vecera, S. P., 211
 Veenhoven, R., 417
 Vekassy, L., 93
 Veltkamp, M., 195
 Veneziano, R. A., 135, 138
 Verbeek, M. E. M., 437
 Verhaeghen, P., 152
 Verier, R. L., 391
 Verma, S., 344
 Verosky, S. C., 244
 Verschuere, B., 379
 Vertes, R. P., 95
 Verwijmeren, T., 195
 Vessel, E. A., 354
 Vigil, J. M., 167, 381
 Vigliocco, G., 319
 Vining, E. P. C., 58
 Vinkhuyzen, A. A. E., 340
 Virgil, 22, 376
 Visalberghi, E., 318
 Visich, P. S., 407
 Visser, B. A., 333
 Viswesvaran, C., 333
 Vita, A. J., 105
 Vitello, P., 152
 Vitiello, M. V., 92
 Vitória, P. D., 111
 Vittengl, J. R., 570
 Voas, D., 438
 Vocks, S., 537
 Vogel, G., 27
 Vogel, P., 59
 Vohs, K. D., 287, 403, 484
 Volkow, N. D., 507
 Vollhardt, J., 576
 von Békésy, G., 219
 Von Ebner-Eschenbach, M., 338
 von Helmholtz, H., 206, 207, 219
 von Hippel, W., 152, 172
 von Senden, M., 215
 von Wachter, T., 391
 Vrana, S. R., 378

Vroom, V. H., B-11
 Vuorisalo, T., 359
 Vyazovskiy, V. V., 88
 Vygotsky, L., 124, 129, 159

W

Waber, R. L., 23
 Wacker, J., 437
 Wade, K. A., 295
 Wade, N. G., 566
 Wagar, B. M., 280
 Wagenmakers, E.-J., 232
 Wager, T. D., 223, 518
 Wagner, A. R., 259
 Wagner, D. D., 263
 Wagner, N. N., 173
 Wagner, U., 89
 Wagstaff, G., 459
 Wahlberg, D., 391
 Wai, J., 339, 342
 Wakefield, J. C., 516
 Walk, R. D., 210
 Walker, E., 531, 533
 Walker, M. P., 90
 Walker, W. R., 157
 Walkup, J. T., 570
 Wall, P. D., 221
 Wallace, D. S., 460
 Wallace, G. L., 330
 Wallach, L., 435
 Wallach, M. A., 435
 Waller, J., 470
 Walster (Hatfield), E., 489
 Walton, G. M., 346
 Wampold, B. E., 562, 565
 Wang, K.-S., 532
 Wang, Q., 402
 Wang, S.-H., 127
 Wang, X. T., 404
 Wansink, B., 360
 Warburton, W. A., 486
 Ward, A., 363
 Ward, C., 100
 Ward, J., 229
 Ward, K. D., 105
 Ward, L. M., 177
 Ward, R., 326
 Wardle, J., 224
 Wargo, E., 410
 Warner, J., 179
 Warren, R., 199
 Washburn, A. L., 357
 Washburn, M. F., 3, 316
 Wason, P. C., 307
 Wasserman, E., 385
 Wasserman, E. A., 247, 317
 Wastell, C. A., 407
 Waterhouse, R., A-2
 Waterman, A. S., 145
 Waterman, I., 227
 Waterman, R. H., Jr., 254
 Waters, E., 133
 Watkins, E. R., 519
 Watkins, J. G., 534
 Watson, D., 408, 414
 Watson, J. B., 4, 32, 78, 239, 240,
 245, 256, 259, 266, 268, 269
 Watson, R. L., Jr., 472
 Watson, S. J., 108
 Watson, T., 254
 Watters, E., 508
 Wayment, H. A., 155
 Weaver, J. B., 176

Webb, W. B., 87, 92
 Weber, E., 195, 234
 Webley, K., 477
 Wechsler, D., 335
 Wegman, H. L., 137
 Weinberger, D. R., 141
 Weiner, B., 459
 Weingarten, G., B-1
 Weisbuch, M., 368
 Weiskrantz, L., 79
 Weiss, A., 418, 437
 Weiss, D. S., 516
 Weiss, H. M., B-7
 Weitzman, M. S., 496
 Welch, J. M., 518
 Welch, W. W., 515
 Weller, S., 174
 Wellman, H. M., 127
 Wells, D. L., 406
 Wells, G. L., 238
 Wender, P. H., 523
 Werker, J. F., 320
 Wernicke, C., 323
 Wesley, D.-M., 165
 West, R. L., 153
 Westen, D., 375, 428, 430, 562
 Wetzel, R. D., 524
 Whalen, P. J., 378
 Whaley, S. E., 137
 Whang, W., 400
 Wheeler, D. R., 17, 230
 Wheelwright, J., 64
 Whetten, K., 137
 Whishaw, I. Q., 122
 White, H. R., 482
 White, L., 156
 White, R. A., 231
 White, S., 518
 Whitehead, B. D., 155
 Whiten, A., 18, 317
 Whiting, B. B., 139
 Whiting, J. W. M., 391
 Whitley, B. E., Jr., 479
 Whitlock, J. R., 284
 Whitmer, R. A., 361
 Whooley, M. A., 400
 Whorf, B. L., 326, 327
 Wicherts, J. M., 344
 Wickelgren, I., 221
 Wickelgren, W. A., 280
 Wielkiewicz, R. M., B-11
 Wiens, A. N., 552
 Wierson, M., 254
 Wierzbicki, M., 66
 Wiesel, T. N., 204, 215
 Wiesner, W. H., B-6
 Wigdor, A. K., 345
 Wilcox, A. J., 172
 Wilde, O., 527
 Wilder, D. A., 478
 Wiles, A., 314, 315
 Wilford, J. N., 71
 Wilkens, C., 493, 494
 Wilkinson, P., 525
 Wilkinson, R., 484
 Wilkowski, B. M., 482
 Willems, D., 457, 458, 493
 Willemssen, T. M., 165
 William (Prince, Duke of
 Cambridge, U.K.), 289
 Williams, C. L., 391
 Williams, J. E., 165
 Williams, J. H. G., 157

Williams, K. D., 366, 367, 472
 Williams, L. A., 450
 Williams, L. E., 228
 Williams, N. M., 507
 Williams, S. L., 552
 Williams, W. M., 342
 Williamson, D. A., 536
 Willingham, D. T., 276, 369
 Willis, J., 380
 Willmuth, M. E., 176
 Wilson, A. E., 450
 Wilson, D., 310
 Wilson, G. D., 181
 Wilson, G. T., 103
 Wilson, J., 271
 Wilson, M. A., 95
 Wilson, R. S., 123, 134, 153
 Wilson, T. D., 80, 257, 346
 Wilson, W. A., 110
 Wiltshire, S., 330
 Windholz, G., 241, 243
 Windle, G., 408
 Winfrey, O., 285
 Winkielman, P., 374
 Winner, E., 339
 Winquist, J., 526
 Winter, W. C., 88
 Wirz-Justice, A., 564
 Wiseman, R., 231
 Witelson, S. F., 57
 Withey, M. J., 443
 Witt, J. K., 200
 Wittgenstein, L., 71
 Witvliet, C. V. O., 378, 399
 Wixted, J. T., 291
 Woehr, D. J., 445
 Wojtowicz, J. M., 570
 Wolak, J., 484
 Wolfson, A. R., 95
 Wolitzky-Taylor, K. B., 514, 551
 Woll, S., 489
 Wolpe, J., 551
 Wolpert, E. A., 94
 Wonderlich, S. A., 536
 Wong, B. D., C-4
 Wong, D. F., 530
 Wood, D., 432
 Wood, J. M., 293, 430
 Wood, J. V., 447, 526
 Wood, W., 163, 165, 185, 238, 445,
 475, B-5
 Woodruff, G., 128
 Woodruff-Pak, D. S., 282
 Woods, N. F., 168
 Woods, T., 101
 Woodward, B., 10
 Woodward, L. G., 522
 Woolcock, N., 467
 Woolf, V., 521
 Woolley, A. W., B-11
 Worobey, J., 134
 Wortham, J., 367
 Worthington, E. L., Jr., 141, 567
 Wortman, C. B., 158
 Wren, C. S., 112
 Wright, I. C., 531
 Wright, J., 151
 Wright, P., 531
 Wright, P. H., 165
 Wright, W., 65
 Wrosch, C., 519
 Wrzesniewski, A., B-1
 Wu, J., 476

Wuethrich, B., 103
 Wulsin, L. R., 400
 Wundt, W., 2, 3, 4, 5, 32
 Wyatt, J. K., 94, 293
 Wyatt, R. J., 532
 Wynn, K., 127
 Wynne, C. D. L., 324

X

Xu, Y., 290

Y

Yamagata, S., 440
 Yang, N., 484
 Yanof, D. S., 146
 Yarkoni, T., 443
 Yarnell, P. R., 284
 Yates, A., 512, 536
 Yates, W. R., 172
 Ybarra, O., 448
 Yellen, A., 84
 Yerkes, R. M., 354
 Yeung, J. W. K., 111
 Yokley, J. L., 532
 Young, T., 206, 207
 Youngentob, S. L., 120
 Younger, J., 365
 Youngman, H., 94
 Yücel, M., 108
 Yuki, M., 383

Z

Zabin, L. S., 167
 Zaccaro, S. J., B-11
 Zadra, A., 93
 Zadro, L., 366
 Zagorsky, J. L., 332
 Zajonc, R. B., 334, 374, 375, 376,
 387, 471, 488, A-8
 Zammit, S., 529
 Zauberman, G., 312
 Zayas, V., 194
 Zdravkovic, S., 182
 Zeelenberg, R., 374
 Zeidner, M., 333, 343
 Zeineh, M. M., 281
 Zell, E., 417
 Zeno, 549
 Zeta-Jones, C., 521
 Zhang, S., 451
 Zhong, C.-B., 228, 315
 Zhu, W. X., 477
 Zietsch, B. P., 181
 Zigler, E., 136
 Zillbergeld, B., 560, 562
 Zillmann, D., 175, 176, 373, 485
 Zillmer, E., 431
 Zimbardo, P. G., 461, 462, 472, 479
 Zimmer-Gembeck, M. J., 176
 Zimmerman, R. D., B-6
 Zinbarg, R., 518, 576
 Zogby, J., 217
 Zola-Morgan, S., 282
 Zou, Z., 226
 Zubieta, J.-K., 222, 223
 Zucker, C., 130
 Zucker, G. S., 459
 Zuckerman, M., 353
 Zvolensky, M. J., 513
 Zwolinski, J., C-1

A

- Absolute thresholds, 193–194
- Abuse
abusive relationships, 365
attachment bonds and, 137
child, 68, 243, 298–299, 538–539
repressed or constructed memories of, 298–299
sexual, 137, 298–299
- Acceptance, in Rogers' therapy, 433
- Accidents
human factors in, B-14
selective attention and, 81
- Accommodation, 125, 201
- Acetaminophen, and social pain, 366
- Acetylcholine (ACh), 40
- Achievement motivation, 370–371, B-10–B-11
- Acquisition, in learning, 241–242
- Action potential, 37–38
- Actions and attitudes, 460–463
- Active listening, 549–550
- Activity levels, obesity and, 362
- Acupuncture, pain control and, 223
- Acute schizophrenia, 530
- Adaptation
natural selection and, 69
perceptual, 215
sensory, 196
- Adaptation-level phenomenon, 416
- Addiction, drug, 101–102
- Adolescence, 140–150
cognitive development and, 141–143
continuity and stages and, 149–150
emerging adulthood and, 148–149
physical development and, 140–141
sexual development and, 167–168
social connectedness and, 166
social development and, 143–148
- Adoption studies, 63–66, 339–341. *See also* Genetics
- Adoptive *vs.* biological relatives, 66
- Adrenal glands, 45
- Adrenaline, 45
- Adulthood, 150–159
aging and life satisfaction, 156
biopsychosocial influences and successful aging, 157
cognitive development in, 153
commitments and, 154–156
death and dying, 157–158
emerging, 148–149
love and, 154–155
physical development in, 150–152
recall and recognition in, 153
social development in, 154–158
stability and change in, 158–159
well-being across life span, 156–157
- Aerobic exercise
depression and, 408, 570
stress reduction and, 407–409
- Afterimage effect, 207
- Aggression, 481–486
antisocial effects and, 264
aversive events and, 483
biochemical influences on, 482
biology of, 481–483
cocaine use and, 106
gender and, 164–165
genetic influences and, 481–482
media models for, 264–265, 484–485
neural influences on, 482–483
punishment and, 252
reinforcement, modeling, and self-control, 483–484
violent video games and, 485–486
- Aggression-replacement programs, 484
- Aging. *See* Later life; Life span development
- Agoraphobia, 514
- AIDS (acquired immune deficiency syndrome), 174, 396
- Alcohol use
aggression and, 482
aversion therapy for, 553
dependence on, 103
expectancy effects and, 103
fetal brain and, 120
memory disruption and, 102–103
reduced self-awareness and, 103
reduced self-control and, 103
slowed neural processing and, 102
teen pregnancy and, 176
- Algorithms, 307
- All-or-none response, 38
- Alpha waves, 85
- Altered states of consciousness, 78
- Alternative therapies, 563–565
eye movement desensitization and reprocessing, 563–564
light exposure therapy, 564–565
neurostimulation, 572–573
- Altruism, 493–496
bystander intervention and, 494–495
norms for helping, 496
reciprocity norm and, 496
social exchange theory and, 496
social-responsibility norm and, 496
- Alzheimer's disease, 284
- American Psychological Association (APA),
divisions of, C-1, C-2
- Amnesia
anterograde, 290
infantile, 124
retrograde, 290
source, 296–297
- Amphetamines, 104, 106
- Amplitude, sound, 216
- Amygdala, 50–51, 283, 375
- Analytical intelligence, 331
- Anger, 398–399. *See also* Aggression
- Animal research, ethical guidelines and, 27–29
- Animals
cognitive skills and, 316–317
language capacity and, 323–325
- Anorexia nervosa, 536
- Anterior cingulate cortex, 366, 518
- Anterograde amnesia, 290
- Anti-Muslim animosity, 479
- Antianxiety drugs, 569
- Antidepressant drugs, 518, 569–570
- Antipsychotic drugs, 568–569
- Antisocial effects, in observational learning, 264
- Antisocial personality disorder, 538–539
- Anxiety disorders, 512–518
brain and, 518
cognition and, 517
conditioning and, 516–517
generalized anxiety disorder, 513
genetics and, 517–518
natural selection and, 518
obsessive-compulsive disorder, 514–515
panic disorder, 513
phobias, 513–514
post-traumatic stress disorder, 515–516
- Apes, language capacity and, 324
- Aphasia, 322
- Aplysia*, 283–284
- Apnea, sleep, 92–93
- Appetite hormones, 358

