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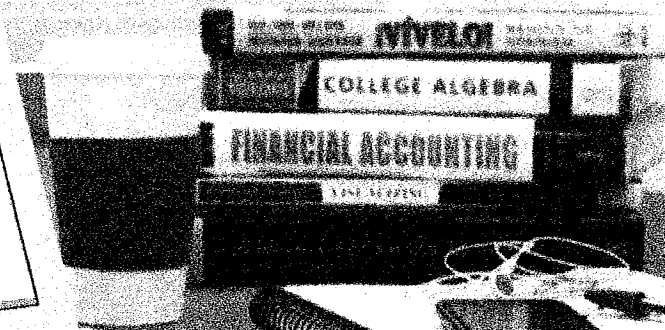
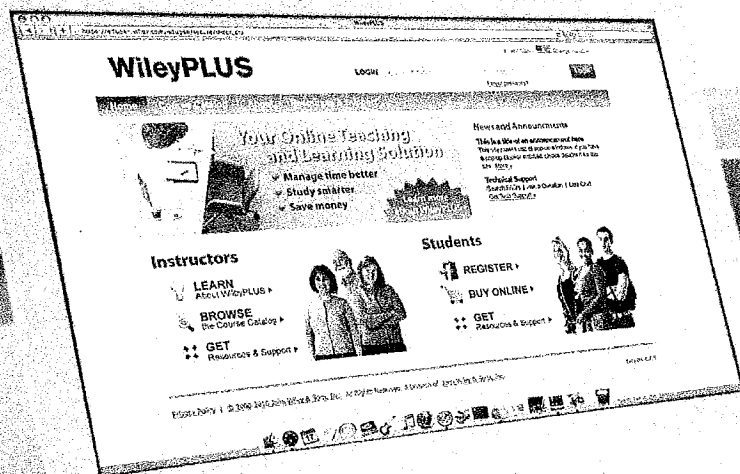


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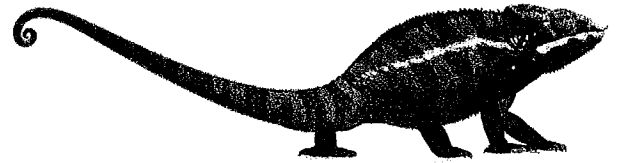


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REAL WORLD PSYCHOLOGY



Karen Huffman
Palomar College

Catherine A. Sanderson
Amherst College

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brief contents



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preface



“I have made this letter longer than usual, only because I have not had the time to make it shorter.”

This quote, attributed to philosopher Blaise Pascal (among others), provides one key rationale for this new text, ***Real World Psychology (RWP)***. After a combined total of 49 years of teaching introductory psychology, and reading thousands of essay exams, we firmly believe that *brevity matters*! Given the time constraints for today's instructors and students, we need a brief book now more than ever.

In addition to being brief, this text will provide the latest up-to-date coverage and real world applications of the core concepts in psychology. Designed for introductory psychology teachers and their students, this text is:

- **CONCISE** When textbook chapters (or classroom lectures) are too long, attention strays and educational goals are lost. But brevity is more than just fewer words. The true goal of concise writing is clarity. Textbooks and teachers must be as brief and clear as possible because *brevity with clarity matters*!
- **COMPREHENSIVE** Knowing that the overarching goal of all instructors is to present the essentials of our field, this text is dedicated to comprehensive coverage of all the core concepts because *content matters*! For example, given that the scientific method and its various components is one of the most common learning objectives in psychology, we believe students need more practice and exposure than just the basic introductory material most texts traditionally provide. Therefore, we include a special **Psych Science** feature that offers an expanded discussion of the latest research on various “Hot Topics,” such as the influence of media images of women on preschool girls’ body-shape preferences, the impact of cell phone use on driving errors, and whether animals have distinct personalities. The detailed example is then followed by a special, interactive **Research Challenge**, which asks the reader to identify the research method, independent variable (IV), dependent variable (DV), and so on. This exercise helps reinforce the core learning objective on research methods, while also building student appreciation and engagement with the latest research. Answers are provided in Appendix B. (See sample **Psych Science** to the right.)
- **COMPREHENSIBLE** A good textbook must be more than concise and comprehensive. It must organize and present complex topics in a manner that is easily read and understood by the reader. However, comprehension without real world application is fairly useless. Therefore, **RWP** will use real world examples and real world applications to scaffold the content of psychology onto the reader’s existing schemas, thus increasing comprehension, while at the same time showing students why *studying psychology matters*!



PSYCHSCIENCE

CAN WRITING IMPROVE YOUR MARRIAGE?



Self-reflection and journaling are proven successful therapy techniques, so researchers in one study asked 120 volunteer married couples to describe the most significant disagreement they had experienced with their spouse during the past four months (Finkel et al., 2013). Half of the couples were then asked to complete a series of three seven-minute writing exercises. These writing exercises asked both spouses to reflect on the disagreement while taking the perspective of a neutral third party who wants the best for all involved. The researchers then contacted the couples every four months for the next two years to assess their levels of relationship satisfaction, love, intimacy, trust, passion, and commitment. During these follow-up contacts, couples also were asked to provide a similar neutral summary of their most significant marital disagreement in the past four months.

Couples in both groups showed decreased marital satisfaction over the first year (a typical finding in married couples), but those that completed the writing exercises by taking the

perspective of a neutral third party showed no additional decline in marital satisfaction in the second year. In contrast, couples that did not take this neutral perspective continued to show even greater declines in satisfaction.

Can you see how taking the perspective of a neutral third party might have indirectly trained the couples to use more *empathy* and *unconditional positive regard* with one another—two terms we discussed earlier in this chapter? Similarly, can you understand how this writing exercise might have helped these couples avoid Beck’s negative thinking patterns of *selective perception*, *overgeneralization*, *magnification*, and *all-or-nothing thinking*? Most importantly, can you apply the results of this research, and the terms we’ve just identified, to improving your own relationships with love partners, family members, and friends?

RESEARCH CHALLENGE

☒ Based on the information provided, did this study (Finkel et al., 2013) use descriptive, correlational, and/or experimental research?

☒ If you chose:

- descriptive research, is this a naturalistic observation, survey/interview, case study, or archival research?
- correlational research, is this a positive, negative, or zero correlation?
- experimental research, label the IV, DV, experimental group(s), and control group.

>>>CHECK YOUR ANSWERS IN APPENDIX B.

Finally, we've added a new feature, **Voices from the Classroom**, which provides real life examples from professors across the nation, which illustrate how psychology can help us *describe*, *explain*, *predict*, and *change* our personal worlds--and maybe even the world around us:



Voices from the Classroom

Operant Conditioning and Driving with Kids I have two children, who used to fight like cats and dogs, especially in the confined area of the car. Rather than punish them, I decided to ignore their bickering (as long as no arms or legs flew out the window). If we made it all the way to the shopping mall without an argument, I immediately praised them highly, showed excitement, and told them how great I felt. Another time when they made it to the mall without bickering, I stopped and we had ice cream on the way home. (Trips with bickering were ignored; no reinforcement.) Happily, within about five or six trips to the mall, there was virtually no bickering. It was awesome!

Professor Barbara Kennedy
Brevard Community College
Palm Bay, Florida

- **CONVENIENT** Today's instructors and students are busier than ever, so **RWP** will provide them with the most essential, educationally sound assets in the most easily accessible and user-friendly manner because *convenience matters!*

As you can see, we feel passionate about our new text and believe that our B (Brevity) and four C's (Concise, Comprehensive, Comprehensible, and Convenient) can turn "B" and "C" students into "A"s! Even more important than high grades, the study of psychology offers an incomparable window into not only ourselves, but also to the world around us. We're eager to share our passion for psychology with all instructors and their students. If you have suggestions or comments, please feel free to contact us directly: Karen Huffman (khuffman@palomar.edu) and Catherine Sanderson (casanderson@amherst.edu).

SUPPLEMENTS TEACHING AND LEARNING PROGRAM

Real World Psychology is accompanied by a full menu of ancillary materials designed to facilitate the mastery of psychology.

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- **Instructor's Test Bank**, prepared by Mike Majors, Delgado Community College, is available in Word document format or through Respondus. Instructors can easily alter or add new questions or answer options. They also can create multiple versions of the same test by quickly scrambling the order of all questions found in the Word version of the test bank. The test bank has over 2000 multiple choice questions, including approximately 10 essay questions for each chapter (with suggested answers). Each multiple-choice question has been linked to a specific, student learning outcome, coded as "Factual" or "Applied," and the correct answer is provided with section references to its source in the text.
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- **Digital Version of the Complete Textbook** with integrated videos, animations, and quizzes.
- **Chapter Exams**, prepared by Paulina Mulhaupt, Macomb Community College, give students a way to easily test themselves on course material before exams. Each chapter exam contains page referenced fill-in-the-blank, application, and multiple-choice questions. The correct answer for each question is provided, which allows immediate feedback and increased understanding. All questions and answers are linked to a specific learning objective within the book to further aid a student's concept mastery.
- **Interactive Flashcards** allow students to easily test their knowledge of key vocabulary terms.
- **Handbook for Non-Native Speakers** clarifies idioms, special phrases, and difficult vocabulary, which has a documented history of significantly improving student performance—particularly for those who do not use English as their first language.

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Real World Psychology is ready for immediate customization with two supplementary chapters not part of the standard text: "Gender and Human Sexuality" and "Industrial/Organizational Psychology." Visit wiley.com/college/custom to review these chapters today.