- Applied research, 9
- Aptitude tests, 314
- Archetypes, 428
- Arcuate nucleus, 357
- Arousal, emotional, 373, 377
- Asch's conformity experiments, 466–467
- Asperger syndrome, 130
- Assimilation, 125
- Assistive listening technologies, B-14
- Association areas, brain, 56–57
- Associative learning, 238
- Astrology, 438–439
- Attachment
abuse victims and, 137
basic trust and, 135
deprivation of, 136–137
differences in, 134–135
fathers and parenting, 135
insecure attachment, 134
origins of, 132–133
secure attachment, 134
styles and later relationships, 135
temperament and, 134–135
- Attention-deficit hyperactivity disorder (ADHD), 507
- Attitudes and actions, 460–463
- Attraction, 487–493
companionate love, 492–493
online matchmaking and, 468
passionate love, 492
physical attractiveness and, 489–491
proximity and, 487–489
psychology of, 487–491
reward theory of, 491
romantic love and, 491–493
similarity and, 491
speed dating and, 468
- Attribution theory, 458–459
- Audition, 216
- Auditory canal, 216
- Auditory cortex, 55–56, 216
- Auditory nerve, 216
- Authoritarian parenting style, 138
- Authoritative parenting style, 138
- Autism, 130–131
- Autism spectrum disorder, 130
- Automatic mimicry, 465–466
- Automatic prejudice, 477
- Automatic processing, memory and, 273, 274–275
- Autonomic nervous system, 42–43, 377
- Availability heuristic, 308–311
- Aversive conditioning, 552–553
- Aversive events, aggression and, 483
- Axons, 36

B

- B lymphocytes, 394
- Babbling stage, language and, 320
- Baby physics and math, 127
- Bar graphs, A-1
- Barbiturates, 103
- Barnum effect, 439
- Basal ganglia, memory storage and, 282
- Basal metabolic rate, 358
- Basic research, 9

- Basic trust, attachment styles and, 135
 Basilar membrane, 216
 Beck's therapy for depression, 555–556
 Behavior control, 246
 Behavior clusters, 465–466
 Behavior feedback effect, 385
 Behavior genetics, 62–68. *See also* Genetics;
 Table 1, Evolutionary Psychology and
 Behavior Genetics, xvi
 biological *vs.* adoptive relatives and, 66
 focus of, 7
 gene–environment interaction, 67–68
 genes and, 62
 identical *vs.* fraternal twins, 63–64
 separated twins and, 64–65
 twin and adoption studies, 63–66
 Behavior modification, 553–554
 Behavior rating scales, B-6
 Behavior therapies, 550–554
 classical conditioning techniques, 551–553
 operant conditioning, 553–554
 Behavioral perspective, 7
 Behaviorism, 240
 Behaviorists, 4
 Belief perseverance, 312
 Bell-shaped distribution, A-4
 Belonging, 364–370
 benefits of, 364–365
 mobile networks and social media, 367
 social effects of social networking, 367–370
 social exclusion and, 365–367
 Bereavement therapy, 158
 Bias
 intelligence testing and, 345–346
 stereotype threat and, 345–346
 two meanings of, 345
 Big Five personality factors, 439–440
 Bilingual advantage, 327
 Binge-eating disorder, 363, 536
 Binge sleeping, 95
 Binocular depth cues, 210–211
 Biochemical influences, aggression and, 482
 Biofeedback, 409
 Biological clock, 87
 Biological influences. *See also* Behavior genetics;
 Table 2, Neuroscience, xvi
 brain and behavior, 46–62
 on conditioning, 256–259
 drug use and, 110
 endocrine system, 45–46
 evolutionary psychology, 68–72
 nervous system and, 41–45
 neural communication and, 36–41
 pain and, 221–222
 on personality, 437
 on sexual motivation and, 175
 on sexual orientation, 180–183
 Biological psychologists, 37
 Biological rhythms, sleep and, 83–88
 Biological *vs.* adoptive relatives, 66
 Biomedical therapies, 546, 568–575
 brain stimulation, 571–573
 drug therapies, 568–571
 psychosurgery, 575
 therapeutic lifestyle change, 574–575
 Biopsychosocial approach, 6–7
 aggression and, 487
 development and, 186–187
 drug use and, 109–112
 hypnosis and, 99–100
 learning and, 256–260
 pain and, 222–223
 personality and, 444
 psychological disorders and, 508
 successful aging and, 157
 therapeutic lifestyle change and, 574–575
 Bipolar cells, 202
 Bipolar disorder, 519, 520–521, 570–571
 Birth control, teen pregnancy and, 176
 Blame-the-victim dynamic, 478, 481
 Blind spots, 202
 Blindsight, 79, 205
 Blogs, 473
 Bobo doll experiment, 261
 Body changes, puberty and, 167–168
 Body chemistry, hunger and, 357–359
 Body contact, social development and,
 132–133
 Body image, 537
 Body position and movement, 227
 Botox injections, 385
 Bottom-up emotions, 374
 Bottom-up processing, 192
 Brain
 aging and, 152
 anxiety disorders and, 518
 brainstem, 47
 cerebellum, 50
 cerebral cortex, 53–58
 consciousness and, 78–82
 depression and, 523–525
 development during infancy and childhood,
 121–123
 dual processing and, 79–80
 experienced and imagined pain in, 263
 feelings of love and, 365
 fMRI scan of, 55
 gay-straight brain differences, 180–181
 hunger and, 357–359
 imaging of, 48–49
 language and, 322–323
 limbic system, 50–52
 maturation and memory, 124
 mirrors and imitation in, 262–263
 older brain structures, 47–52
 pathways for emotions and, 374
 plasticity and, 57–58
 retaining information and, 281–283
 reticular formation, 49–50
 right-left hemispheric differences in, 61–62
 schizophrenia and, 530–531
 selective attention and, 80–82
 smell and, 226
 split-brain, 59–61
 taste and, 226
 thalamus, 48
 Brain stimulation, 571–573
 alternative neurostimulation therapies,
 572–573
 electroconvulsive therapy, 571–572
 Brain waves, sleep stages and, 85
 Brainstem, 47
 Brightness constancy, 212–213
 Broca's area, 323
 Bulimia nervosa, 536
 Bullying, 264
 Bystander effect, 494–495
 Bystander intervention, 494–495
C
 Caffeine, 104, 109
 Cancer, stress and, 397
 Cannon-Bard theory, 372
 Case studies, 17–18
 Castration, 172
 Catastrophes, stress and, 391
 Catastrophizing, 556
 Catatonic schizophrenia, 529
 Categorization, prejudice and, 479–480
 Catharsis, 398
 Cause-effect relationships, 21–22
 Cell body, 36
 Cell phones, 81, 367
 Central nervous system, 41, 44–45
 Central route persuasion, 460
 Central tendency measures, A-2
 Cerebellum, 50, 282
 Cerebral cortex, 53–58, 122
 association areas and, 56–57
 functions of, 54–57
 mapping and, 54
 motor functions and, 54
 sensory functions and, 54–56
 structure of, 53
 Chain migration, 365
 Chameleon effect, 465
 Chance events, 154
 Change blindness, 82
 Chemotherapy, 258
 Child abuse, 68, 243, 298–299, 538–539
 Childhood. *See* Infancy and childhood
 Children's eyewitness recall, 297–298
 Chimpanzees, language capacity and, 324–325
 Chromosomes, 62, 167
 Chronic schizophrenia, 530
 Chunking information, 276–277
 Cilia, 217
 Circadian rhythm, 83–84
 Clairvoyance, 230
 Classical conditioning, 238–245
 acquisition and, 241–242
 applications of, 245
 aversive conditioning, 552–553
 cognition and, 250
 discrimination and, 244
 exposure therapies, 551–552
 extinction and spontaneous recovery, 242
 generalization and, 243–244
 in therapy, 551–553
 limits on, 256–258
 operant conditioning contrasted, 255–256
 Pavlov's experiments, 240–244
 Pavlov's legacy and, 244
 Client-centered therapy, 549
 Clinical psychologists, 9, 567, C-1
 Close relationships, health and, 364–365, 406
 Club drugs, 107
 Cocaine, 105–106
 Cochlea, 216
 Cochlear implants, 218
 Cocktail party effect, 80
 Cognition
 anxiety disorders and, 517
 classical conditioning and, 259
 definition of, 124
 emotions and, 374
 operant conditioning and, 259–260
 Cognitive-behavioral therapy, 556–557
 Cognitive development
 adolescence and, 141–143
 adulthood and, 153
 concrete operational stage and, 128–129
 dreams and, 96
 egocentrism and, 128
 formal operational stage and, 129
 infancy and childhood and, 124–131
 morality development, 142–143
 Piaget's theory, 126–131
 preoperational stage and, 127–128