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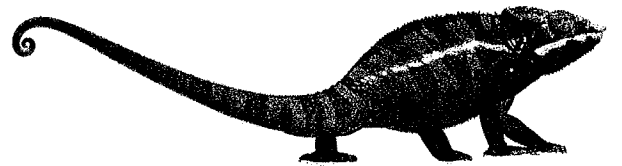
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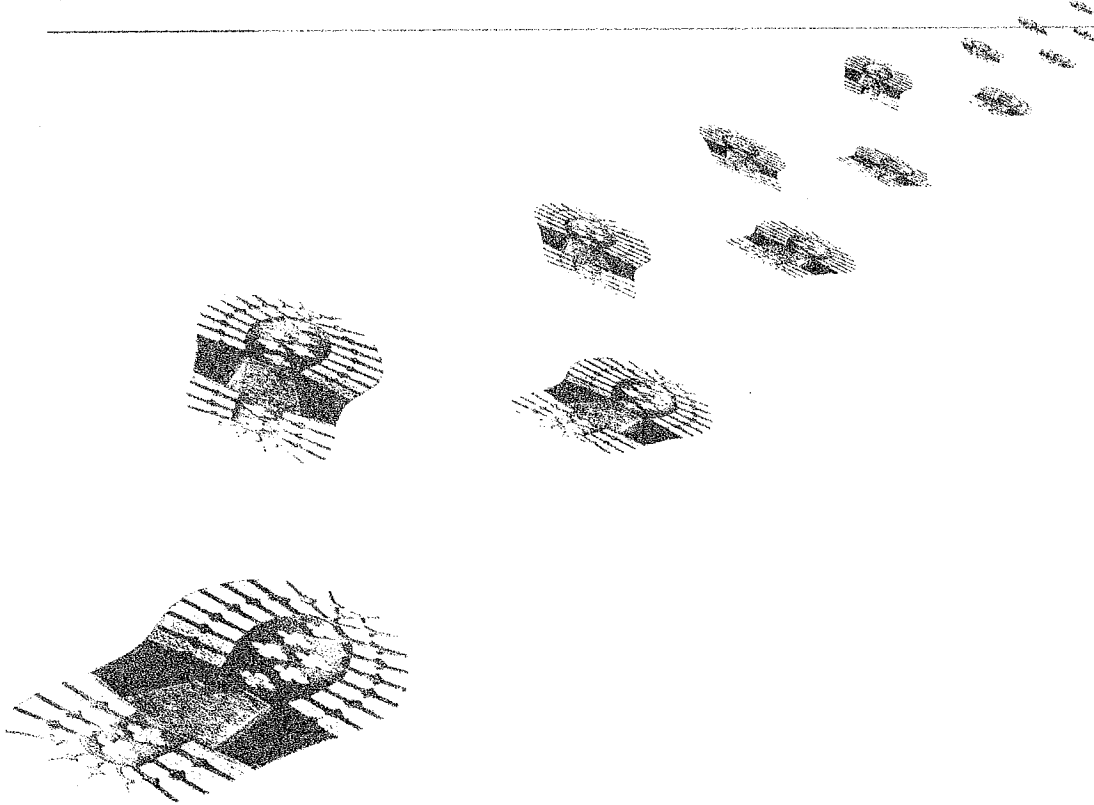
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- This first edition text particularly benefited from the incredible patience, wisdom, and insight of Elisa Adams and Helen McInnis who carefully guided us through the text's development and the tricky world of permissions. They made sure that every page was perfect and ready for print.



REAL WORLD PSYCHOLOGY





realworldpsychology

THINGS YOU'LL LEARN IN CHAPTER 1

- ① How does your culture influence what you look for in a romantic partner?
- ② Can diet, preschool education, and parental behavior increase a child's intelligence?
- ③ Are older people happier than younger people?
- ④ Why do heavy drinkers misreport their alcohol use?
- ⑤ How do spreading your study sessions and practice testing improve test scores?

THROUGHOUT THE CHAPTER, MARGIN ICONS FOR Q1–Q5 INDICATE WHERE THE TEXT ADDRESSES THESE QUESTIONS.

A+ great work photo: © Olga Danylenko / iStockphoto; elderly man smiling happy: Kurhan / Shutterstock; schoolgirl with apple: © Ljupco / iStockphoto; empty beer bottles: © TokenPhoto / iStockphoto; indian couple in traditional clothing: Uniquely India / Getty Images



TEST YOURSELF: PSYCHOLOGY VERSUS PSEUDOPSYCHOLOGY

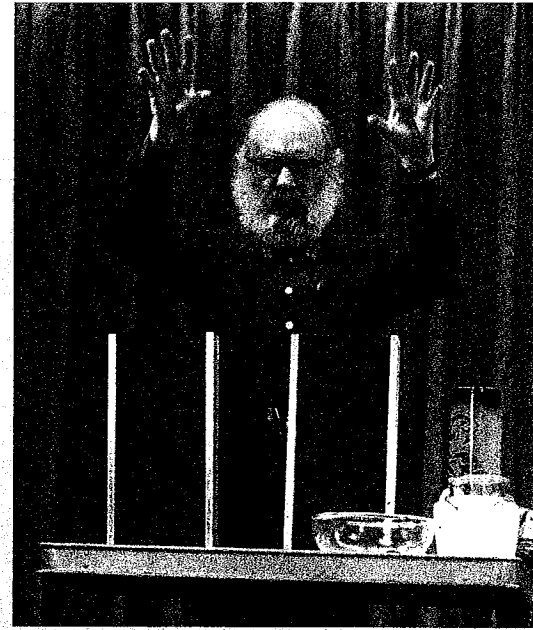
psychology and you

TRUE OR FALSE?

- ____ 1. The best way to learn and remember information is to “cram,” or study it intensively during one concentrated period.
- ____ 2. Advertisers and politicians often use subliminal persuasion to influence our behavior.
- ____ 3. Most brain activity stops when we're asleep.
- ____ 4. Punishment is the most effective way to permanently change behavior.
- ____ 5. Eyewitness testimony is often unreliable.
- ____ 6. Polygraph (“lie detector”) tests can accurately and reliably reveal whether a person is lying.
- ____ 7. Behaviors that are unusual or that violate social norms may indicate a psychological disorder.
- ____ 8. People with schizophrenia have two or more distinct personalities.
- ____ 9. Similarity is one of the best predictors of long-term relationships.
- ____ 10. In an emergency, as the number of bystanders increases, your chance of getting help decreases.

The magician James Randi has dedicated his life to educating the public about fraudulent pseudopsychologists. Along with the prestigious MacArthur Foundation, Randi has offered \$1 million to “anyone who proves a genuine psychic power under proper observing conditions” (Randi, 1997; The Amazing Meeting, 2011). Even after many years, the money has never been collected.

Henry Groskinsky/Time Life Pictures/Getty Images



Answers: 1. False (Chapter 1), 2. False (Chapter 4), 3. False (Chapter 10), 4. False (Chapter 6), 5. True (Chapter 7), 6. False (Chapter 10), 7. True (Chapter 12), 8. False (Chapter 12), 9. True (Chapter 14), 10. True (Chapter 14)

Before we go on, we'd like to introduce you to a special feature in this text. In addition to the *Real World* research and practical applications you'll encounter throughout the text, we invited psychology professors from around the country to contribute their best stories and anecdotes, called “Voices from the Classroom.”



Voices from the Classroom

The Joys of Teaching Intro Psych One of the things I like most is teaching a freshman class of Introduction to Psychology. Why? Because I can still remember how powerful my first psychology class was to me. My childhood consisted mainly of going to school and to church, two places that basically told me what to think. When I started college, I really didn't know how to think for myself. My first psych professor began class one day with a simple question. “If there was a pill that could make you happy all the time, would you take it?” He had no interest in a “correct” answer; he just wanted us to *think*. Why? Because psychology is the science of thought and behavior. That day in class, I realized that psychology could help me answer questions I had about *my own thoughts* and about *my own behaviors*. I was hooked. So, with that in mind, let me see if I can hook you with a question. In 1637, French philosopher Renee Descartes stated, (in Latin), “*Cogito ergo sum*,” or in English, “I think, therefore I am.” Here's my question: If you were brain dead, and no longer capable of action or thought, have you ceased to exist? Cool question, huh? Welcome to psychology!

Professor Keith W. Swain
Red Rocks Community College
Lakewood, Colorado

TABLE 1.1 MODERN PSYCHOLOGY'S SEVEN MAJOR PERSPECTIVES

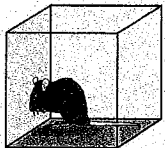
Perspectives	Major Emphases	Sample Research Questions	
Psychodynamic	Unconscious dynamics, motives, conflicts, and past experiences	How do adult personality traits or psychological problems reflect unconscious processes and early childhood experiences?	
Behavioral	Objective, observable, environmental influences on overt behavior; stimulus-response relationships and consequences for behavior	How do we learn both our good and bad habits? How can we increase desirable behaviors and decrease undesirable ones?	
Humanistic	Free will, self-actualization, and human nature as naturally positive and growth seeking	How can we promote a client's capacity for self-actualization and understanding of his or her own development? How can we promote international peace and reduce violence?	
Cognitive	Thinking, perceiving, problem solving, memory, language, and information processing	How do our thoughts and interpretations affect how we respond in certain situations? How can we improve how we process, store, and retrieve information?	
Biological	Genetic and biological processes in the brain and other parts of the nervous system	How might changes in neurotransmitters or damage to parts of the brain lead to psychological problems and changes in behavior and mental processes?	
Evolutionary	Natural selection, adaptation, and evolution of behavior and mental processes	How does natural selection help explain why we love and help certain people, but hurt others? Do we have specific genes for aggression and altruism?	
Sociocultural	Social interaction and the cultural determinants of behavior and mental processes	How do the values and beliefs transmitted from our social and cultural environments affect our everyday psychological processes?	

FIGURE 1.2 B. F. SKINNER (1904–1990)

B. F. Skinner was one of the most influential psychologists of the twentieth century. Here he uses the so-called "Skinner box" to train a rat to press a lever for a reward.



Nina Leen/Time Life
Pictures/Getty Images

behavior. Behaviorism's founder, John B. Watson (1913), rejected the practice of introspection and the influence of unconscious forces. Instead, Watson adopted Russian physiologist Ivan Pavlov's concept of *conditioning* (Chapter 6) to explain behavior as a result of observable stimuli (in the environment) and observable responses (behavioral actions).

Most early behaviorist research was focused on learning; nonhuman animals were ideal participants for this research. One of the best-known behaviorists, B. F. Skinner, was convinced that behaviorist approaches could be used to "shape" human behavior (**Figure 1.2**).

As you'll discover in Chapters 6 and 13, therapeutic techniques rooted in the behavioristic perspective have been most successful in treating observable behavioral problems, such as those related to phobias and alcoholism (Kiefer & Dinter, 2013; May et al., 2013; Sarafino, 2012).

perspective, there's even an evolutionary explanation for the longevity of humans over other primates—it's grandmothers! Without them, a mother who has a two-year-old and then gives birth would have to devote her time and resources to the newborn at the expense of the older child. Grandmothers act as supplementary caregivers.

Finally, the **sociocultural perspective** emphasizes social interactions and cultural determinants of behavior and mental processes. Although we are often unaware of their influence, factors such as ethnicity, religion, occupation, and socioeconomic class, all have an enormous psychological impact on our mental processes and behavior (Berry et al., 2011; Boer & Fischer, 2013). For example, in countries with low levels of gender equality, women are more likely to be attracted by their partner's resources and men by physical attractiveness (Zentner & Mitura, 2012).

Gender and Minority Influences

One of the first women to be recognized in the field of psychology was Mary Calkins. Her achievements are particularly noteworthy, considering the significant discrimination that she overcame. During the late 1800s and early 1900s, most colleges and universities provided little opportunity for women and ethnic minorities, either as students or as faculty members. In Mary Calkins' case, even after she completed all the requirements for a Ph.D. at Harvard University in 1895, and was described by William James as his brightest student, the university refused to grant the degree to a woman. Nevertheless, Calkins went on to perform valuable research on memory, and in 1905 served as the first female president of the American Psychological Association (APA). The first woman to receive her Ph.D. in psychology was Margaret Floy Washburn (Cornell, 1894), who wrote several influential books and served as the second female president of the APA.

Francis Cecil Sumner became the first African American to earn a Ph.D. in psychology (Clark University, 1920). Dr. Sumner later chaired one of the country's leading psychology departments, at Howard University. In 1971, one of Sumner's students, Kenneth B. Clark, became the first African American to be elected APA president. Clark's research with his wife, Mamie Clark, documented the harmful effects of prejudice and directly influenced the Supreme Court's landmark 1954 ruling against racial segregation in schools, *Brown v. Board of Education* (Figure 1.4).

Sumner, Clark, Calkins, and Washburn, along with other important minorities and women, made significant and lasting contributions to psychology's development. In recent times, people of color and women have been actively encouraged to pursue graduate degrees in psychology. Today, women earning doctoral degrees in psychology greatly outnumber men, but minorities are still underrepresented (New Ph.D.s and Employment Outcomes, 2011; Willyard, 2011).

Biopsychosocial Model

The seven major perspectives, as well as gender and minority influences, each make different contributions to modern psychology, which is why most contemporary psychologists do not adhere to one single intellectual perspective. Instead, a more integrative, unifying theme—the **biopsychosocial model**—has gained wide acceptance. This model views biological processes (genetics, neurotransmitters, evolution), psychological factors (learning, personality, motivation), and social forces (family, culture, gender, and ethnicity) as interrelated. It also sees all three factors as influences inseparable from the seven major perspectives (Figure 1.5).

Why is the biopsychosocial model so important? As the old saying goes, "A fish doesn't know it's in water." Similarly, as individuals living alone inside our own heads, we're often unaware of the numerous, interacting factors that affect us—particularly cultural forces. For example, most North Americans and Western Europeans are raised to be very individualistic and are surprised to learn that over 70% of the world's population lives in collectivistic cultures. As you can see in **Table 1.2**, in *individualistic cultures*, the needs and goals of the individual are emphasized over the needs and goals of the group. When asked to complete the statement "I am . . .,"

Sociocultural perspective An approach to understanding behavior and mental processes that emphasizes the social interaction and cultural determinants of behavior and mental processes.



FIGURE 1.4 KENNETH CLARK (1914–2005) AND MAMIE PHIPPS CLARK (1917–1985)

Kenneth Clark and his wife, Mamie Phipps Clark, conducted experiments with black and white dolls to study children's attitudes about race. This research and their expert testimony contributed to the U.S. Supreme Court's ruling that racial segregation in public schools was unconstitutional.

Biopsychosocial model An integrative, unifying theme of modern psychology that sees biological, psychological, and social processes as interacting influences.

TABLE 1.2 A COMPARISON BETWEEN INDIVIDUALISTIC AND COLLECTIVISTIC CULTURES

Sample Individualistic Countries	Sample Collectivistic Cultures
United States	Hong Kong
Australia	China
Great Britain	India
Canada	Japan
The Netherlands	West Africa region
Germany	Thailand
New Zealand	Taiwan

Sample Individualistic Values	Sample Collectivistic Values
Independence	Interdependence
Individual rights	Obligations to others
Self-sufficiency	Reliance on group
Individual achievement	Group achievement
Independent living	Living with kin
Personal failure leads to shame and guilt	Failing the group leads to shame and guilt

settings, or in a combination of settings. As you can see in **Table 1.3**, there are several career paths and valuable life skills associated with a bachelor's degree in psychology. Of course, your options are even greater if you go beyond the bachelor's degree and earn your master's degree, Ph.D., or Psy.D.—see **Table 1.4**. For more information about what psychologists do—and how to pursue a career in psychology—check out the websites of the American Psychological Association (APA) and the Association for Psychological Science (APS).

WHAT CAN I DO WITH A BACHELOR'S DEGREE IN PSYCHOLOGY?

TABLE 1.3

realworldpsychology

Top Careers with a Bachelor's Degree in Psychology

- Management and administration
- Sales
- Social work
- Labor-relations, personnel and training
- Real estate, business services, insurance

Sample Skills Gained from a Psychology Major

- Improved ability to predict and understand behavior
- Better understanding of how to use and interpret data
- Increased communication and interpersonal skills
- Increased ability to manage difficult situations and high-stress environments
- Enhanced insight into problem behavior

Note that the U.S. Department of Labor predicts only an average rate of growth for psychologists in the next decade. However, the good news is that a degree in our field, and this course in general psychology, will provide you with invaluable lifetime skills.

RETRIEVAL PRACTICE: INTRODUCING PSYCHOLOGY

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

- Psychology is defined as the _____.
 - science of conscious and unconscious forces
 - empirical study of the mind and behavior
 - scientific study of the mind
 - scientific study of behavior and mental processes
- _____ rely on common beliefs, folk wisdom, or even superstitions and do not follow the basics of the scientific method.
 - Pseudopsychologies
 - Sociologists
 - Astronomers
 - Counselors
- _____ is generally acknowledged to be the father of psychology.
 - Sigmund Freud
 - B. F. Skinner
 - Wilhelm Wundt
 - William James
- Which of the following terms do not belong together?
 - structuralism, unconscious behavior
 - behaviorism, observable behavior
 - psychoanalytic, unconscious
 - humanism, free will conflict

Think Critically

- Psychologists are among the least likely to believe in psychics, palmistry, astrology, and other paranormal phenomena. Why might that be?
- Which of the seven modern perspectives of psychology do you most agree with? Why?
- How might the biopsychosocial model explain difficulties or achievements in your own life?

realworldpsychology

How does your culture influence what you look for in a romantic partner?



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THE SCIENCE OF PSYCHOLOGY

RETRIEVAL PRACTICE While reading the upcoming sections, respond to each Learning Objective in your own words. Then compare your responses with those found at www.wiley.com/college/huffman.

- COMPARE** the fundamental goals of basic and applied research.
- DESCRIBE** the scientific method.
- IDENTIFY** psychology's four main goals.

In science, research strategies are generally categorized as either *basic* or *applied*. **Basic research** is most often conducted to advance core scientific knowledge, whereas **applied research** is generally designed to solve practical ("real world") problems (**Figure 1.6**). As you'll see in Chapter 6, classical and operant conditioning principles evolved from numerous *basic research* studies designed to advance the general understanding of how human and nonhuman animals learn. In Chapters 12 and 13, you'll also discover how *applied research* based on these principles has been used to successfully treat psychological disorders, such as phobias. Similarly, in Chapter 7, you'll see how basic research on how we create, store, and retrieve our memories has led to practical applications in the legal field, such as a greater appreciation for the fallibility of eyewitness testimony.

LEARNING OBJECTIVES

Basic research Research that typically focuses on fundamental principles and theories; most often conducted in universities and research laboratories.

Applied research Research that is generally conducted outside the laboratory; its data are typically used for real world application.