- pretend play and, 128
 reasoning power development and, 141
 sensorimotor stage and, 126–127
 theory of mind and, 128, 130
 Vygotsky's theory, 129
- Cognitive dissonance, 462–463
 Cognitive learning, 239
 Cognitive map, 259–260
 Cognitive neuroscience, 4, 78
 Cognitive perspective, focus of, 7
 Cognitive psychologists, C-1
 Cognitive therapies, 554–557
 Beck's therapy for depression, 555–556
 cognitive-behavioral therapy, 556–557
 selected techniques of, 556
- Colds, stress and, 395
 Collective unconscious, 428
 Collectivist culture, 450–453
 Color constancy, 212–213
 Color vision, 206–208
 afterimage effects, 207
 opponent-process theory and, 207
 Young-Helmholtz trichromatic (three-color) theory and, 207
- Commitments, adulthood, 154–156
 Communal solidarity, 451
 Communication, peacemaking and, 500
 Communication styles, gender and, 165–166
 Community psychologists, 577, C-2–C-3
 Companionate love, 491–493
 Compulsive behaviors, 514–515
 Computer-assisted learning, 253
 Concept formation, 306
 Conciliation, peacemaking and, 500
 Concrete operational stage, cognitive development and, 128–129
 Conditioned reinforcers, 248
 Conditioned response (CR), 240
 Conditioned stimulus (CS), 240
 Conditioning, anxiety disorders and, 516–517
 Condoms, 174
 Conduction hearing loss, 217
 Cones, visual processing and, 202–203
 Confirmation bias, 307
 Conflict and peacemaking, 496–500
 communication and, 500
 conciliation and, 500
 contact and, 498–499
 cooperation and, 499–500
 elements of conflict, 497–498
 enemy perceptions and, 498
 promoting peace and, 498–500
 social traps and, 497–498
- Conformity, 465–467
 automatic mimicry and, 465–466
 social norms and, 466–467
- Confounding variables, 24
 Connectionism, 273
 Consciousness
 altered states of, 78
 brain and, 78–82
 drugs and, 100–112
 hypnosis and, 97–100
 sleep and dreams, 83–96
- Conservation, in cognitive development, 127
 Contact, peacemaking and, 498–499
 Content validity, 337
 Context-dependent memory, 287
 Context effects in perception, 198–199
 Continuous reinforcement, 249
 Control groups, 22
 Convergent thinking, 314
 Cooperation, peacemaking and, 499–500
- Copycat violence, 465
 Cornea, 200
 Coronary heart disease, 397–398
 Corpus callosum, 59
 Correlation, 20–22, A-4–A-6
 Correlation coefficient, 20, A-4
 Cortisol, 90
 Counseling psychologists, 9, C-3
 Counselors, 567
 Counterconditioning, 551
 Crack cocaine, 106
 Creative environments, 315
 Creative intelligence, 331
 Creative thinking, 88–89, 314–315
 Criminal behavior, 251
 Critical periods
 brain development and, 123
 language development and, 321–322
 Critical thinking, 15, 30. *See also* Table 6,
 Critical Thinking and Research Emphasis,
 xxii
- Cross-race effect, 480
 Cross-sectional studies, 153, A-7
 Crystallized intelligence, 337
 Culture transmission, other species and, 317
 Cultural influences, 463–464. *See also* Table 4,
 Culture and Multicultural Experience, xxi
 aggression and, 484
 attraction and, 490
 behavior and, 26–27
 child rearing and, 139–140
 collectivism, 450–453
 context effects and, 198
 depression and, 527
 drug use and, 111
 eating disorders and, 537
 human sexuality and, 185–186
 individualism, 450–453
 personality and, 450–453
 suicide and self-injury and, 524
 variation across cultures, 464
 variation over time, 464
- Curiosity, in motivation, 354
 Cyber-bullying, 368
 Cyber-ostracism, 366
- D**
- Daily hassles, stress and, 392
 Data, describing, A-1–A-6
 Day care, social development and, 136
 Death and dying, 157–158
 Debriefing, 28
 Decibels, 216
 Decision making and judgments, 308–314
 availability heuristic and, 308–311
 belief perseverance and, 312
 fear and, 310–311
 framing and, 312–313
 intuition and, 313–314
 other species and, 316–317
 overconfidence and, 311–312
- Declarative memories, 274
 Decline effect, in parapsychology, A-6
 Deep-brain stimulation, 572
 Deep processing, 278
 Defense mechanisms, 427
 Defensive self-esteem, 450
 Deindividuation, 472
 Déjà vu, 296
 Delayed reinforcers, 248–249
 Delta waves, 85
 Delusions, schizophrenia and, 528
 Dendrites, 36
- Denial, 427
 Dependent variables, 23–25
 Depo-Provera, 172
 Depressants, 102–103
 Depression, 399–400, 521–522. *See also* Major
 depressive disorder
 Beck's therapy for, 555–556
 behaviors and thoughts and, 521
 brain and, 523–525
 drug use and, 110
 exercise and, 408
 gender and, 521–522
 genetics and, 523
 negative thoughts and negative moods,
 526–527
 new generations and, 522
 sleep loss and, 89–90
 social-cognitive perspective and, 526–527
 suicide and self-injury and, 524–525
 termination of, 522
 universality of, 521
 vicious cycle of, 527
- Depth perception
 binocular cues and, 210–211
 monocular cues and, 211
 visual organization and, 210–211
- Description of behavior by researchers, 17–20
 case studies and, 17–18
 naturalistic observation and, 18–19
 surveys and, 19–20
- Desensitization, media and, 265
 Detaching, 136
 Developmental psychologists, 9, C-3
 Developmental psychology
 adolescence, 140–149
 adulthood, 150–159
 continuity and stages and, 118
 infancy and childhood, 121–139
 major issues in development research, 118
 nature and nurture and, 118
 prenatal development and the newborn,
 118–121
 stability and change and, 118
- Diagnostic and Statistical Manual of Mental Disorders,
 Fourth Edition (DSM-IV-TR)*, 509–510
- Diaries, emotional support and, 407
 Difference thresholds, 194–195
 Disability
 coping with, 414–415
 intellectual, 338
- Discrimination, in classical conditioning, 244
 Discrimination, in social psychology, 476
 Discriminative stimulus, 247
 Disorganized thinking, schizophrenia and,
 528–529
- Displacement, 427
 Dissociation, hypnosis and, 99
 Dissociative disorders, 534–535
 Dissociative identity disorder (DID), 534–535
 Distraction, pain control and, 223
 Distributed practice, memory and, 278
 Disturbed perceptions, schizophrenia and, 529
 Divergent thinking, 314
 Divided brain, 59–61
 Divided consciousness, hypnosis as, 99–100
 Divorce, 155, 365
 DNA (deoxyribonucleic acid), 62
 Dopamine, 40, 539
 Dopamine overactivity, schizophrenia and, 530
 Dopamine pathways, 41
 Double-blind procedures, 23
 Doubled receptor sites, 284
 Down syndrome, 338

- Dreams, 93–96. *See also* Sleep
 cognitive development and, 96
 functions of, 94–96
 manifest and latent content and, 94–95
 memories and, 95
 nature of, 93–94
 neural pathways and, 95
 neural static and, 95
 REM rebound and, 96
 theories of, 96
- Drive-reduction theory, 353
- Drug therapies, 568–571
 anti-anxiety drugs, 569
 antidepressant drugs, 569–570
 antipsychotic drugs, 568–569
 mood-stabilizing medications, 570–571
- Drug use, 100–112
 addiction and, 101–102
 biological influences and, 110
 influences on, 109–112
 peer influence and, 111–112
 physical dependence and, 102
 psychoactive drug types, 102–109
 psychological dependence and, 102
 psychological influences and, 110–112
 social-cultural influences and, 110–112
 tolerance and, 100–101
 trends in, 110
 withdrawal and, 102
- Dual processing, consciousness and, 79–80
- Dual-track memory, 274
- E**
- e-mail, detecting personality from, 442–443
- e-mailing, 367
- Ear, 216–219. *See also* Hearing
 cochlea, 216
 cochlear implants and, 218
 eardrum, 216
 inner ear, 216
 middle ear, 216
 outer ear, 216
- Eating disorders, 536–537
 anorexia nervosa, 536
 binge-eating disorder, 536
 bulimia nervosa, 536
 cognitive therapy for, 554
- Ebbinghaus' forgetting curve, 291
- Ebbinghaus' retention curve, 286
- Echoic memory, 276
- Eclectic approaches, therapy, 546
- Ecology of eating, 360
- Economic status, longevity and, 402
- Ecstasy drug, 107
- Educational psychologists, C-3–C-4
- Effortful processing, memory and, 274–280
- Ego, in psychoanalysis, 425
- Egocentrism, 128, 381
- Electra complex, 426
- Electroconvulsive therapy (ECT), 284, 571–572
- Electroencephalogram (EEG), 48
- Electronic communication. *See also* Social networking
 healthy self-disclosure and, 368
 management of, 369
 polarization and, 473
- Embodied cognition, 229
- Embodied emotion, 376–378
- Embryos, 119
- Emerging adulthood, 148–149
- Emotion-focused coping, 401
- Emotion suppression, 407
- Emotional intelligence, 333
- Emotional roots, prejudice and, 479
- Emotional stability–instability, 437
- Emotional ups and downs, 414–415
- Emotions
 arousal and, 373
 autonomic nervous system and, 377
 basic emotions, 376
 Cannon-Bard theory of, 372
 cognition and, 374
 components of, 372
 culture and, 382–384
 detection in others, 379–381
 embodied emotion, 376–378
 emotional arousal, 377
 expressed and experienced emotions, 378–385
 facial feedback effect, 384–385
 gender and, 381–382
 infants' naturally occurring emotions, 376
 James-Lange theory and, 372
 lie detection and, 379
 memory and, 283
 nonverbal cues and, 380–381
 pathways for, 374–375
 perceptions and, 199–200
 physiology of, 377–378
 theories of, 372–375
 two-factor theory and, 373
- Empathy, 433
- Empirically derived tests, 437
- Employee satisfaction and engagement, B-7–B-9
- Empty nest syndrome, 156
- Encoding, memory, 273, 274–280
- Encoding failure, 291
- Endocrine system, 45–46
- Endorphins, 40–41, 221
- Enemy perceptions, conflict and, 498
- Environmental influences
 environment–gene interaction, 67–68
 on intelligence, 341–342
 on sexual orientation, 179–180
- Environmental relatives, 66
- Epigenetics, 67–68
- Epinephrine, 45
- Equity, enduring relationships and, 492
- Erectile dysfunction, 86, 173
- Erikson's stages of psychosocial development, 144
- Erogenous zones, 426
- Erotic plasticity, 179
- Estrogens, 171
- Ethics
 debriefing and, 28
 human and animal studies and, 27–29
 informed consent and, 28
- Evidence-based practice, 562–563
- Evolutionary perspective, 7
- Evolutionary psychology, 68–72, 352–353. *See also* Table 1, Evolutionary Psychology and Behavior Genetics, xvi
 contemporary, 70–72
 genetic legacy and, 70
 human sexuality and, 183–186
 natural selection and adaptation, 69
- Excitement, sexual response cycle and, 173
- Exclusion, 365–367
- Exercise
 depression and, 408
 eating disorders and, 536
 happiness and, 417–418
 longevity and, 411
 neurogenesis and, 408
 physical changes in later life and, 151–152
 sleep and, 92
 strengthening self-control and, 403–404
- stress reduction and, 401, 407–409
 successful aging and, 157
 therapeutic lifestyle change and, 574–575
- Exhibitionism, 174
- Expectancy effects, alcohol use and, 103
- Experimental groups, 22
- Experimental psychologists, C-4
- Experimentation, 22–25
 confounding variables and, 24
 control groups and, 22
 dependent variables and, 23–25
 double-blind procedures and, 23
 independent variables and, 23–25
 placebo effect and, 23
 random assignment and, 22–23
- Expertise, creativity and, 314–315
- Explanatory style, 526
- Explicit memories, 274–280, 281–282
- Exposure therapies, 551–552
- External locus of control, 403
- External stimuli, sexual arousal and, 175–176
- Extinction, in learning, 242
- Extrasensory perception (ESP), 230–232
- Extraversion–introversion, 437
- Extrinsic motivation, 260
- Eye. *See also* Vision
 accommodation and, 201
 blind spots and, 202
 fovea, 203
 iris, 200, 201
 lens, 201
 optic nerve, 202
 pupil, 200, 201
 retina, 201–202
 rods and cones, 202–203
 receptors in, 203
 vision and, 200–201
- Eye movement desensitization and reprocessing (EMDR), 563–564
- Eyewitness recall, children's, 297–298
- Eysenck Personality Questionnaire, 437
- F**
- Face recognition processing, 204
- Face-to-face therapy, 548
- Facebook, 367–369, 473
- Facial expressions
 culture and, 383
 emotional cues and, 380–381
 facial feedback effect, 384–385
- Factor analysis, 330, 436
- Faith communities, health benefits and, 410–412
- False consensus effect, 432
- False memories, 297
- Familiarity, social development and, 133
- Family therapy, 558
- Fathers, full-time, 135
- Fear, 251–252, 310–311
- Feature detection, vision and, 204–205
- Feel-good, do-good phenomenon, 413
- Fetal alcohol syndrome (FAS), 120
- Fetishism, 174
- Fetus, 119–120
- Fight or flight response, 393
- Figure-ground relationship, form perception and, 208–209
- Fixation, 308, 426
- Fixed interval reinforcement schedules, 250
- Fixed-ratio reinforcement schedules, 249
- Flashbulb memories, 283
- Flat affect, schizophrenia and, 529
- Flow, B-1–B-2
- Fluid intelligence, 337