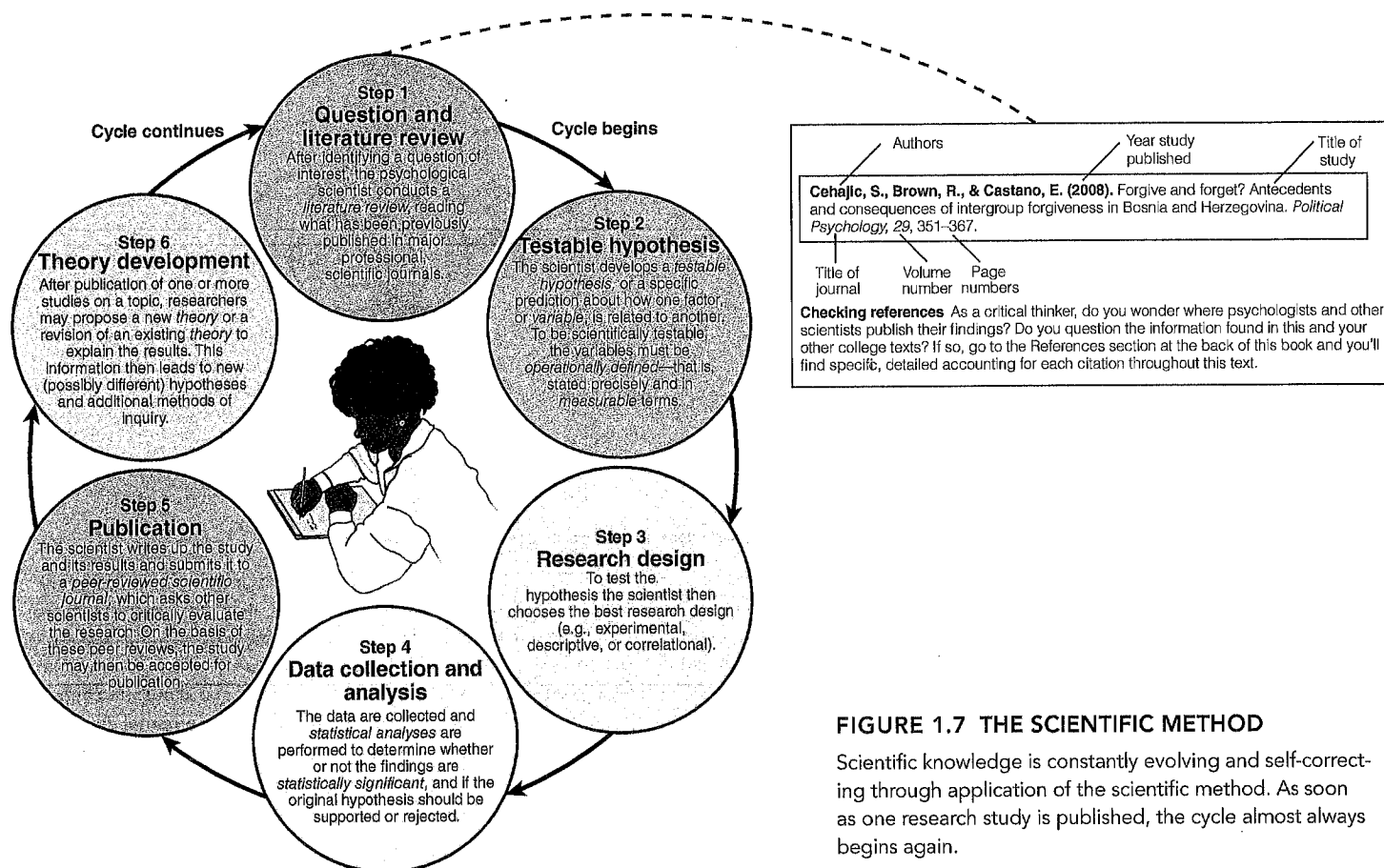


FIGURE 1.7 THE SCIENTIFIC METHOD

Scientific knowledge is constantly evolving and self-correcting through application of the scientific method. As soon as one research study is published, the cycle almost always begins again.

For Step 3, you would then most likely choose an experimental research design and solicit 100 volunteers from various classes, 50 of whom should be randomly assigned to Group 1 (Retrieval Practice) and the other 50 to Group 2 (no Retrieval Practice). After both groups study for three hours, you would present and score a 20-point quiz, followed by a statistical analysis (Step 4) to determine whether the difference in test scores between the two groups is **statistically significant**. To be statistically significant, the difference between the groups must be large enough that the result is probably not due to chance. In Step 5, you could publish your research, and then you go on to further investigate additional study techniques that might contribute to theory development on the most effective study methods, Step 6. [You'll be interested to know that research does exist on the superiority of retrieval practice on retention of material and improved exam scores (Agarwal et al., 2012; Karpicke & Smith, 2012), which is why they're emphasized in this text.]

Note also in Figure 1.7 that the scientific method is cyclical and cumulative. Scientific progress comes from repeatedly challenging and revising existing theories and building new ones. If numerous scientists, using different procedures or participants in varied settings, can repeat, or *replicate*, a study's findings, there is increased scientific confidence in the findings. If the findings cannot be replicated, researchers look for other explanations and conduct further studies. When different studies report contradictory findings, researchers may average or combine the results of all such studies and reach conclusions about the overall weight of the evidence, a popular statistical technique called **meta-analysis**. For example, one recent meta-analysis found that a healthy diet, high-quality preschool, and interactive reading with parents can all lead to increases in children's intelligence (Protzko et al., 2013).

After many related findings have been collected and confirmed, scientists may generate a **theory** to explain the data through a systematic, interrelated set of

Statistical significance A statistical statement of how likely it is that a study's result occurred merely by chance.

Meta-analysis A statistical technique for combining and analyzing data from many studies in order to determine overall trends.

Theory An organized, interrelated set of concepts that explain a phenomenon or body of data.

of *prediction*, identifying “when” and under what conditions a future behavior or mental process is likely to occur. For instance, knowing that alcohol leads to increased aggression (Ferguson, 2010; Parker & McCaffree, 2013), we can predict that more fights will erupt in places where alcohol is consumed than in places where it isn’t.

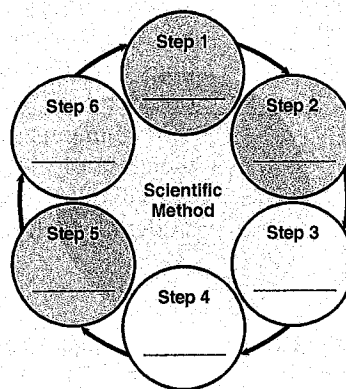
4. **Change** For some people, change as a goal of psychology brings to mind evil politicians or cult leaders brainwashing unknowing victims. However, to psychologists, *change* means applying psychological knowledge to prevent unwanted outcomes or bring about desired goals. In almost all cases, change as a goal of psychology is positive. Psychologists help people improve their work environment, stop addictive behaviors, become less depressed, improve their family relationships, and so on. Furthermore, as you may know from personal experience, it is very difficult (if not impossible) to change someone’s attitude or behavior against her or his will. (*Here is an old joke: Do you know how many psychologists it takes to change a light bulb? Answer: None. The light bulb has to want to change.*)

RETRIEVAL PRACTICE: THE SCIENCE OF PSYCHOLOGY

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

- If you conducted a study on areas of the brain most affected by drinking alcohol, it would be _____ research.
 - unethical
 - basic
 - pseudopsychology
 - applied
- A(n) _____ provides a precise definition of how the variables in a study will be observed and measured.
 - meta-analysis
 - theory
 - independent observation
 - operational definition
- The goal of _____ is to tell what occurred, whereas the goal of _____ is to tell when.
 - health psychologists; biological psychologists
 - description; prediction
 - psychologists; psychiatrists
 - pseudopsychologists; clinical psychologists
- Label the six steps in the scientific method.



Think Critically

- What is the difference between a scientific theory, an opinion, and a hunch?
- Nonhuman animals are sometimes used in psychological research when it would be impractical or unethical to use human participants. What research questions might require the use of nonhuman animals?
- Which side of the debate, nature or nurture, has had the most influence on your life?

realworldpsychology

Can diet, preschool education, and parental behavior increase a child’s intelligence?



HINT: LOOK IN THE MARGIN FOR 

talking on a cell phone were less likely to come to a complete stop at a stop sign (Strayer et al., 2011). Can you guess what they found?

The chief advantage of naturalistic observation is that researchers can obtain data about natural behavior rather than about behavior that is a reaction to an artificial experimental situation. But naturalistic observation can be difficult and time-consuming, and the lack of control by the researcher makes it difficult to conduct observations for behavior that occurs infrequently.

For a researcher who wants to observe behavior in a more controlled setting, *laboratory observation* has many of the advantages of naturalistic observation, but with greater control over the variables (Figure 1.9).



Jeffrey Greenberg/Photo Researchers

FIGURE 1.9 LABORATORY OBSERVATION

In this type of observation, the researcher brings participants into a specially prepared room in the laboratory, with one-way mirrors, or inconspicuous, hidden cameras and microphones. Using such methods, the researcher can observe school children at work, families interacting, or the like.

Survey/Interview

Psychologists use **surveys/interviews** to ask people to report their behaviors, opinions, and attitudes (Nestor & Schutt, 2012). In Chapter 6 you'll read about a study in which researchers interviewed 3- to 6-year-old girls about their preference for using game pieces depicting thinner or heavier women when playing Candy Land to measure preference for the thin ideal (Harriger et al., 2010). In Chapter 10, you'll read about the use of survey research to study how a person's first sexual experience may impact subsequent sexual relationships (Smith & Shaffer, 2013). One key advantage of this approach is that researchers can gather data from many more people than is generally possible with other research designs.

Unfortunately, most surveys/interviews rely on self-reported data, and not all participants are honest. As you might imagine, people are especially motivated to give less-than-truthful answers when asked about highly sensitive topics, such as infidelity, drug use, and pornography.

Survey/interview A research technique that questions a large sample of people to assess their behaviors and mental processes.

Case Study

What if a researcher wants to investigate photophobia (fear of light)? In such a case, it would be difficult to find enough participants to conduct an experiment or to use surveys/interviews or naturalistic observation. For rare disorders or phenomena, researchers try to find someone who has the problem and study him or her intensively. This type of in-depth study of a single research participant, or a small group of individuals, is called a **case study** (Moore et al., 2012). In Chapter 9, we'll share a fascinating case study that examined the impact of severe neglect during childhood on language acquisition. This study obviously could not be conducted using another method, for ethical reasons, and because of the rarity of such severe deprivation.

Case study An in-depth study of a single research participant or a small group of individuals.

Archival research A descriptive research approach that studies existing data to find answers to research questions.

Archival Research

The fourth type of descriptive research is **archival research**, in which researchers study previously recorded data. For example, and as described in Chapter 14, using preexisting data from more than 50 years of Major League Baseball games, researchers revealed that more batters are deliberately hit by pitchers on hot days than on cooler days (Larrick et al., 2011). Interestingly, the new "digital democracy," based on spontaneous comments on Twitter or Facebook, may turn out to be an even better method of research than the traditional random sampling of adults. Researchers who used a massive archive of billions of stored data from Twitter found "tweet share" predicted the winner in 404 out of 435 competitive races in the U.S. House elections in 2010 (DiGrazia et al., 2013). Apparently, just the total amount of discussion—good or bad—is a very good predictor of votes.

Leo Cullum/cartoonbank.com. All Rights Reserved



"What I drink and what I tell the pollsters I drink are two different things."

Looking closely at the right-hand side of the chart in Figure 1.10, you'll note that while the numbers in the first column (+1.00 to -1.00) describe the *strength* of the relationship between two variables, what's often overlooked is the second column, which shows the actual percentage of *variance* (or how widely individuals in a group vary). We calculate this variance by multiplying the correlation number by itself (in this example $.5 \times .5 = 25\%$). It's important to understand this because people often over-interpret popular examples such as the .5 correlation between IQ (intelligence quotient) and GPA (grade point average) or the .4 correlation between IQ and income. Now that you understand more about correlations, you can see that your GPA has only a moderate relationship with your IQ (25%) and that there is an even lower relationship (16%) between your IQ and your eventual income. The good news is that many factors other than IQ explain both GPA and income—mainly hard work, motivation, and perseverance.

In addition to providing more accurate prediction, correlational studies often point to *possible* causation. For example, smoking cigarettes and drinking alcohol while pregnant are highly correlated with birth defects (Agopian et al., 2013; Pruett et al., 2013). This strong correlation led to a large number of animal experiments and other research methods that added supportive evidence, which has helped convince pregnant mothers to avoid these drugs while pregnant—thus preventing many birth defects.

In other cases, it's important to emphasize that a correlation between two variables does not *necessarily* mean that one variable *causes* another (Figure 1.11). When people read media reports about correlations between stress and cancer or between a full moon and increased crime, they often mistakenly infer that stress causes cancer or that a full moon causes crime. In fact, a wide variety of possible third factors may cause someone to have greater susceptibility to both the correlated phenomena. This point is so important and critical to becoming an educated consumer of scientific research that we offer another example (Figure 1.12).

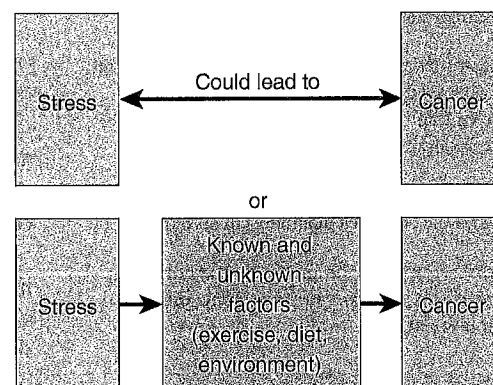
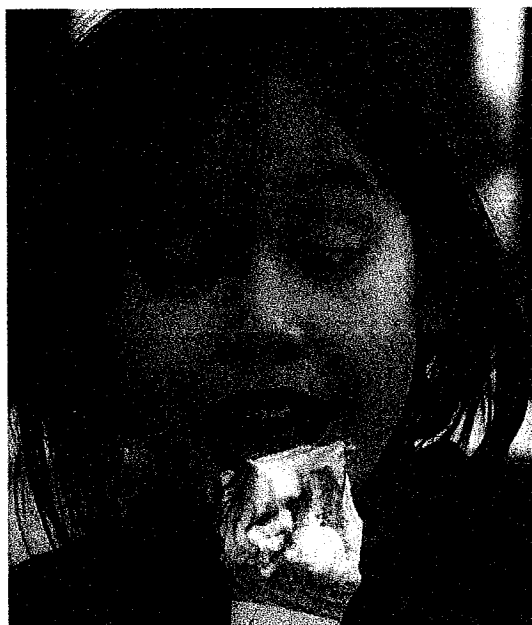


FIGURE 1.11 CORRELATION VERSUS CAUSATION

Research has found a strong correlation between stress and cancer (Chapter 3). However, this correlation does not tell us whether stress causes cancer, whether cancer causes stress, or whether other known and unknown factors, such as smoking, drinking, or pesticides, could contribute to both stress and cancer. Can you think of a way to study the effects of stress on cancer that is not correlational and still ethical?

FIGURE 1.12 REVISITING CORRELATION VERSUS CAUSATION

Ice cream consumption and drowning are highly correlated. Does this mean that eating ice cream causes people to drown? Of course not! A third factor, such as high temperatures, increases both ice cream consumption and participation in water-based activities.



Norbert Scherwin/
The Image Works

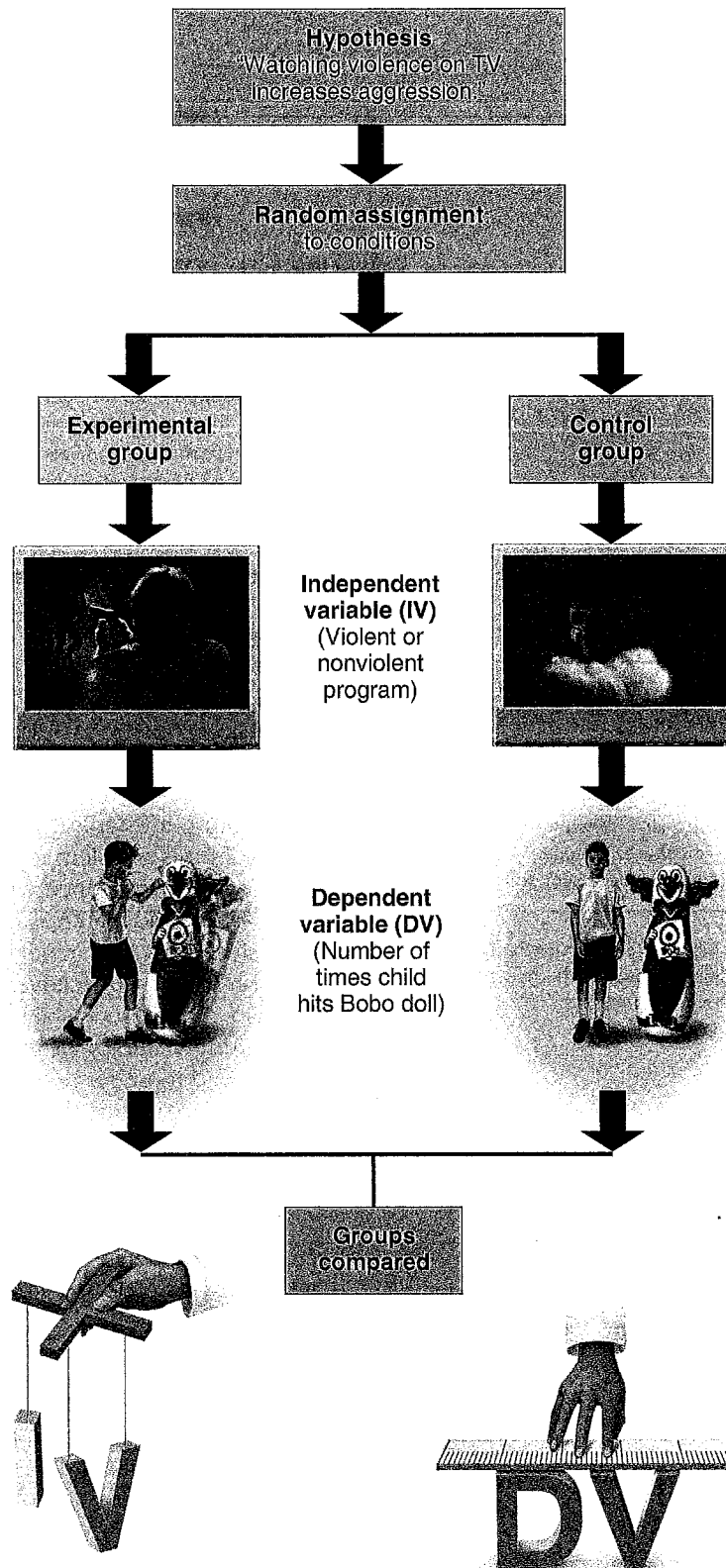


Chris Lowe/Photolibrary/
Getty Images

FIGURE 1.13 EXPERIMENTAL RESEARCH DESIGN

When designing an experiment, researchers must follow certain steps to ensure that their results are scientifically meaningful. In this example, researchers want to test whether watching violent television shows increases aggression in children.

- 1 The experimenter begins by identifying the hypothesis.
- 2 In order to avoid sample bias, the experimenter randomly assigns participants to two different groups.
- 3 Having at least two groups allows the performance of one group to be compared to that of another.
- 4 The experimental group watches violent programs while the control group watches nonviolent programs. Watching violent versus nonviolent TV programs is the independent variable (IV).
- 5 The experimenter then counts how many times the child hits, kicks, or punches a large plastic doll. The number of aggressive acts is the dependent variable (DV).
- 6 The experimenter relates differences in aggressive behavior (DV) to whether the child watched a violent or a nonviolent TV program (IV).



To help you remember the independent and dependent variables (IV and DV), carefully study these drawings and create a visual picture in your own mind of how:

The experimenter "manipulates" the IV to determine its causal effect on the DV.

The experimenter "measures" the DV, which "depends" on the IV.

Participant

**Single-blind procedure**

Only the experimenter knows who is in the experimental group versus the control group.

Experimenter

**Double-blind procedure**

Neither the experimenter nor the participants know who is in which group.