- Fluoxetine, 569
 Food cues, 363
 Food variety, 360
 Foot-in-the-door phenomenon, 460–461
 Forensic psychology, 8, C-4
 Forgetting, 289–294
 anterograde amnesia and, 290
 encoding failure and, 291
 memory repression and, 294
 motivated forgetting, 293–294
 proactive interference and, 292
 retrieval failure and, 293–294
 retroactive interference and, 293
 retrograde amnesia and, 290
 storage decay and, 291–292
 two-track mind and, 290
 Form perception
 figure and ground, 208–209
 grouping, 209
 visual organization and, 208–209
 Formal operational stage, cognitive development and, 129
 Fovea, 203
 Framing, decision-making and, 312–313
 Fraternal birth-order effect on sexual orientation, 182
 Fraternal twins, 63–64
 Free association, in psychoanalysis, 424, 547
 Free radicals, 88
 Frequency, sound waves and, 216
 Frequency theory, pitch perception and, 219
 Freud's psychoanalytic perspective, 4, 424–427
 defense mechanisms and, 427
 ego and, 425
 fixation and, 426
 free association and, 424
 id and, 425
 identification process and, 426
 modern research and, 430–431
 Oedipus complex and, 426
 personality development and, 426–427
 personality structure and, 425–426
 psychosexual stages and, 426
 superego and, 425–426
 unconscious mind and, 424
 Freud's therapeutic technique, 547
 Frontal lobes
 cortex structure and, 53
 development of, 122
 maturation of, 140
 memory storage and, 281–282
 Fruit fly studies, sexual orientation and, 181
 Frustration-aggression principle, 483
 Functional magnetic resonance imaging (fMRI), 48–49
 Functionalism, 3
 Fundamental attribution error, 458–459
- G**
 Gamma-aminobutyric acid (GABA), 40
 Ganglion cells, 202
 Gardner's eight intelligences, 330–331
 Gate-control theory, 221
 Gay-straight brain and trait differences, 180–183
 Gender. *See also* Table 5, The Psychology of Men and Women, xxi
 aggression and, 164–165
 behavior dependence on, 26–27
 depression and, 521–522
 eating disorders and, 537
 emotions and, 381–382
 gender genocide, 476–477
 gender identity, 170–171, 426
 gender roles, 169–171
 human sexuality and, 183–184
 intelligence tests and, 342–343
 roles and, 169–171
 self-esteem and, 164
 sexualization of girls, 177
 similarities and differences, 164–166
 social connectedness and, 165–166
 social power and, 165
 suicide and self-injury and, 524
 typing, 170
 Gene-environment interaction, 67–68
 Gene expression, epigenetics and, 67
 General adaptation syndrome (GAS), 393
 General intelligence (*g*), 330
 Generalization, in learning, 243–244
 Generalized anxiety disorder, 513
 Genes, 62
 Genetics. *See also* Behavior genetics
 aggression and, 481–482
 antisocial personality disorder and, 538
 anxiety disorders and, 517–518
 autism and, 130–131
 behavior, 62–68
 depression and, 523
 eating disorders and, 536
 genetic legacy, 70
 happiness and, 418
 intelligence and, 339–341
 motor development and, 123
 obesity and, 361–362
 schizophrenia and, 532–533
 sexual orientation and, 181
 Genocide, 494
 Genuineness, in Rogers' therapy, 433
 Gestalt psychologists, 208–209
 Gestures, emotional cues and, 380–381
 Ghrelin, 358
 Glial cells, 37
 Glucose, 357
 Glutamate, 40, 518
 Goal setting, B-10–B-11
 Grammar, 319
 Graphic rating scales, for performance appraisal, B-6
 Great person theory of leadership, B-11
 Grief, 157–158, 414
 Grit, achievement and, 370–371
 GRIT (graduated and reciprocated initiatives in tension-reduction) strategy, 500
 Group behavior, 471–475
 deindividuation, 472
 group polarization, 473
 groupthink, 474
 power of individuals and, 474–475
 social facilitation and, 471
 social loafing and, 471–472
 Group polarization, 473
 Group therapy, 557
 Grouping, form perception and, 209
 Groupthink, 474
 Growth, sleep and, 89
 Guilt, sexual activity related, 176
- H**
 Habituation, 121
 Hair cells, 216
 Hallucinations, 85, 529
 Hallucinogens, 107–108
 Halo errors, performance appraisals and, B-7
 Happiness, 413–419
 adaptation-level phenomenon and, 416
 culture and, 418
 emotional ups and downs and, 414–415
 feel-good, do-good phenomenon, 413
 genetics and, 418
 positive psychology and, 413–414
 predicting, 417–419
 relative deprivation and, 417
 subjective well-being and, 413
 wealth and well-being, 415
 Health changes, later life and, 152
 Health psychologists, C-4
 Health psychology, 394
 Healthy environments, creating, 577
 Hearing, 216–219
 conduction hearing loss, 217
 the ear and, 216–219
 loudness perception, 218
 pitch perception, 219
 sensorineural hearing loss, 217
 sound location, 219
 sound waves and, 216
 stimulus input and, 216
 Heart disease
 depression and, 399–400
 exercise and, 407–408
 pessimism and, 399–400
 stress and, 397–400
 Height differences, gender and, 168
 Helping, norms for, 496
 Helplessness, learned, 402, 526
 Heritability of intelligence, 340
 Heroin, 103
 Heuristics, 307
 Hierarchies, processing information and, 277–278
 Hierarchy of needs, 355, 433
 Hindsight bias, 11, 481
 Hippocampus, 281–282, 523
 HIV (human immunodeficiency virus), 174, 396
 Holocaust, 406, 469–470, 576
 Homeostasis, 42, 353
 Homosexuality. *See* Sexual orientation
 Hormones
 endocrine system and, 45
 sexual behavior and, 171–172
 Hue, 200
 Human factors psychology, B-3, B-13–B-15
 Human papilloma virus (HPV), 174
 Humanistic personality theories, 433–435
 assessing the self, 434
 evaluation of, 434–435
 Maslow's self-actualizing person, 433
 Rogers' person-centered perspective, 433–434
 Humanistic psychologists, 4
 Humanistic therapies, 548–550
 Hunger, 356–363
 body chemistry and the brain and, 357–359
 obesity and weight control, 361–363
 physiology of, 357–359
 psychology of, 359–360
 situational influences and, 360
 stomach contractions and, 357
 taste preferences and, 359–360
 Hypersexuality, 177
 Hypertension, 397
 Hypervigilance, 517
 Hypnagogic sensations, 85
 Hypnosis, 97–100
 acting against will and, 98
 dissociation and, 99
 as divided consciousness, 99–100
 forgotten events and, 97
 frequently asked questions regarding, 97–98
 hypnotic ability, 97
 levels of analysis for, 100

- Hypnosis (*continued*)
 memories recovered under, 299
 posthypnotic suggestions and, 98
 selective attention and, 100
 as social phenomenon, 98
 Hypothalamus, 45, 51–52, 357–358
 Hypotheses, 16
- I**
 Iconic memory, 276
 Id, in psychoanalysis, 425
 Identical twins, 63–64, 65
 Identification process, 426
 Identity formation, 144–145
 Illness, stress and, 394–400
 Illusory correlations, A-5–A-6
 Images, thinking in, 328
 Imagination effect, memory and, 295
 Imaginative thinking skills, creativity and, 315
 Imagined stimuli, sexual arousal and, 176
 Imitation
 learning and, 262–263
 media violence and, 264–265
 Immediate reinforcers, 248–249
 Immune functioning, social support and, 406
 Immune responses, 395
 Immune suppression, stress and, 394
 Immune system, sleep loss and, 90
 Implicit memories, 274–275, 282
 Implicit racial associations, 477
 Imprinting, 133
 Inappropriate emotions, schizophrenia and, 529
 Inattention blindness, 81
 Incentives, 353
 Independence, gender and, 165
 Independent variables, 23–25
 Individualism, 435, 450–453, 467
 Industrial-organizational psychology, 9,
 B-2–B-15, C-4
 human factors psychology, B-3, B-13–B-15
 organizational psychology, B-2, B-7–B-13
 personnel psychology, B-2, B-3–B-7
 Infancy and childhood, 121–139
 brain development and, 121–123
 brain maturation and memory, 124
 cognitive development and, 124–131
 language development and, 321–322
 maturation and, 121
 motor development and, 123
 nature and nurture and, 139
 physical development and, 121–124
 social development and, 132–139
 Infantile amnesia, 124, 282
 Inference, 292–293
 Inferiority complex, 428
 Information processing, dreams and, 95–96
 Information processing models, in memory, 273
 Informational social influence, 467
 Informed consent, 28
 Ingroup bias, 478–479
 Inner ear, 216
 Insanity and responsibility, 512
 Insecure anxious attachment, 365
 Insecure avoidant attachment, 365
 Insight, 307, 317
 Insight therapies, 548
 Insomnia, 91–92
 Instability, 437
 Instincts, evolutionary psychology and, 352–353
 Insula, 378
 Intellectual disability, 338
 Intelligence, 329–346
 aging and, 337–338
 analytical intelligence, 331
 assessment of, 333–337
 comparing theories of, 334
 creative intelligence, 331
 crystallized intelligence, 337
 defining of, 329–333
 Down syndrome and, 338
 emotional intelligence, 333
 environmental influences and, 341–342
 extremes of, 338
 fluid intelligence, 337
 general intelligence, 330
 high extreme in, 339
 intellectual disability, 338
 multiple intelligences, 330–332
 practical intelligence, 332
 twin and adoption studies and, 339–341
 Intelligence quotient (IQ), 335
 Intelligence tests, 333–337
 bias and, 345–346
 gender similarities and differences and, 342–343
 innate IQ and, 335
 predicting school achievement and, 334
 racial and ethnic similarities and differences
 and, 343–344
 reliability and, 336
 separate scores for separate skills and, 335–336
 standardization and, 336
 stereotype threat and, 345–346
 validity and, 337
 Intensity, light, 200
 Interleaving, in learning and memory, 30
 Internal locus of control, 403
 Internet. *See also* Social networking
 predators on, 368
 as social amplifier, 473
 social isolation and, 368
 Interneurons, 41, 44
 Interposition (overlap), in depth perception, 211
 Interpretation, psychoanalysis and, 547
 Intersex individuals, 168–169
 Interviewer illusion, B-4–B-5
 Interviews
 interviewer illusion, B-4–B-5
 performance predictions and, B-4
 structured interviews, B-5–B-6
 unstructured interviews, B-4–B-5
 Intimacy, capacity for, 145
 Intrinsic motivation, 260, 315
 Introspection, in Titchener's theory, 3
 Introversion, 437
 Intuition, 10–12, 308, 313–314
 Iris, 200, 201
- J**
 James-Lange theory, 372
 Job-relevant strengths, harnessing, B-9–B-10
 Judgments, and decision making, 308–314
 Jumpy eye, 196
 Just-world phenomenon, 478, 480–481
- K**
 Kinesthesia, 227
 Kitty Genovese case, 494
 Knowledge, curse of, B-15
 Knowledge work, B-2
 Kohlberg's levels of moral reasoning, 142
- L**
 Language, 318–328
 aging and, 321–322
 babbling stage, 320
 bilingual advantage and, 327
 brain and, 322–323
 critical periods and, 321–322
 development and, 319–322
 early childhood and, 322
 grammar and, 319
 morphemes and, 319
 one-word stage, 320
 other species and, 323–325
 perception and, 327
 phonemes and, 319
 productive language, 320–321
 receptive language, 320
 sign language, 324
 structure of, 318–319
 telegraphic speech, 320–321
 thinking and, 326–328
 thinking in images, 328
 two-word stage, 320
 Latent content, dreaming and, 95, 427
 Latent learning, 260
 Laughter, health benefits of, 405
 Law of effect, 246
 Leadership styles, B-11–B-13
 Learned associations, smell and, 226
 Learned helplessness, 402, 526
 Learning
 associative learning, 238
 basic forms of, 238–239
 biological constraints on conditioning, 256–259
 biopsychosocial influences on, 256
 classical conditioning, 238–245
 cognition's influence on conditioning, 259–260
 cognitive learning, 239
 latent learning, 260
 observational learning, 261–266
 operant conditioning, 239, 246–256
 psychological principles and, 29–31
 Leniency errors, B-7
 Lens, 201
 Levels of analysis, 7–8
 Lie detection, 379
 Life changes, stress and, 392
 Life satisfaction, aging and, 156
 Lifestyle change, therapeutic, 574–575
 Lifestyle modification, recurrent heart attacks and,
 409
 Light and shadow, in depth perception, 211
 Light energy, 200
 Light exposure therapy, 564
 Lightness constancy, 212–213
 Limbic system, 50–52
 amygdala, 50–51
 hippocampus, 50, 52
 hypothalamus, 51–52
 Linear perspective, in depth perception, 211
 Linguistic determinism, 326
 Linkage analysis, 523
 Lithium, 570–571
 Little Albert experiments, 245
 Lobotomy, 575
 Loneliness, 364–367
 Long-term memory, 273
 Long-term potentiation (LTP), 284
 Longitudinal studies, 153, A-7
 Loop systems, B-14
 Loudness, 216
 perception of, 218
 Love, 154–155. *See also* Romantic love; Passionate
 love
 LSD (lysergic acid diethylamide), 107
 Luminance, 213
 Lymphocytes, 394