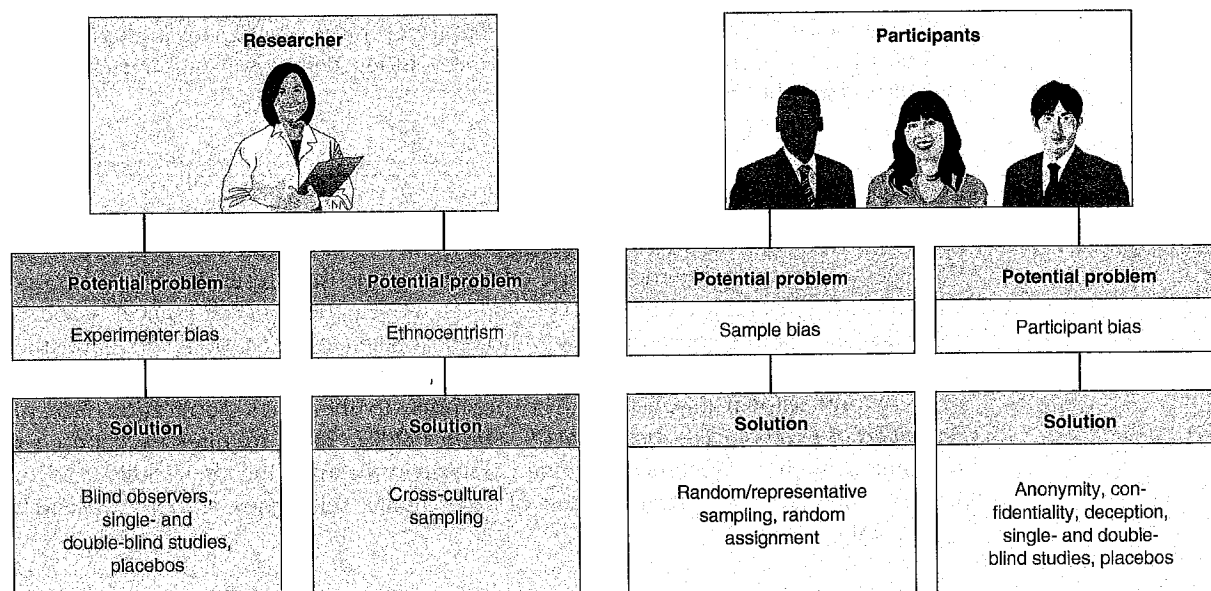
**FIGURE 1.15 A SINGLE- OR DOUBLE-BLIND EXPERIMENTAL DESIGN**

To test a new drug, researchers administering the experimental drug and/or the participants taking the drug must be unaware of (or “blind” to) who is receiving a *placebo* (a fake pill or injection) and who is receiving the drug itself. Placebos are necessary because researchers know that the mere act of taking a pill or receiving an injection can change a participant’s condition or responses, the so-called “placebo effect” (Barbui et al., 2011; Brown, 2013).

participants may not be told the true goal of the study because they might try to present themselves as more helpful than they actually would be in real life.

Recognizing that we’ve offered a large number of research problems and safeguards associated with the various research methods (descriptive, correlational, and experimental), we’ve gathered them all into **Figure 1.16**. Be sure to study it carefully. In addition, note that the problems and safeguards connected with descriptive and correlational research described earlier also apply to experimental research.

Before closing this section on research methods, we want to clarify that although experiments are considered the “gold standard” in research, descriptive and correlational methods also offer unique information that can help us live safer and more productive lives. For example, psychologists have repeatedly found high correlations between stress and disease (Chapter 3) and between cocaine use and heart attacks (Chapter 5). Can you see how we could never logically or morally create human,

FIGURE 1.16 POTENTIAL RESEARCH PROBLEMS AND SOLUTIONS

Respecting the Rights of Human Participants

The APA and APS have developed rigorous guidelines regulating research with human participants, including:

- **Informed consent** Researchers must obtain an **informed consent** agreement from all participants *before* initiating an experiment. Participants are made aware of the nature of the study, what to expect, and significant factors that might influence their willingness to participate, including all physical risks, discomfort, and possibly unpleasant emotional experiences.
- **Voluntary participation** Participants must be told that they're free to decline to participate or to withdraw from the research at any time.
- **Restricted use of deception followed by debriefing** If participants knew the true purpose behind certain studies, they might not respond naturally. In one of the most famous studies in social psychology, researchers ordered participants to give electric shocks to another participant (who was really a confederate of the researcher and was not actually receiving any shocks). Although this study was testing participants' willingness to follow orders, they were told that the study was examining the use of shocks to assist with learning. Obviously in this case, participants' behavior could not be accurately measured if they were told the real focus of the study (Milgram, 1963). Therefore, researchers occasionally need to temporarily deceive participants about the actual reason for the experiment.

However, when deception is necessary, important guidelines and restrictions still apply. One of the most important is **debriefing**, which is conducted once the data collection has been completed. The researchers provide a full explanation of the research, including its design and purpose, any deceptions used, and then clarify participants' misconceptions, questions, or concerns.

- **Confidentiality** All information acquired about people during a study must be kept private and not published in such a way that an individual's right to privacy is compromised.

Informed consent A participant's agreement to take part in a study after being told what to expect.

Debriefing A discussion procedure conducted at the end of an experiment or study; participants are informed of the study's design and purpose, possible misconceptions are clarified, questions answered, and explanations are provided for any possible deception.

Respecting the Rights of Nonhuman Animals

Although they are used in only 7 to 8% of psychological research (APA, 2009; ILAR, 2009; MORI, 2005), nonhuman animals—mostly rats and mice—have made significant contributions to almost every area of psychology. Without nonhuman animals in *medical research*, how would we test new drugs, surgical procedures, and methods for relieving pain? *Psychological research* with nonhuman animals has led to significant advances in virtually every area of psychology—the brain and nervous system, health and stress, sensation and perception, sleep, learning, memory, motivation, and emotion.

Nonhuman animal research has also produced significant gains for some animal populations, such as the development of more natural environments for zoo animals and more successful breeding techniques for endangered species.

Despite the advantages, using nonhuman animals in psychological research remains controversial (Akins & Panicker, 2012; Baker & Serdikoff, 2013). While debate continues about ethical issues in such research, psychologists take great care in handling research animals. Researchers also actively search for new and better ways to protect the animals (Guidelines for Ethical Conduct, 2008; Pope & Vasquez, 2011).

Respecting the Rights of Psychotherapy Clients

Professional organizations such as the APA and APS, as well as academic institutions and state and local agencies, all may require that therapists, like researchers,

STRATEGIES FOR STUDENT SUCCESS

RETRIEVAL PRACTICE While reading the upcoming sections, respond to each Learning Objective in your own words. Then compare your responses to those found at www.wiley.com/college/huffman.

- 1 DESCRIBE** the steps you can take to improve your study habits.
- 2 IDENTIFY** how you might improve your current time management habits.

LEARNING OBJECTIVES

In this section, you will find several well-researched study strategies and techniques guaranteed to make you a more successful college student. They are grouped together under *study habits* and *time management*.

Study Habits

Do you sometimes read a paragraph many times yet remember nothing from it? Here are four ways to successfully read (and remember) information in this and most other texts:

- 1. Familiarization** The first step is to familiarize yourself with the general text so that you can take full advantage of its contents. In *Real World Psychology*, the Preface, Table of Contents, Glossary (both running through the text of each chapter and at the end of each chapter), References, Name Index, and Subject Index will help give you a bird's-eye view of the rest of the text. In addition, as you scan the book to familiarize yourself with its contents, you should also take note of the many tables, figures, photographs, and special feature boxes, all of which will enhance your understanding of the subject.
- 2. Active Reading** The next step is to make a conscious decision to actively read and learn the material. Reading a text is *not* like reading a novel or fun articles on the Internet! You must tell your brain to slow down, focus on details, and save the material for future recall.
- 3. Distributed practice** As you'll discover in Chapter 7, spreading your study sessions out over time (distributed practice) is far more efficient than waiting until right before an exam and cramming in all the information at once (massed practice). If you were a basketball player, you wouldn't wait until the night before a big play-off game to practice. The same is true for exam preparation. Keep in mind that distributed practice is NOT simply rereading the chapter several times over a few days. As mentioned above, you need to actively focus and study what you're reading.
- 4. Practice test taking** For most of us, taking tests is NOT one of our favorite activities. However, it's important to note that research has clearly shown that practice test taking and distributed practice are two of the most efficient ways to study and learn (Carpenter, 2012; Dunlosky et al., 2013). Just as you need to repeatedly practice throwing baskets to become a good basketball player, you need to repeatedly practice your test taking skills. The easiest way to practice this skill (and to improve your grades) is by completing the Self-Tests and Think Critically Questions found in each chapter of this book. You also can easily access the free flashcards and other forms of self-testing on the student companion website for this text at www.wiley.com/college/huffman.

For more tips on improving your study habits, see *Psychology and You*.

psychology and you **The Importance of Focus** Think about a time when you were trying to study for an important test, but you continued to find your mind wandering. Perhaps you started thinking about what you were going to eat for dinner, or what weekend plans you hoped to make. As you might imagine, this type of distracted studying isn't very effective! This book will give you strategies for active learning that will help you not only in your psychology class but in all your other classes!



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- **Improve your general test-taking skills** Expect a bit of stress but don't panic. Pace yourself but don't rush. Focus on what you know. Skip over questions when you don't know the answers, and then go back if time allows. On multiple-choice exams, carefully read each question and all the alternative answers before responding. Answer all questions and make sure you have recorded your answers correctly.
- **Overlearn** Many people tend to study new material just to the point where they can recite the information, but they do not attempt to understand it more deeply. For best results, however, you should overlearn. In other words, be sure to fully understand how key terms and concepts are related to one another and also be able to generate examples other than the ones in the text. In addition, you should repeatedly review the material (by visualizing the phenomena that are described and explained in the text and by rehearsing what

you have learned) until the information is firmly locked in place. Overlearning is particularly important if you suffer from test anxiety.

- **Take study skills courses** Improve your reading speed and comprehension and your word-processing/typing skills by taking additional courses designed to develop these specific abilities. Also, don't overlook important human resources. Your instructors, roommates, classmates, friends, and family members often provide useful tips and encouragement.