M

- Macrophages, 394
- Magnetic resonance imaging (MRI), 48
- Major depressive disorder, 519–520. *See also* Depression
- Management by objectives, B-11
- Mania, 520–521, 524
- Manifest content, dreaming and, 94–95, 427
- Marijuana, 108
- Marriages, 155
 - stability of, smiles and predicting, 159
- Maslow's hierarchy of needs, 355
- Maslow's self-actualizing person, 433
- Massage therapy, 410
- Massed practice, memory and, 30, 278
- Materialism, 415
- Mating preferences, natural selection and, 184–185
- Maturation, 121
- McGurk effect, 228
- MDMA (methylenedioxymethamphetamine), 107
- Mean, statistical, A-2
- Meaningful information, memory processing and, 279–280
- Measures of central tendency, A-2
- Measures of statistical relationships, A-4–A-6
- Measures of variation, A-3–A-4
- Media models for aggression, 484–485
- Median, statistical, A-2
- Medical model, psychological disorders and, 507
- Meditation, stress reduction and, 409–410
- Mediterranean diet, 525
- Medulla, 47
- Melatonin, 87
- Memory
 - alcohol use and, 102–103
 - automatic processing, 274–275
 - building memories, 274–280
 - chunking and, 276–277
 - distributed practice and, 278
 - dreams and, 95
 - dual-track memory, 274
 - echoic memory, 276
 - effortful processing, 274–280
 - encoding, 273, 274–280
 - explicit memories, 274–280
 - hierarchies and, 277–278
 - iconic memory, 276
 - implicit memories, 274–275
 - improving, 299–300
 - long-term memory, 273
 - meaningful context and, 279–280
 - memory models, 273–274
 - mnemonics and, 277
 - pain and, 222
 - priming, 287
 - processing levels and, 278–279
 - recall and, 272
 - recognition and, 272
 - relearning and, 272
 - retrieval and, 273
 - sensory memory, 273, 275–276
 - short-term memory, 273, 276
 - sleep and, 88, 300
 - spacing effect and, 278
 - storage and, 273
 - three-stage processing model of, 273
 - working memory, 273–274, 276
- Memory construction errors, 294–299
 - abuse survivors and, 298–299
 - children's eyewitness recall, 297–298
 - discerning true and false memories, 297
 - imagination effects and, 295
 - misinformation effects and, 295
 - source amnesia and, 296–297
- Memory retrieval, 285–288. *See also* Forgetting
 - context-dependent memory, 287
 - measuring retention and, 285–286
 - priming and, 286–287
 - retrieval cues, 286–289
 - serial position effect, 288
 - state-dependent memory, 288
- Memory storage, 280–284
 - amygdala and, 283
 - cerebellum and basal ganglia and, 282
 - emotions and, 283
 - explicit-memory system and, 281–282
 - flashbulb memories, 283
 - frontal lobes and hippocampus and, 281–282
 - implicit-memory system and, 282
 - long-term potentiation and, 284
 - retaining information in the brain, 281–283
 - synaptic changes and, 283–284
- Menarche, 140, 167–168
- Menopause, 151
- Mental age, 334
- Mental rehearsal, 328
- Mental rotation test, 343
- Mental set, 308
- Mere exposure effect, 488
- Metabolism, obesity and, 361
- Methamphetamine, 106
- Middle ear, 216
- Midlife transition, 154
- Mild cognitive impairment, 284
- Milgram's obedience studies, 467–470
- Mimicry, automatic, 465–466
- Mind-blindness, 130–131
- Mindfulness meditation, 410
- Minnesota Multiphasic Personality Inventory (MMPI), 437–439
- Minority influence, 475
- Mirror-image perceptions, 498
- Mirror neurons, 262
- Misinformation effects, memory and, 295
- Mnemonic devices, memory and, 300
- Mnemonics, 277
- Mobile networks, 367
- Mode, statistical, A-2
- Modeling
 - aggression and, 483–484
 - learning and, 261
- Modern unconscious mind, 431–432
- Moebius syndrome, 385
- Momentary photographic memory, 275
- Monoamine oxidase A, 482
- Monocular depth cues, 211
- Mood-congruent memory, 288
- Mood disorders, 519–527. *See also* Depression
 - bipolar disorder, 520–521
 - characteristics of, 519
 - depressed brain, 523–525
 - depression effects, 521–522
 - genetics and, 523
 - major depressive disorder, 520
 - social-cognitive perspective and, 526–527
- Mood-stabilizing medications, 570–571
- Moods, negative, 526–527
- Moon illusion, 213
- Moon madness, 539
- Morality
 - developing, 142–143
 - moral action, 143
 - moral intuition, 142–143
 - moral reasoning, 142
- Morphemes, 319
- Morphine, 103
- Motion
 - perception of, 205
 - relative, in depth perception, 211
- Motivated forgetting, 293–294
- Motivational concepts, 352–355
 - drives and incentives, 353
 - hierarchy of needs, 355
 - instincts and evolutionary psychology, 352–353
 - optimum arousal, 353–354
- Motivations, perceptions and, 199–200
- Motor development, infancy and childhood and, 123
- Motor functions, cerebral cortex and, 54
- Motor neurons, 41, 44
- Multiple intelligences, 330–332
- Multiple personality disorder. *See* Dissociative identity disorder
- Multiple sclerosis, 37
- Music
 - expressions of emotion, 383
 - intelligence, 330–331
 - preferences, 442
- Mutations, genetic, 69
- Myelin sheath, 36–37, 140
- N**
- Narcissism, 369–370, 449
- Narcissistic personality disorder, 538
- Narcolepsy, 92
- Natural killer cells, 394
- Natural selection
 - anxiety disorders and, 518
 - Darwin and, 6
 - learned behaviors and, 257
 - mating preferences and, 184–185
 - understanding human nature and, 68–69
- Naturalistic observation, 18–19
- Nature-nurture issue, 5–6, 139. *See also* Behavior genetics; Biological influences; Cultural influences; Environmental influences; Genetics; Table 1, Evolutionary Psychology and Behavior Genetics, xvi
- Nausea conditioning, cancer patients and, 258
- Near-death experience, 107
- Necker cube, 208
- Need to belong, 364–370
- Negative correlation, 20
- Negative explanatory style, 526
- Negative punishment, 251
- Negative reinforcement, 248
- Negative self-talk, 556
- Negative thoughts, negative moods and, 526–527
- Neo-Freudian theorists, 428–429
- Neophobia, 360
- Nerves, 41
- Nervous system, 41–45
 - central nervous system, 44–45
 - functional divisions of, 42
 - peripheral nervous system, 42–43
- Neural activation theory of dreams, 96
- Neural communication, 36–41
- Neural impulse, 37–38
- Neural influences, aggression and, 482–483
- Neural pathways, dreams and, 95
- Neural processing, alcohol use and, 102
- Neural static theory of dreams, 95
- Neuroadaptation, 100
- Neurogenesis, 58, 408, 570
- Neurons, 36–37
- Neuropsychologists, C-4
- Neuroscience perspective, 7. *See also* Table 2, Neuroscience, xvi

- Neurotransmitters, 39–41
 behavior, influences on, 40–41
 pathways, 41
- Neutral stimulus (NS), 240
- Newborn. *See also* Prenatal development and the newborn
 abilities of, 120–121
 habituation and, 121
 nourishment and, 121
 preferences for faces and, 121
- Nicotine, 104–105
- Night terrors, 93
- Non-suicidal self-injury (NSSI), 525
- Nondeclarative memories, 274
- Nonverbal cues, 380–381
- Noradrenaline, 45
- Norepinephrine, 40, 45, 524
- Normal distribution curves, 336, A-4
- Normative social influence, 467
- Norms, 464
- Nucleus accumbens, 51
- O**
- Obedience, 467–470
- Obesity, 361–363
 activity levels and, 362–363
 genetic factors and, 361–362
 physiology of, 361–363
 risk factors and, 361
 set point and metabolism and, 361
 sleep loss and, 362
 social influence and, 362
 weight management and, 363
- Object permanence, 126
- Observational learning, 261–266
 antisocial effects and, 264
 applications of, 263–264
 cognitive learning and, 239
 mirrors and imitation in the brain, 262–263
 prosocial effects and, 263–264
- Obsessive-compulsive disorder (OCD), 514–515, 557
- Occipital lobes, 53
- Odor molecules, 226
- Oedipus complex, 426
- Older brain structures, 47–52
- Older-brother effect on sexual orientation, 182
- Olfaction, 225–226
- One-word stage, language and, 320
- Online matchmaking, 468
- Operant behaviors, 256
- Operant chamber, 246
- Operant conditioning, 246–256, 553–554
 applications of, 253–254
 classical conditioning contrasted, 255–256
 cognition and, 250–260
 conditioned reinforcers, 248
 delayed reinforcers, 248–249
 at home, 254
 immediate reinforcers, 248–249
 learning associations and, 239
 limits on, 258–259
 primary reinforcers, 248
 punishment and, 251–252
 reinforcement schedules and, 249–250
 reinforcer types and, 248–249
 at school, 253
 shaping behavior and, 247
 Skinner's experiments, 246–252
 Skinner's legacy and, 253
 in sports, 253–254
 at work, 254
- Operational definitions, 16
- Opiates, 41, 103
- Opponent color, 207
- Opponent-process theory, 207
- Optic nerve, 202
- Optimism, 399, 404–405
- Optimum arousal, 353–354
- Organizational psychology, B-2, B-7–B-13
 goal setting, B-10–B-11
 harnessing job-relevant strengths, B-9–B-10
 leadership style and, B-11–B-13
 satisfaction and engagement, B-7–B-9
- Orgasm, sexual response cycle and, 173
- Orgasmic dysfunction, 173–174
- Ostracism, 366
- Other-race effect, 480
- Outcome simulation, 328
- Outer ear, 216
- Outgroups, 478–479
- Oval window, 216
- Overconfidence, 12–13, 311–312
- Overimitation, 262
- Overlearning, 30
- Overt prejudice, 476
- Overthinking, 526
- Ovulation, 172
- Own-race bias, 480
- Oxytocin, 45
- P**
- Pain, 220–223
 biological influences on, 221–222
 control of, 223
 experienced and imagined, 263
 gate-control theory and, 221
 pain circuit, 221
 pain reflex, 42
 phantom limb sensations, 222
 psychological influences on, 222
 social-cultural influences on, 222
 understanding pain, 221–222
 virtual-reality pain control, 224
- Palm reading, 438–439
- Panic attack, 513, 517
- Panic disorder, 513, 514
- Paradoxical sleep, 86
- Parallel processing, in vision, 79–80, 205–206, 273
- Paraphilias, 174
- Parapsychology, 230
- Parasympathetic nervous system, 42–43, 377
- Parental relationships, social development and, 145–148
- Parenting styles, 138–139
- Parietal lobes, 53
- Partial (intermittent) reinforcement, 249
- Partner training, 255
- Passionate love, 491–492
- Patronization, unconscious, 477
- Pavlov's experiments, 240–244. *See also* Classical conditioning
- Paxil, 569
- Peacemaking, 498–500. *See also* Conflict and peacemaking
- Peak experiences, 433
- Pedophilia, 174
- Peer influences on drug use, 111–112
- Peer relationships, social development and, 145–148
- Peg-word system, in memory, 277
- Perception. *See* Sensation and perception
- Perceptual adaptation, 215
- Perceptual constancy
 color and brightness constancies, 212–213
 shape and size constancies, 213–214
 visual organization and, 212–214
- Perceptual set, 197–198, 308
- Performance appraisals, B-6–B-7
- Peripheral nervous system, 41, 42–43
- Peripheral route persuasion, 460
- Permissive parenting style, 138
- Person-centered perspective, 433–434
- Person-situation controversy, 441–443
- Personal control
 power of individuals and, 474–475
 stress and, 401–404
- Personal spaces, detecting personality from, 442
- Personality
 biopsychosocial approach and, 444
 culture and, 450–453
 development of, in psychoanalysis, 426–427
 disorders, 537–539
 exploring the self and, 446–453
 humanistic theories and, 433–435
 inventories, 437–439
 psychodynamic theories and, 424–432
 self-esteem and, 447–448
 self-serving bias and, 448–450
 social-cognitive theories and, 443–446
 stability, 441
 structure, in psychoanalysis, 425–426
 trait theories and, 435–443
- Personality psychologists, 9
- Personnel psychology, B-2, B-3–B-7
 harnessing strengths and, B-3–B-6
 interviews and performance predictions, B-4
 performance appraisals, B-6–B-7
 structured interviews, B-5–B-6
 unstructured interviews and interviewer illusion, B-4–B-5
- Persuasion, 460
- Pessimism, 399–400, 404–405
- Pessimistic explanatory style, 527
- Pets, emotional support and, 406
- Phantom limb sensations, 222
- Phobias, 513–514
- Phonemes, 319
- Photographic memory, 275
- Physical attractiveness, 489–491
- Physical changes in later life, 151–152
- Physical dependence on drugs, 102
- Physical development
 adolescence and, 140–141
 adulthood and, 150–152
 infancy and childhood and, 121–124
 menopause and, 151
 middle adulthood and, 151–152
 puberty and, 140
- Physiological function theory of dreams, 96
- Physiology of emotions, 377–378
- Piaget's stages of cognitive development, 126–129
- Piaget's test of conservation, 127
- Pitch perception, 219
- Pituitary gland, 45
- Pituitary secretions, 46
- Place theory of pitch perception, 219
- Placebo effect, 23, 223, 570
- Plasticity, brain, 57–58
- Plateau, sexual response cycle and, 173
- Pleasure principle, 425
- Polarization, group, 473
- Polygenetic intelligence, 340
- Polygraph tests, 379
- Popout phenomenon, 82
- Population, random sampling and, 20
- Pornography, 484–485
- Portion size, obesity and, 363

- Positive correlation, 20
 Positive psychology, 9, 413–414
 Positive punishment, 251
 Positive reinforcement, 248
 Positive transfer, 293
 Positron emission tomography (PET), 48
 Post-traumatic growth, 516, 576
 Post-traumatic stress disorder (PTSD), 515–516
 Posthypnotic suggestions, 98
 Poverty, and attributions, 459
 Practical intelligence, 332
 Precognition, 230
 Predictive validity, 337
 Pregnancy, teen, 176–178
 Prejudice, 476–481
 automatic prejudice, 477
 categorization and, 479–480
 cognitive roots of, 479–481
 emotional roots of, 479
 implicit racial associations and, 477
 just world beliefs and, 480–481
 overt prejudice, 476
 race-influenced perceptions and, 477
 reflexive bodily responses and, 477
 scale of, 476–477
 social roots of, 478–479
 subtle prejudice, 476
 unconscious patronization and, 477
 vivid case remembrances and, 480
 Premature ejaculation, 173
 Prenatal development and newborn, 118–121
 competent newborn, 120–121
 conception and, 118
 fetal alcohol syndrome and, 120
 habituation and, 121
 prenatal development, 119–120
 teratogens and, 120
 Prenatal environment, schizophrenia and, 531–532
 Prenatal influences, sexual orientation and, 181–182
 Prenatal sexual development, 167
 Preoperational stage, cognitive development and, 127–128
 Pretend play, 128
 Primacy effect, 288
 Primary reinforcers, 248
 Primary sex characteristics, 167
 Priming
 memory retrieval and, 286–287
 sensation and perception and, 194
 Proactive interference, 292
 Problem-focused coping, 401
 Problem solving, 307–308
 Process schizophrenia, 530
 Process simulation, 328
 Processing levels, memory and, 278–279
 Productive language, 320
 Projection, 427
 Projective tests, 429
 Prosocial effects, in observational learning, 263–264
 Protective function, sleep and, 88
 Protein molecules, 62
 Prototypes, concept formation and, 306
 Proximity, attraction and, 487–489
 Prozac, 569
 Psychedelic drugs, 107–108
 Psychiatrists, 9, 567
 Psychoactive drugs, 102–109. *See also* Drug use
 alcohol, 103
 barbiturates, 103
 caffeine, 104, 109
 cocaine, 105–106
 depressants, 102–103
 Ecstasy, 107
 guide to, 109
 hallucinogens, 107–108
 LSD, 107
 marijuana, 108
 methamphetamine, 106
 nicotine, 104–105
 opiates, 103
 stimulants, 104–107
 Psychoanalysis, 424, 547–548. *See also* Freud's
 psychoanalytic perspective
 goals of, 547
 techniques of, 547
 Psychodynamic perspective, 7
 Psychodynamic theories, 424–432
 assessing unconscious processes, 429–430
 evaluation of, 430–431
 Freud's psychoanalytic perspective, 424–427
 modern research and, 430–431
 modern unconscious mind, 431–432
 Neo-Freudian and later psychodynamic
 theorists, 428–429
 repression and, 431
 Psychodynamic therapy, 548
 Psychokinesis, 230
 Psychological contract, B-2
 Psychological dependence, drugs, 102
 Psychological disorders
 anxiety disorders, 512–518
 attention-deficit hyperactivity disorder, 507
 biopsychosocial approach and, 508
 characteristics of, 506
 classification of, 509–511
 dissociative disorders, 534–535
 eating disorders, 536–537
 insanity and responsibility, 512
 medical model and, 507
 mood disorders, 519–527
 personality disorders, 537–539
 power of labels and, 511
 rates of, 540–541
 schizophrenia, 528–533
 suicide and self-injury and, 524–525
 understanding, 506–508
 Psychological influences
 drug use and, 110–112
 pain and, 222
 sexual motivation and, 175
 Psychology
 birth of, 2
 contemporary, 5–10
 early developments in, 4–5
 levels of analysis in, 7–8
 modern definition of, 4–5
 roots of, 2–5
 subfields of, 8–9
 women and, 3
 Psychology's subfields, C-1–C-5
 Psychometric and quantitative psychologists, C-5
 Psychoneuroimmunology, 394
 Psychopharmacology, 568. *See also* Drug therapies
 Psychosexual stages, 426
 Psychosurgery, 575
 Psychotherapies
 behavior therapies, 550–554
 clients' perceptions and, 560
 clinicians' perceptions and, 560
 cognitive therapies, 554–557
 consumer's guide to, 567
 culture and values in, 566–567
 effectiveness of, 562–563
 empathic, trusting, caring relationships and,
 565–566
 evaluating, 559–567
 evidence-based practice and, 562–563
 group and family therapies, 557–559
 hope for demoralized people and, 565
 humanistic therapies, 548–550
 new perspectives and, 565
 outcome research and, 560–561
 psychoanalysis and psychodynamic therapy,
 547–548
 training and, 567
 Puberty, 140, 167–168, 171
 Punishment, 251–252
 aggression and, 252
 discrimination among situations and, 251
 fear and, 251–252
 suppression of, 251
 Pupil, 200
- ## Q
- Quantitative psychologists, C-4
- ## R
- Race, intelligence tests and, 343–344
 Race-influence perceptions, 477
 Racial associations, implicit, 477
 Racial attitudes, 461
 Random assignment, experiments and, 22–23
 Random events, perceiving order in, 12–13
 Random sampling, surveys and, 20
 Range of scores, A-3
 Rationalization, 427
 Reaction formation, 427
 Reactive schizophrenia, 530
 Reality principle, in psychoanalysis, 425
 Reasoning power, developing, 141
 Recall, 272
 Recall testing, 153
 Recency effect, 288
 Recency errors, performance appraisals and, B-7
 Receptive language, 320
 Receptor sites, doubled, 284
 Reciprocal determinism, 443–444
 Reciprocal influences, 443–444
 Reciprocity norm, 496
 Recognition, 272
 Recuperative function, sleep and, 88
 Reflexes, central nervous system and, 44
 Reflexive bodily responses, 477
 Refractory period, sexual response cycle and, 173
 Regression, 427
 Regression toward the mean, A-5–A-6
 Rehabilitation psychologists, C-5
 Rehearsal
 memory and, 273
 memory improvement and, 300
 Reinforcement
 aggression and, 483–484
 schedules, 249–250
 Skinner's concept of, 247
 Reinforcer types, operant conditioning and,
 248–249
 Relationship measures, in statistics, A-4–A-6
 Relative deprivation, 417
 Relative height, in depth perception, 211
 Relative luminance, 213
 Relative motion, in depth perception, 211
 Relative size, in depth perception, 211
 Relaxation, stress reduction and, 409–410
 Relaxation response, 410
 Relearning, 272

- Reliability, intelligence tests and, 336
- Religious involvement, health benefits and, 410–412
- REM rebound, 96
- REM (rapid eye movement) sleep, 84–87
- Repetitive transcranial magnetic stimulation (rTMS), 573
- Replication of research study, 16
- Representative samples, 20
- Repression, 294, 427, 431
- Resiliency, emotional, 414–415, 576–577
- Resistance, psychoanalysis and, 547
- Resolution, sexual response cycle and, 173
- Restored vision, 215–216
- Retention, memory, 285–286
- Reticular formation, 49–50
- Retina, 201–202
- Retinal disparity, 210
- Retrieval, memory, 273
- Retrieval cues, memory and, 300
- Retrieval failure, forgetting and, 293–294
- Retrieval practice effect, 29
- Retroactive interference, 293
- Retrograde amnesia, 290
- Reuptake process, 39, 106
- Reward deficiency syndrome, 52
- Reward theory of attraction, 491
- Rewards, intrinsic motivation and, 260
- Right-left differences, brain and, 61–62
- Rods, visual processing and, 202–203
- Rogers' client-centered therapy, 549
- Rogers' person-centered perspective, 433–434
- Role playing, 461–462
- Romantic love, 491–493
- Romantic red, 257
- Rorschach inkblot test, 429–430
- S**
- Sampling bias, 20
- Savant syndrome, 330–331
- Scapigoat theory, 479
- Scatterplots, A-4–A-5
- Schachter-Singer two-factor theory of emotion, 373
- Schemas, 125, 170–171
- Schizophrenia, 528–533
 - abnormal brain activity and anatomy, 530–531
 - antipsychotic drugs and, 570–571
 - brain abnormalities and, 530–531
 - delusions and, 528
 - developmental risks and, 532
 - disorganized thinking and, 528–529
 - disturbed perceptions and, 529
 - dopamine overactivity and, 530
 - genetic influences and, 532–533
 - inappropriate emotions and actions and, 529
 - onset and development of, 529–530
 - prenatal environment and risk and, 531–532
 - subtypes of, 528
- School achievement, predicting, 335
- School psychologists, C-5
- Scientific attitude, 13–14
- Scientific method, 15–17
- Seasonal affective disorder (SAD), 519, 564
- Secondary sex characteristics, 167
- Secure self-esteem, 450
- Selective attention, 80–82, 100, 529
- Selective inattention, 81–82
- Selective serotonin reuptake inhibitors (SSRIs), 569–570
- Self
 - culture and, 450–453
 - exploring of, 446–453
 - self-disparagement, 450
 - self-esteem, 447–448
 - self-serving bias, 448–450
- Self-actualization, 355, 433
- Self-assertion instinct, 352
- Self assessment, 323
- Self-awareness, alcohol use and, 103
- Self-concept, 434
- Self-control
 - aggression and, 483–484
 - alcohol use and, 103
 - depleting and strengthening, 403–404
 - extreme, 404
- Self-defeating beliefs, 526
- Self-disclosure
 - enduring relationships and, 492–493
 - social networking and, 368
- Self-disparagement, 450
- Self-efficacy, 447
- Self-esteem, 164, 447–448
- Self-help groups, 558–559
- Self-injury, non-suicidal, 524–525
- Self-reference effect, 280
- Self-serving bias, 448–450
- Self-testing, memory and, 279
- Self-transcendence, in Maslow's hierarchy of needs, 355, 433
- Selye's general adaptation syndrome, 393
- Semicircular canals, 227
- Sensation and perception
 - absolute thresholds and, 193–194
 - basic principles of, 192–200
 - body position and movement, 227
 - bottom-up processing and, 192
 - context effects and, 198–199
 - difference thresholds, 194–195
 - embodied cognition and, 229
 - extrasensory perception, 230–232
 - hearing, 216–219
 - motivation and emotion and, 199–200
 - pain, 220–223
 - perceptual sets and, 197–198
 - priming and, 194
 - sensory adaptation and, 196
 - sensory interaction and, 227–229
 - smell, 225–226
 - subliminal messages and, 194–195
 - taste, 224–225
 - thresholds and, 193–195
 - top-down processing and, 192
 - touch, 220
 - transduction and, 192
 - vision, 200–215
- Sensorimotor stage in cognitive development, 126–127
- Sensorineural hearing loss, 217
- Sensory adaptation, 196
- Sensory functions, cerebral cortex and, 54–56
- Sensory interaction, 227–229
- Sensory memory, 273, 275–276
- Sensory neurons, 41, 44
- Sensory restriction, 215–216
- Separated twins, 64–65
- Separation anxiety, 135
- September 11 terrorist attacks, 479, 499, 515, 576
- Serial position effect, memory retrieval and, 288
- Serotonin, 40, 518, 524
- Serotonin pathways, 41
- Set point, weight and, 358, 361
- Settling point, weight and, 359
- Severity errors, performance appraisals and, B-7
- Sex-reassignment surgery, 169
- Sex-selective abortions, 476–477
- Sexting, 368
- Sexual abuse, 137, 298–299
- Sexual aggression, 484–485
- Sexual arousal
 - external stimuli and, 175–176
 - imagined stimuli and, 176
- Sexual development
 - adolescent, 167–168
 - prenatal, 167
 - variations in, 168–169
- Sexual orientation, 179–183
 - biological correlates of, 182
 - biology and, 180–183
 - environment and, 179–180
 - gay-straight brain differences, 180–181
 - gay-straight trait differences, 182–183
 - genetic influences and, 181
 - prenatal influences and, 181–182
 - same-sex attraction in other species, 180
- Sexuality, 171–178
 - aging and, 151
 - critiquing evolutionary perspective and, 185–186
 - cultural expectations and, 185–186
 - dysfunctions and, 173–174
 - evolutionary explanation of, 183–186
 - external stimuli and, 175–176
 - gender differences and, 183–184
 - hormones and sexual behavior, 171–172
 - imagined stimuli and, 176
 - natural selection and mating preferences, 184–185
 - physiology of, 171–174
 - psychology of, 175–178
 - restraint and, 177
 - sexual dysfunctions and paraphilias, 173–174
 - sexual response cycle, 173
 - sexualization of girls, 177
 - sexually transmitted infections, 174
 - teen pregnancy and, 176–178
- Shallow processing, memory and, 278
- Shape constancy, 213–214
- Shaping behavior, operant conditioning and, 247
- Short-term memory, 273, 276
- Sign language, 324
- Signal detection theory, 193–194
- Significant differences, in statistics, A-7–A-9
- Significant life changes, stress and, 392
- Silent treatment, 366
- Similarity, attraction and, 491
- Situational influences, eating and, 360
- Situations, assessing behavior in, 445
- Size constancy, 213–214
- Skeletal nervous system, 42
- Skewed distribution, A-3
- Skinner box, 246–247
- Skinner's experiments, 246–252. *See also* Operant conditioning
- Sleep, 83–93. *See also* Dreams
 - age and, 86
 - apnea, 92–93
 - binge sleeping, 95
 - biological rhythms and, 83–88
 - brain waves and, 85
 - circadian rhythm and, 83–84
 - creative thinking and, 88–89
 - deprivation, 89–91
 - erectations during, 86
 - functions of, 88–89
 - growth and, 89
 - insomnia and, 91–92
 - interactions with, 87–88