Think Critically

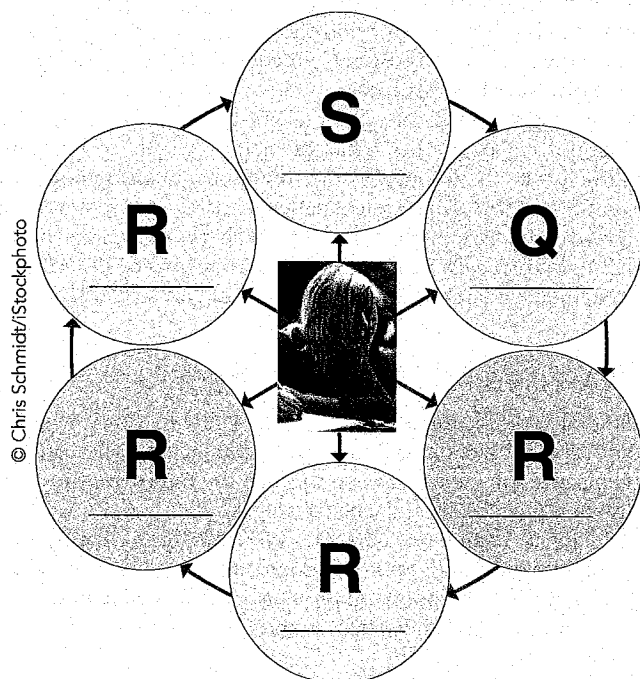
- What factors might prevent you from reading test questions carefully and responding accurately?
- How could a friend or roommate help you improve your grades on tests?

RETRIEVAL PRACTICE: STRATEGIES FOR STUDENT SUCCESS

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

- List the six steps in the SQ4R method.



- One of the clearest findings in psychology is that _____ practice is a much more efficient way to study and learn than _____ practice.

a. spaced (distributed); massed	b. active; passive
c. applied; basic	d. none of these options
- Research suggests that _____ might be two of the most important keys to improving grades.

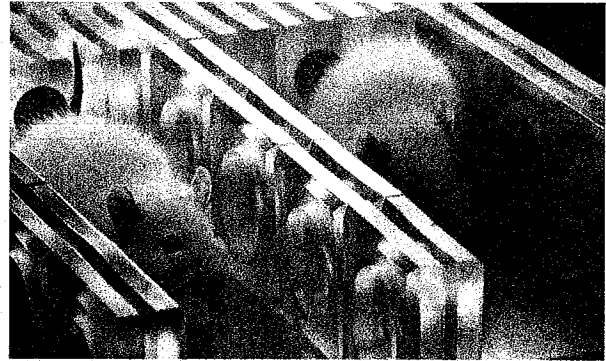
a. highlighting and rereading	b. personal control and better time management
c. active studying and the SQ4R method	d. distributed practice and practice testing
- _____ is particularly important if you suffer from test anxiety.

a. Overlearning	b. Hyper-soma control
c. Active studying	d. Passive listening

◎ applying real world psychology

We began this chapter with five intriguing Real World Psychology questions, and you were asked to revisit these questions at the end of each section. Questions like these have an important and lasting impact on all of our lives. See if you can answer these additional critical thinking questions related to real world examples.

- 1 Nonhuman animals, like the mice in this photo, are sometimes used in psychological research when it would be impractical or unethical to use human participants. Do you believe nonhuman animal research is ethical? Why or why not?
- 2 What research questions might require the use of nonhuman animals? How would you ensure the proper treatment of these animals?
- 3 On p. 22, we discussed a potential experimental design to test whether watching violent TV might increase aggression in children. Assuming that we did find a significant increase, can you think of reasons the findings might not generalize to real world situations?
- 4 You may have heard that dog owners are healthier than cat owners, which leads some to believe that getting a dog would improve their health. Given this chapter's repeated warning that "correlation does not prove causation," can you think of an alternative explanation for why dog owners might be healthier?
- 5 People often confuse critical thinking with simply being critical and argumentative. How would you explain the true meaning and value of critical thinking?
- 6 How does psychology's emphasis on the scientific method contribute to critical thinking?

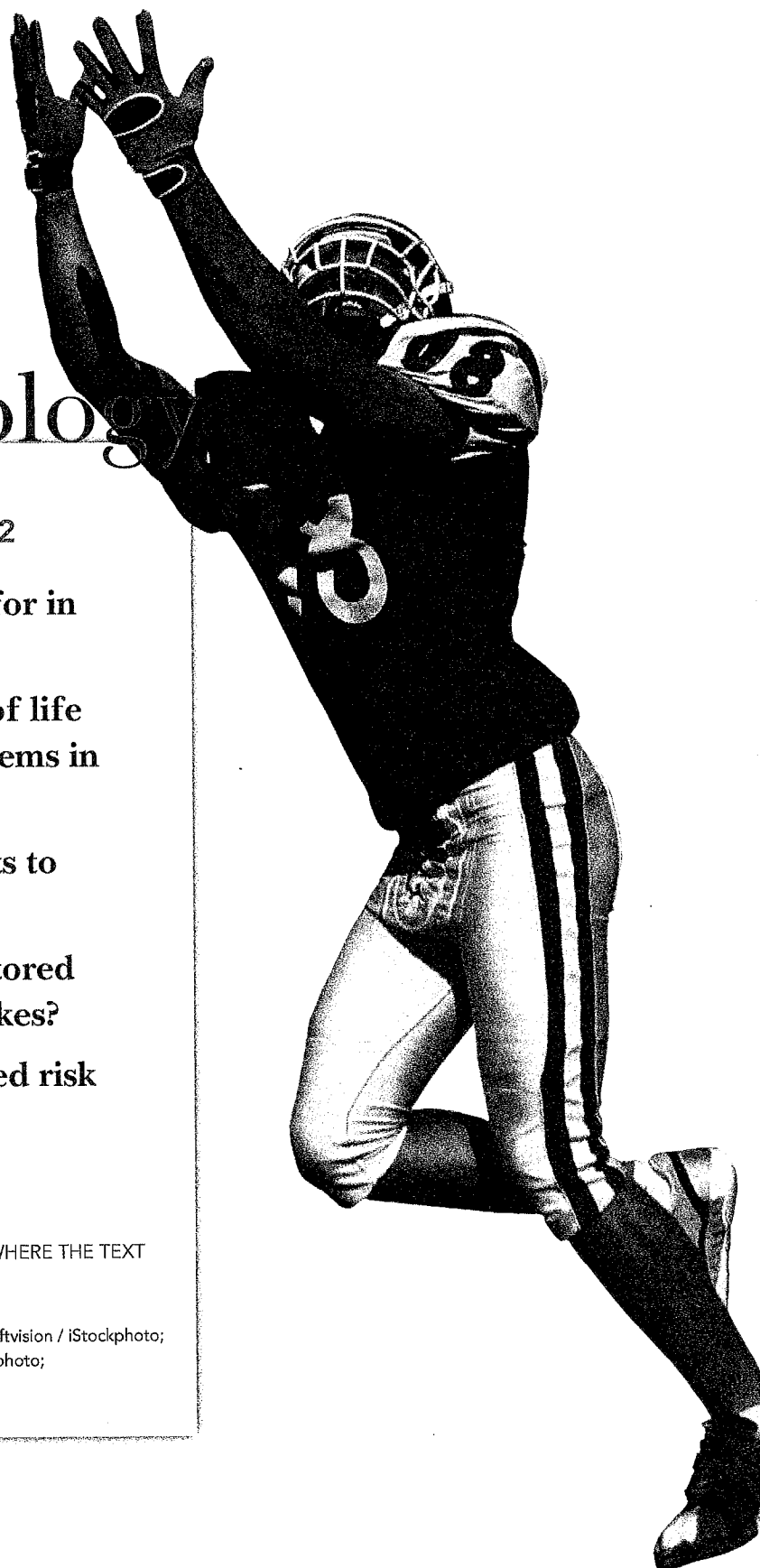
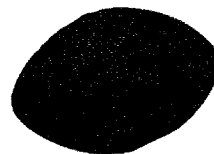
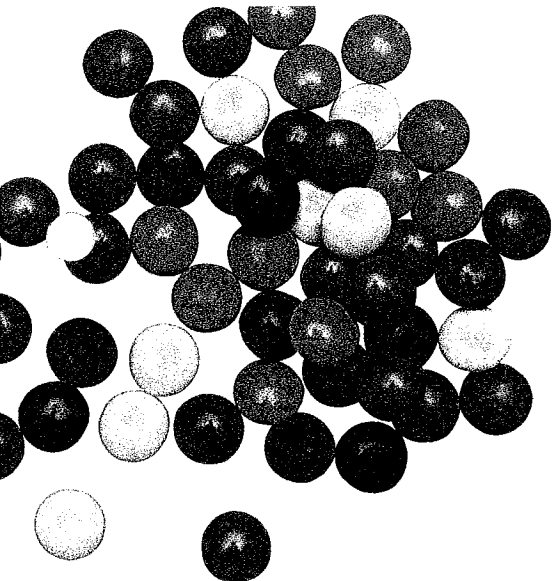


Jonathan Selig/Getty Images

Key Terms

RETRIEVAL PRACTICE Write a definition for each term before turning back to the referenced page to check your answer.