- loss, obesity and, 362
 major sleep disorders, 91–93
 measuring activity during, 84–85
 memory consolidation and, 88, 282
 memory improvement and, 300
 narcolepsy and, 92
 natural sleep aids, 92
 night terrors and, 93
 paradoxical sleep, 86
 protective function of, 88
 recuperative function of, 88
 REM sleep, 85–87
 sleep apnea, 92–93
 sleep loss effects, 89–91
 sleepwalking and, 93
 sleepwalking and, 93
 spindles, 85
 stages of, 84–85
 stress and, 92
- Smell, 225–226
- Smoking, 104–105
 adolescents and, 111
 brain functions and, 263
- Social bonds. *See* Belonging
- Social clock, 154
- Social-cognitive perspective, mood disorders and, 526–527
- Social-cognitive theories, 443–446
 assessing behavior in situations, 445
 evaluation of, 445–446
 reciprocal influences, 443–444
- Social connectedness, gender and, 165–166
- Social control, 474–475
- Social-cultural influences
 drug use and, 110–112
 pain and, 222
 sexual motivation and, 175
- Social-cultural perspective, 7
- Social development
 adolescence and, 143–148
 adulthood and, 154–158
 adulthood's commitments and, 154–156
 ages and stages and, 154
 attachment deprivation and, 136–137
 attachment differences and, 134–135
 attachment origins and, 132–133
 body contact and, 132–133
 culture and child rearing and, 139–140
 day care and, 136
 familiarity and, 133
 identity formation and, 144–145
 imprinting and, 133
 infancy and childhood and, 132–139
 intimacy capacity and, 145
 parent and peer relationships and, 145–148
 parenting styles and, 138–139
 social clock and, 154
 stranger anxiety and, 132
- Social exchange theory, 496
- Social exclusion, 365–367
- Social facilitation, 360, 471
- Social identity, 144–145
- Social inequalities, 478
- Social influence, 463–475
 conformity and, 465–467
 cultural influences and, 463–464
 group behavior and, 471–475
 obedience and, 467–470
 obesity and, 362
- Social influence theory of hypnosis, 98
- Social isolation, social networking and, 365, 368
- Social leadership, B-11
- Social learning theory, gender identity and, 170–171
- Social loafing, 471–472
- Social media, 367
- Social networking, 367–370
 false personalities and, 368
 group polarization and, 473
 healthy self-disclosure and, 368
 management of, 369
 narcissism and, 369–370
 social isolation and, 368
- Social norms, conformity and, 466–467
- Social phobia, 514
- Social power, gender and, 165
- Social psychologists, 458, C-5
- Social relations, 475–500
 aggression and, 481–486
 altruism and, 493–496
 attraction and, 487–493
 conflict and peacemaking and, 496–500
 prejudice and, 476–481
- Social-responsibility norm, 496
- Social scripts, 176, 484, 485–486
- Social support, stress and, 405–407
- Social thinking, 458–463
 attitudes and actions, 460–463
 cognitive dissonance theory and, 462–463
 foot-in-the-door phenomenon and, 460–461
 fundamental attribution error and, 458–459
 role playing and, 461–462
- Social traps, conflict and, 497–498
- Social workers, 567
- Somatic nervous system, 42
- Sound location, 219
- Source amnesia, 296–297
- Spaced practice in memory, 30, 278
- Spearman's general intelligence factor, 330
- Speed dating, 468
- Spillover effect, 373
- Spinal cord, 44
- Split brains, 59–61
- Spontaneous recovery, in learning, 242
- Sports, operant conditioning and, 253–254
- Sports injuries, 222
- Sport psychologists, C-5
- Spotlight effect, 447
- SQ3R study method, 29–30
- Standard deviation, A-3
- Standardization, intelligence tests and, 336
- Stanford-Binet intelligence test, 335
- State-dependent memory, 288
- Statistical reasoning, A-1–A-9
 correlation measure of relationships, A-4–A-6
 describing data and, A-1–A-6
 measures of central tendency, A-2
 measures of variation, A-3–A-4
 significant differences, A-7–A-9
- Statistical significance, A-8
- Stereotype threat, intelligence tests and, 345–346
- Stereotypes, 476
- Sternberg's three intelligences, 331–332
- Stimulants, 104–107
- Stimulus, 238
- Stimulus generalization, 517
- Stimulus input, vision and, 200
- Storage, memory, 273
- Storage decay, forgetting and, 291–292
- Stranger anxiety, 132
- Strengths, harnessing, B-3–B-6
- Stress
 age and, 392
 AIDS and, 396
 basic concepts and, 390–393
 cancer and, 397
 catastrophes and, 391
 colds and, 395
 coping with, 401–407
 daily hassles and, 392
 extreme or prolonged, 391
 general adaptation syndrome and, 393
 heart disease and, 397–400
 illness and, 394–400
 internal *vs.* external locus of control and, 403
 learned helplessness and, 402
 optimism *vs.* pessimism and, 404–405
 personal control and, 401–404
 self-control and, 403–404
 significant life changes and, 392
 sleep deprivation and, 92
 social support and, 405–407
 stress appraisal, 390
 stress reduction, 407–412
 stress response system, 393–394
 stressors, 391–392
 tend-and-befriend stress response, 393
- Stress reduction, 407–412
 aerobic exercise and, 407–409
 faith communities and, 410–412
 relaxation and meditation and, 409–410
- Stressors, 391–392
- Structuralism, 3
- Structured interviews, B-5–B-6
- Study time distribution, 30
- Study tips, 29–31
- Subfields of psychology, 8–9, C-1–C-5
- Subjective well-being, 413
- Subliminal messages, 194–195
- Subtle prejudice, 476
- Successive approximations, 247
- Suicide, 524–525
- Suicide terrorism, 473
- Supercell clusters, 204–205
- Superego, in psychoanalysis, 425–426
- Superordinate goals, 499
- Suprachiasmatic nucleus, 87
- Surveys, 19–20
 random sampling and, 20
 wording effects and, 19
- Survivor resiliency, 516
- Sympathetic nervous system, 42–43, 377
- Synaptic changes, memory storage and, 283–284
- Synaptic gap, 39
- Synaesthesia, 229
- Systematic desensitization, 551
- T**
- T lymphocytes, 394
- Tardive dyskinesia, 568
- Task leadership, B-11
- Taste, 224–225
 aversion, 257
 embodied cognition and, 229
 preferences, 359–360
- Teen pregnancy, 176–178
- Telegraphic speech stage, language development and, 320–321
- Telepathy, 230
- Television, observational learning and, 264
- Temperament, 134–135
- Temporal lobes, 53
- Tend-and-befriend stress response, 393
- Teratogens, 120
- Terminal decline, 153
- Testing effect, 29, 279
- Testosterone, 167, 172, 482

- Testosterone-replacement therapy, 172
 Texting, 367
 Thalamus, 48
 THC (delta-9-tetrahydrocannabinol), 108
 Theory, 15–16
 Theory of mind, 128
 Therapeutic lifestyle change, 574–575
 Therapy. *See also* Alternative therapies; Behavior therapies; Biomedical therapies; Cognitive therapies; Psychotherapies
 alternative therapies, 563–564
 biomedical therapies, 568–575
 history of treatment, 546
 preventing psychological disorders, 576–578
 psychotherapies, 546–559
 treating psychological disorders, 546
 Thinking, 306–317
 availability heuristic and, 308–311
 belief perseverance and, 312
 concepts and, 306
 convergent thinking, 314
 creative thinking and, 314–315
 divergent thinking, 314
 fear and, 310–311
 forming good and bad decisions and judgments, 308–314
 framing and, 312–313
 in images, 328
 intuition and, 313–314
 language and, 326–328
 other species and, 316–317
 overconfidence and, 311–312
 problem solving and, 307–308
 360-degree feedback, B-6–B-7
 Threshold, neural impulse and, 37
 Thresholds, 193–195
 Tinnitus, 222
 Token economy, 553–554
 Tolerance, drug, 100–101
 Tool use, other species and, 317–318
 Top-down emotions, 374
 Top-down processing, 192
 Touch, 220
 Traffic accidents, sleep and, 91
 Trait theories, 435–443
 assessing traits, 437–439
 Big Five factors and, 439–440
 biology and personality, 437
 evaluation of, 441–443
 exploring traits, 436
 factor analysis and, 437
 person-situation controversy and, 441–443
 Tranquilizers, 103
 Transduction, 192
 Transference, psychoanalysis and, 547
 Transformational leadership, B-12
 Transgender people, 170–171
 Transsexual people, 171
 Trauma. *See* Post-traumatic stress disorder
 Trust, attachment styles and, 135
 Twin studies, 63–66. *See also* Genetics
 intelligence and, 339–341
 sexual orientation and, 181
 Two-factor theory of emotion, 373
 Two-track mind, forgetting and, 290
 Two-word stage, language development and, 320
 Type A personality, 398–399
 Type B personality, 398
U
 Unconditional positive regard, in Rogers' therapy, 433, 550
 Unconditioned response (UR), 240
 Unconditioned stimulus (US), 240
 Unconscious mind, 424
 Unconscious patronization, 477
 Unconscious processes
 assessment of, 429–430
 modern unconscious mind, 431–432
 projective tests and, 429
 Rorschach inkblot test and, 429–430
 Unemployment, 459
 Unit bias, 360
 Unstructured interviews, B-4–B-5
V
 Vagus nerve stimulation, 572
 Validity, intelligence tests and, 337
 Variable-interval reinforcement schedules, 250
 Variable-ratio reinforcement schedules, 249–250
 Variation measures, A-3–A-4
 Venturesome personality, creativity and, 315
 Vestibular sacs, 227
 Vestibular sense, 227
 Vicarious punishment, 261
 Vicarious reinforcement, 261
 Video games, violence and, 485–486
 Violence
 media models for, 484–485
 video games and, 485–486
 Violence-viewing effect, 264–265
 Viral infections, schizophrenia and, 531–532
 Virtual groups, 473
 Virtual reality exposure therapy, 552
 Virtual reality pain control, 224
 Vision, 200–215
 color vision, 206–208
 the eye and, 200–201
 feature detection and, 205
 light energy and, 200
 parallel processing and, 205–206
 stimulus input and, 200
 visual information processing and, 202–206
 visual interpretation, 214–215
 visual organization and, 208–214
 Visual cliff, 210
 Visual cortex, 55
 Visual information processing, 202–206
 Visual interpretation, 214–215
 perceptual adaptation, 215
 restored vision and sensory restriction, 214–215
 Visual organization, 208–214
 depth perception, 210–211
 form perception, 208–209
 perceptual constancy and, 212–214
 Vivid case remembrance, prejudice and, 480
 Vocations, gender and, 166
 Voice effect, leadership and, B-12
 Voice tones, emotional cues and, 381
 Volley principle, pitch perception and, 219
 Vygotsky's theory, 129
W
 Warrior gene, 482
 Wavelength, 200–201
 Wealth and well-being, 415
 Weber's law, 195
 Websites, detecting personality from, 442
 Wechsler Adult Intelligence Scale (WAIS), 335–336
 Weight. *See also* Obesity
 gain, sleep loss and, 90
 management, 363
 weight-obsessed culture, 537
 Wernicke's area, 323
 Williams syndrome, 479
 Wish-fulfillment theory of dreams, 96
 Withdrawal, drug, 102
 Wording effects, surveys and, 19
 Work, operant conditioning and, 254
 Work, B-1–B-15
 human factors psychology, B-13–B-15
 organizational psychology, B-7–B-13
 personnel psychology, B-3–B-7
 Working memory, 273–274, 276
X
 X chromosomes, 167
 X-rated films, 176, 484–485
Y
 Y chromosomes, 167
 Yerkes-Dodson law, 354
 Young-Helmholtz trichromatic (three-color) theory, 207
Z
 Zimbardo Stanford Prison simulation, 461–462
 Zolof, 569
 Zygotes, 119

Timeline

The Story of Psychology: A Timeline

by Charles L. Brewer, Furman University

B.C.E.

387 — Plato, who believed in innate ideas, suggests that the brain is the seat of mental processes.

335 — Aristotle, who denied the existence of innate ideas, suggests that the heart is the seat of mental processes.

C.E.

1604 — Johannes Kepler describes inverted image on the retina.

1605 — Francis Bacon publishes *The Proficiency and Advancement of Learning*.

1636 —



Harvard College is founded.

1637 — René Descartes, the French philosopher and mathematician who proposed mind-body interaction and the doctrine of innate ideas, publishes *A Discourse on Method*.

1690 —

John Locke, the British philosopher who rejected Descartes' notion of innate ideas and insisted that the mind at birth is a "blank slate" (*tabula rasa*), publishes *An Essay Concerning Human Understanding*, which stresses empiricism over speculation.

1774 —

Franz Mesmer, an Austrian physician, performs his first supposed cure using "animal magnetism" (later called Mesmerism and hypnosis). In **1777** he was expelled from the practice of medicine in Vienna.

1793 —

Philippe Pinel releases the first mental patients from their chains at the Bicêtre Asylum in France and advocates more humane treatment of mental patients.

1802 —

Thomas Young publishes *A Theory of Color Vision* in England. (His theory was later called the trichromatic theory.)

1808 —

Franz Joseph Gall, a German physician, describes phrenology, the belief that the shape of a person's skull reveals mental faculties and character traits.



1834 —

Ernst Heinrich Weber publishes *The Sense of Touch*, in which he discusses the just noticeable difference (*ind*) and what we now call Weber's Law.

1848 —

Phineas Gage suffers massive brain damage when a large iron rod accidentally pierces his brain, leaving his intellect and memory intact but altering his personality.

1859 —

Charles Darwin publishes *On the Origin of Species by Means of Natural Selection*, synthesizing much previous work on the theory of evolution, including that of Herbert Spencer, who coined the phrase "survival of the fittest."



1861 —

Paul Broca, a French physician, discovers an area in the left frontal lobe of the brain (now called Broca's area) that is critical for the production of spoken language.

1901 —

Ten founders establish the British Psychological Society.

1905 —

Mary Whiton Calkins becomes the first woman president of the APA.



Ivan Petrovich Pavlov begins publishing studies of conditioning in animals.

Alfred Binet and Théodore Simon produce the first intelligence test for assessing the abilities and academic progress of Parisian schoolchildren.

1913 —



John B. Watson outlines the tenets of behaviorism in a *Psychological Review* article, "Psychology as the Behaviorist Views It."

1914 —

During World War I, Robert Yerkes and his staff develop a group intelligence test for evaluating U.S. military personnel, which increases the U.S. public's acceptance of psychological testing.

1920 —



Leta Stetter Hollingworth publishes *The Psychology of Subnormal Children*, an early classic. In **1921** she is cited in *American Men of Science* for her research on the psychology of women.

1921 —

Francis Cecil Sumner receives a Ph.D. degree in psychology from Clark University, becoming the first African-American to earn a psychology doctorate.



John B. Watson and Rosalie Rayner report conditioning a fear reaction in a child called "Little Albert."

Hermann Rorschach, a Swiss psychiatrist, introduces the Rorschach inkblot test.

1923 —

Developmental psychologist Jean Piaget publishes *The Language and Thought of the Child*.

1924 —

Mary Cover Jones reports reconditioning a fear reaction in a child (Peter), a forerunner of systematic desensitization developed by Joseph Wolpe.

1927 —

In *Introduction to the Technique of Child Analysis*, Anna Freud discusses psychoanalysis in the treatment of children.

1929 —

Wolfgang Köhler publishes *Gestalt Psychology*, which criticizes behaviorism and outlines essential elements of the Gestalt position and approach.

1931 —

Margaret Floy Washburn becomes the first female psychologist (and the second female scientist in any discipline) elected to the U.S. National Academy of Sciences.

1932 —

In *The Wisdom of the Body*, Walter B. Cannon coins the term *homeostasis*, discusses the fight-or-flight response, and identifies hormonal changes associated with stress.

1869

Francis Galton, Charles Darwin's cousin, publishes *Hereditary Genius*, in which he claims that intelligence is inherited. In 1876 he coins the expression "nature and nurture" to correspond with "heredity and environment."

1874

Carl Wernicke, a German neurologist and psychiatrist, shows that damage to a specific area in the left temporal lobe (now called Wernicke's area) disrupts ability to comprehend or produce spoken or written language.

1878

G. Stanley Hall receives from Harvard University's Department of Philosophy the first U.S. Ph.D. degree based on psychological research.

1879

Wilhelm Wundt establishes at the University of Leipzig, Germany, the first psychology laboratory, which becomes a Mecca for psychology students from all over the world.

1883

G. Stanley Hall, student of Wilhelm Wundt, establishes the first formal U.S. psychology laboratory at Johns Hopkins University.

1885

Hermann Ebbinghaus publishes *On Memory*, summarizing his extensive research on learning and memory, including the "forgetting curve."

1886

Joseph Jastrow receives from Johns Hopkins University the first Ph.D. degree in psychology awarded by a Department of Psychology in the United States.

1889

Alfred Binet and Henri Beaunis establish the first psychology laboratory in France at the Sorbonne, and the first International Congress of Psychology meets in Paris.

1890

William James, Harvard University philosopher and psychologist, publishes *The Principles of Psychology*, describing psychology as "the science of mental life."

1891

James Mark Baldwin establishes the first psychology laboratory in the British Commonwealth at the University of Toronto.

1892

G. Stanley Hall spearheads the founding of the American Psychological Association (APA) and becomes its first president.

1893

Mary Whiton Calkins (pictured) and Christine Ladd-Franklin are the first women elected to membership in the APA.

1894

Margaret Floy Washburn is the first woman to receive a Ph.D. degree in psychology (Cornell University).

1896

Harvard University denies Mary Whiton Calkins admission to doctoral candidacy because of her gender, despite Hugo Münsterberg's claim that she was the best student he had ever had there.

1898

John Dewey publishes "The Reflex Arc Concept in Psychology," helping to formalize the school of psychology called functionalism.

1900

In "Animal Intelligence," Edward L. Thorndike, Columbia University, describes his learning experiments with cats in "puzzle boxes." In 1905, he proposes the "law of effect." Sigmund Freud publishes *The Interpretation of Dreams*, his major theoretical work on psychoanalysis.



1933

Inez Beverly Prosser becomes the first African-American woman to receive a doctoral degree in psychology from a U.S. institution (Ph.D., University of Cincinnati).



1935

Christiana Morgan and Henry Murray introduce the Thematic Apperception Test to elicit fantasies from people undergoing psychoanalysis.



1936

Egas Moniz, Portuguese physician, publishes work on the first frontal lobotomies performed on humans.

1938

B. F. Skinner publishes *The Behavior of Organisms*, which describes operant conditioning of animals.

1939

In *Primary Mental Abilities*, Louis L. Thurstone proposes seven such abilities.



1943

Ugo Cerletti and Lucino Bini use electroshock treatment with a human patient.

1945

David Wechsler publishes the Wechsler-Bellevue intelligence test, forerunner of the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Adult Intelligence Scale (WAIS).

1946

Mamie Phipps Clark (pictured) receives a master's degree from Howard University. In collaboration with Kenneth B. Clark, she later extends her thesis, "The Development of Consciousness of Self in Negro Preschool Children," providing joint research cited in the U.S. Supreme Court's 1954 decision to end racial segregation in public schools.

1948

Edward Alexander Bott helps found the Canadian Psychological Association. He becomes its first president in 1940.

1949

World War II provides many opportunities for psychologists to enhance the popularity and influence of psychology, especially in applied areas.

Psychologist Starke Hathaway and physician J. Charnley McKinley publish the Minnesota Multiphasic Personality Inventory (MMPI).
Karen Horney, who criticized Freud's theory of female sexual development, publishes *Our Inner Conflicts*.
Benjamin Spock's first edition of *The Commonsense Book of Baby and Child Care* appears; the book will influence child rearing in North America for several decades.
Alfred Kinsey and his colleagues publish *Sexual Behavior in the Human Male*, and they publish *Sexual Behavior in the Human Female* in 1953.
B. F. Skinner's novel, *Walden Two*, describes a Utopian community based on positive reinforcement, which becomes a clarion call for applying psychological principles in everyday living, especially communal living.
Ernest R. Hilgard publishes *Theories of Learning*, which was required reading for several generations of psychology students in North America.
Raymond B. Cattell publishes the Sixteen Personality Factor Questionnaire (16PF).

The Story of Psychology: A Timeline (continued from inside front cover)

1949

In *The Organization of Behavior: A Neuropsychological Theory*, Canadian psychologist Donald O. Hebb outlines a new and influential conceptualization of how the nervous system functions.

1950

Solomon Asch publishes studies of effects of conformity on judgments of line length.



1951

In *Childhood and Society*, Erik Erikson outlines his stages of psychosocial development.

Carl Rogers publishes *Client-Centered Therapy*.

1952

The American Psychiatric Association publishes the *Diagnostic and Statistical Manual of Mental Disorders*, an influential book that will be updated periodically.

1953

Eugene Aserinski and Nathaniel Kleitman describe rapid eye movements (REM) that occur during sleep.



1954

Janet Taylor's Manifest Anxiety Scale appears in the *Journal of Abnormal Psychology*.

In *Motivation and Personality*, Abraham Maslow proposes a hierarchy of motives ranging from physiological needs to self-actualization. (Maslow later updates the hierarchy to include self-transcendence needs.)

1956

James Olds and Peter Milner, McGill University neuropsychologists, describe rewarding effects of electrical stimulation of the hypothalamus in rats.

1957

Gordon Allport publishes *The Nature of Prejudice*.

1959

In his *Psychological Review* article titled "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," George Miller coins the term *chunk* for memory researchers.

1969

Robert Sears, Eleanor Maccoby, and Harry Levin publish *Patterns of Child Rearing*.



1971

Charles Ferster and B. F. Skinner publish *Schedules of Reinforcement*.

Noam Chomsky's critical review of B. F. Skinner's *Verbal Behavior* appears in the journal *Language*.

1972

Eleanor Gibson and Richard Walk report their research on infants' depth perception in "The Visual Cliff."

1973

Harry Harlow outlines "The Nature of Love," his work on attachment in monkeys.

1974

Lloyd Peterson and Margaret Peterson in the *Journal of Experimental Psychology* article, "Short-Term Retention of Individual Verbal Items," highlight the importance of rehearsal in memory.

1975

John Thibaut and Harold Kelley publish *The Social Psychology of Groups*.

1969

In his APA presidential address, "Psychology as a Means of Promoting Human Welfare," George Miller emphasizes the importance of "giving psychology away."

1971

Kenneth B. Clark becomes the first African-American president of the American Psychological Association.

1972

Albert Bandura publishes *Social Learning Theory*.

1973

Allan Paivio publishes *Imagery and Verbal Processes*.

1974

B. F. Skinner publishes *Beyond Freedom and Dignity*.

1975

Elliot Aronson publishes *The Social Animal*.

1976

Fergus Craik and Robert Lockhart's "Levels of Processing: A Framework for Memory Research" appears in the *Journal of Verbal Learning and Verbal Behavior*.

1977

Robert Rescorla and Allan Wagner publish their associative model of Pavlovian conditioning.

1978

Under the leadership of Derald Sue and Stanley Sue, the Asian-American Psychological Association is founded.

1979

Ethologists Karl von Frisch, Konrad Lorenz, and Nikolaas Tinbergen receive the Nobel Prize for their research on animal behavior.

1980

APA's Division 2 first publishes its journal, *Teaching of Psychology*, with Robert S. Daniel as editor.



Eleanor Maccoby (pictured) and Carol Jacklin publish *The Psychology of Sex Differences*.

1981

Biologist Edward O. Wilson's *Sociobiology* appears; it will be a controversial precursor to evolutionary psychology.

1982

Sandra Wood Scarr and Richard A. Weinberg publish "IQ Test Performance of Black Children Adopted by White Families" in *American Psychologist*.

1983

Psychologist Herbert A. Simon, Carnegie-Mellon University, wins a Nobel Prize for pioneering research on computer simulations of human thinking and problem solving.

1984

James J. Gibson publishes *The Ecological Approach to Visual Perception*.

1985

Elizabeth Loftus publishes *Eyewitness Testimony*.

1986

Ellen Langer is the first woman to be granted tenure in Harvard University's Department of Psychology.

1987

David Hubel and Torsten Wiesel receive a Nobel Prize for research on single-cell recordings that identified feature detector cells in the visual cortex.

1988

Roger Sperry receives a Nobel Prize for research on split-brain patients.



1960

George Sperling publishes "The Information Available in Brief Visual Presentations."

1961

Georg von Békésy receives a Nobel Prize for research on the physiology of hearing.

1962

David McClelland publishes *The Achieving Society*.

Jerome Kagan and Howard Moss publish *Birth to Maturity*.

Stanley Schachter and Jerome Singer publish findings that support the two-factor theory of emotion.

Albert Ellis' *Reason and Emotion in Psychotherapy* appears; it is a milestone in the development of rational-emotive therapy (RET).

1963



Raymond B. Cattell distinguishes between *fluid* and *crystallized* intelligence.

Stanley Milgram's "Behavioral Study of Obedience" appears in the *Journal of Abnormal and Social Psychology*.

1965

Canadian researcher Ronald Melzack and British researcher Patrick Wall propose the gate control theory of pain.

1966

Robert Zajonc's "Social Facilitation" is published in *Science*. Nancy Bayley becomes the first woman to receive the APA's Distinguished Scientific Contribution Award.

1967



Jerome Bruner and colleagues at Harvard University's Center for Cognitive Studies publish *Studies in Cognitive Growth*.

William Masters and Virginia Johnson (pictured) publish results of their research in *Human Sexual Responses*.

Allen Gardner and Beatrix Gardner begin training a chimpanzee (Washoe) in American Sign Language at the University of Nevada, Reno. Washoe dies in 2007.

1968



John Garcia (pictured) and Robert Koelling publish a study on taste aversion in rats.

David M. Green and John A. Swets publish *Signal Detection Theory and Psychophysics*.

Julian Rotter publishes research on locus of control.

1969

Ulric Neisser's *Cognitive Psychology* helps to steer psychology away from behaviorism and toward cognitive processes.

Martin Seligman and Steven Maier publish the results of their research with "learned helplessness" in dogs.

1968

Richard Atkinson and Richard Shiffrin's influential three-stage memory model appears in *The Psychology of Learning and Motivation*.

Neal E. Miller's article in *Science*, describing instrumental conditioning of autonomic responses, stimulates research on biofeedback.

1969



Albert Bandura publishes *Principles of Behavior Modification*.

1981

Paleontologist Stephen Jay Gould publishes *The Mismeasure of Man*, highlighting the debate concerning biological determination of intelligence.

1983

In his *Frames of Mind*, Howard Gardner outlines his theory of multiple intelligences.

1984

The American Psychological Association creates Division 44 (Society for the Psychological Study of Lesbian and Gay Issues).

1984

Robert Sternberg proposes the triarchic theory of human intelligence in *Behavioral and Brain Sciences*.

1987



Elizabeth Scarborough and Laurel Furumoto (pictured) publish *Untold Lives: The First Generation of American Women Psychologists*.

Fluoxetine (Prozac) is introduced as a treatment for depression.

Wilbert J. McKeachie, University of Michigan, receives the first APA Award for Distinguished Career Contributions to Education and Training in Psychology.

1988

The American Psychological Society is founded. It changes its name to Association for Psychological Science in 2006.

1990

Psychiatrist Aaron Beck receives the Distinguished Scientific Award for the Applications of Psychology for advancing understanding and treatment of psychopathology, including pivotal contributions to the development of cognitive therapy.

1990

B. F. Skinner receives APA's first Citation for Outstanding Lifetime Contributions to Psychology and presents his last public address, "Can Psychology Be a Science of Mind?" (He died a few days later at age 86.)

1991

Martin Seligman publishes *Learned Optimism*, which foreshadows the "positive psychology" movement.

1992

Teachers of Psychology in Secondary Schools (TOPSS) is established as part of the APA.

About 3,000 U.S. secondary school students take the first

Advanced Placement (AP) Examination in Psychology, hoping to earn exemption from an introductory psychology course at the post-secondary level.

1993



Psychologist Judith Rodin is elected president of the University of Pennsylvania, becoming the first female president of an Ivy League school.

1996

Dorothy Cantor becomes the first president of the APA with a Psy.D. degree.

2002

New Mexico becomes the first U.S. state to allow qualified clinical psychologists to prescribe certain drugs.

Psychologist Daniel Kahneman, Princeton University, receives a Nobel Prize for research on decision making.

2011

Proposed by participants at the 2008 national conference at the University of Puget Sound, the document, "Principles for Quality Undergraduate Education in Psychology," is approved as official APA policy.