- applied research 13
- archival research 19
- basic research 13
- behavioral perspective 6
- biological perspective 8
- biopsychosocial model 9
- case study 19
- cognitive perspective 8
- confounding variable 22
- control group 22
- correlational research 20
- correlation coefficient 20
- critical thinking 4
- debriefing 27
- dependent variable (DV) 22
- descriptive research 18
- double-blind study 24
- ethnocentrism 24
- evolutionary perspective 8
- experimental group 22
- experimental research 22
- experimenter bias 24
- humanistic perspective 8
- hypothesis 14
- independent variable (IV) 22
- informed consent 27
- meta-analysis 15
- naturalistic observation 18
- nature–nurture controversy 16
- operational definition 14
- participant bias 24
- placebo 24
- positive psychology 8
- psychoanalytic perspective 6
- psychodynamic perspective 6
- psychology 4
- random assignment 22
- sample bias 22
- scientific method 14
- single-blind study 24
- sociocultural perspective 9
- SQ4R method 30
- statistical significance 15
- survey/interview 19
- theory 15



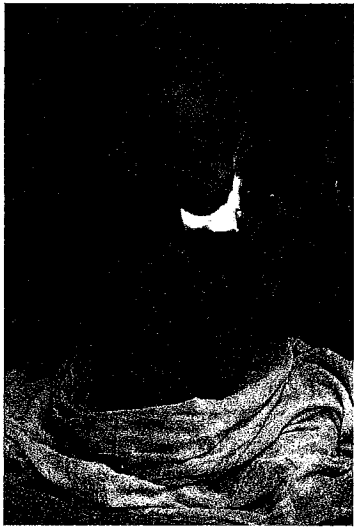
realworldpsychology

THINGS YOU'LL LEARN IN CHAPTER 2

- ① Can our genes influence whom we vote for in presidential elections?
- ② Why can spending the first few months of life in an orphanage lead to long-term problems in cognitive functioning?
- ③ How can a chemical in the brain lead rats to binge-eat M&Ms?
- ④ How can stem cell injections lead to restored vision and improved recovery from strokes?
- ⑤ Why are former NFL athletes at increased risk of depression, dementia, and suicide?

THROUGHOUT THE CHAPTER, MARGIN ICONS FOR Q1–Q5 INDICATE WHERE THE TEXT ADDRESSES THESE QUESTIONS.

syringe: © doug4537 / iStockphoto; DNA: © walrusmail / iStockphoto; mouse: © craftvision / iStockphoto;
M&M candies: © Issaurinko / iStockphoto; football player: © George Peters / iStockphoto;
baby in crib: Fred Goldstein / Shutterstock



Per-Anders Pettersson/Getty Images

FIGURE 2.2 GENE-ENVIRONMENT INTERACTION

Children who are malnourished may not reach their full potential genetic height or maximum intelligence. Can you see how environmental factors interact with genetic factors to influence many traits?

related to the presence or absence of particular genes that control the transmission of traits. In some traits, such as blood type, a single pair of genes (one from each parent) determines what characteristics we will possess. When two genes for a given trait conflict, the outcome depends on whether the gene is *dominant* or *recessive*. A dominant gene reveals its trait whenever the gene is present. In contrast, the gene for a recessive trait is normally expressed only if the other gene in the pair is also recessive.

It was once assumed that characteristics such as eye color, hair color, and height were the result of either one dominant gene or two paired recessive genes. But modern geneticists believe that these characteristics are *polygenic*, meaning they are controlled by multiple genes. Most polygenic traits like height and intelligence also are affected by environmental and social factors (**Figure 2.2**). Fortunately, most serious genetic disorders are not transmitted through a dominant gene. Can you guess why?

Why do scientists study human inheritance? As you'll see throughout this text, researchers are finding increasing evidence that our personality traits, cognitive abilities, behavioral habits, sexual orientation, and psychological disorders are all determined, at least in part, by genetic factors. For example, genetic or chromosomal abnormalities have been found to be important factors in Alzheimer's disease and schizophrenia, as well as in diabetes, heart disease, and cancer (**Figure 2.3**). Surprisingly, researchers have even discovered that our genes can influence which particular political party we identify with, as well as our political views, including beliefs about the death penalty, unemployment, and abortion (Hatemi & McDermott, 2012).

In addition to studying how genes affect us as individuals, behavioral geneticists also examine how and when they're transmitted from one generation to the next.

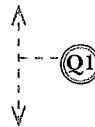


FIGURE 2.3 SAVING HER OWN LIFE? realworldpsychology

In May 2013, actor Angelina Jolie announced that she had undergone a preventive double mastectomy (the removal of both of her breasts) to reduce her personal risk of developing breast cancer. She made this decision after learning that she carries a mutation in her BRAC1 gene, which leads to a 65% lifetime risk of developing breast cancer.



Daniel Zuchnik/Getty Images

As we've seen, behavioral genetics studies help explain the role of heredity (nature) and the environment (nurture) in our individual behavior. To increase our understanding of genetic dispositions, we also need to look at universal behaviors transmitted from our evolutionary past.

Evolutionary Psychology

Evolutionary psychology suggests that many behavioral commonalities, from eating to fighting with our enemies, emerged and remain in human populations because they helped our ancestors (and ourselves) survive (Buss, 2011; Durrant & Ellis, 2013). This perspective stems from the writings of Charles Darwin (1859), who suggested that natural forces select traits that aid an organism's survival. This process of **natural selection** occurs when a particular genetic trait gives an organism a reproductive advantage over others. Because of natural selection, the fastest, strongest, smartest, or otherwise most fit organisms are most likely to live long enough to reproduce and thereby pass on their genes to the next generation.

Genetic mutations also help explain behavior. Everyone likely carries at least one gene that has mutated, or changed from the original. Very rarely, a mutated gene will be significant enough to change an individual's behavior. It might cause someone to be more or less social, risk taking, shy, or careful. If the gene then gives the person a reproductive advantage, he or she will be more likely to pass on the gene to future generations. However, this mutation doesn't guarantee long-term survival. Even a well-adapted population can perish if its environment changes too rapidly.

FIGURE 2.6 HEIGHT AND HERITABILITY

Imagine a small village, in which the average height of all adult women was 4 feet 5 inches. The heritability of height in this group could be quite high; women with short parents would be on average much shorter than women of tall parents. So how would you explain the difference in height between the parent and child in this photo?



Image Source/Getty Images

Natural selection The process by which heritable traits that increase an organism's chances of survival or reproduction are favored over less beneficial traits.

RETRIEVAL PRACTICE: OUR GENETIC INHERITANCE

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

- Behavioral genetics is the study of the relative effects of _____.
 - behavior and genetics on survival
 - heredity and environment on behavior and mental processes
 - genetics on natural selection
 - natural selection and adaptation
- Evolutionary psychology studies the _____.
 - ways in which humans have adapted to their environment, in order to survive and evolve
 - effects of genetics on humankind's behavior over the millennia
 - methods humans used to evolve and change behavior
 - application of evolutionary principles to explain behavior and mental processes.
- _____ is a measure of the degree to which a characteristic is related to genetic versus environmental factors.
 - Heritability
 - Inheritance
 - Biological ratio
 - Genome biostatistics
- The term _____ refers to a process by which heritable traits that increase an organism's chances of survival or reproduction are favored over less beneficial traits.
 - natural selection
 - devolution
 - survival of the fittest
 - reproductive success

Think Critically

- Imagine that scientists were able to identify specific genes linked to serious criminal behavior. If it were possible to remove or redesign these genes, would you be in favor of this type of gene manipulation? Why or why not?
- Using an evolutionary perspective, can you explain why people are more likely to help family members than to help strangers?

realworldpsychology

Can our genes influence whom we vote for in presidential elections?

HINT: LOOK IN THE MARGIN FOR Q1

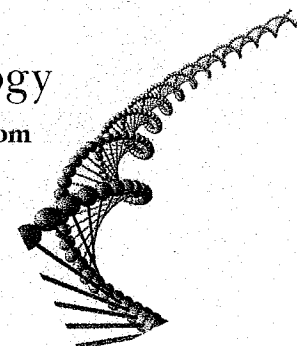
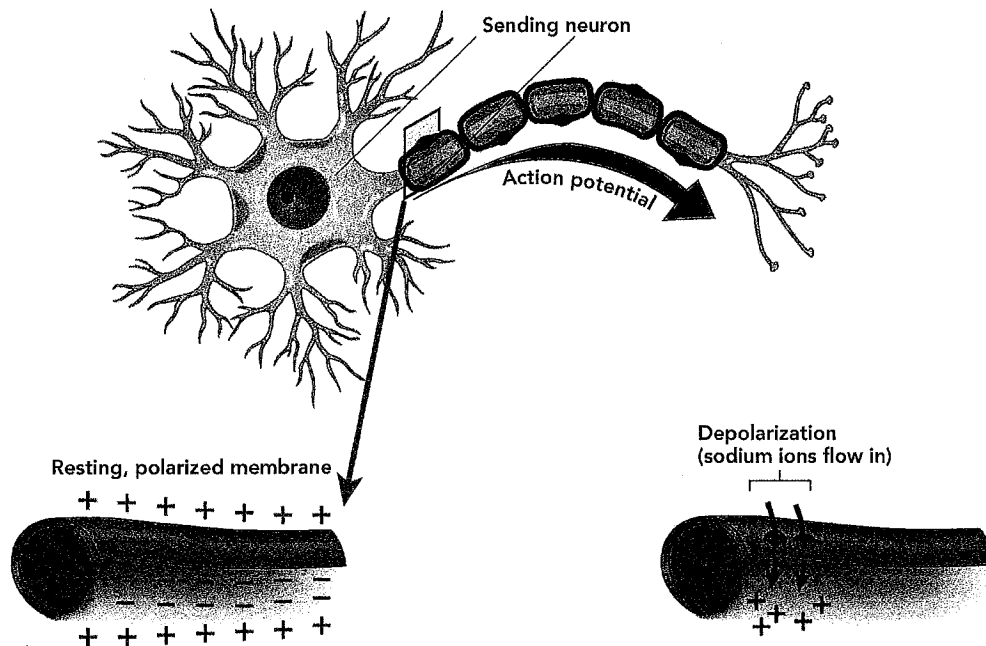


FIGURE 2.8 COMMUNICATION WITHIN THE NEURON

The process of neural communication begins within the neuron itself, when the dendrites and cell body receive information and conduct it toward the axon. From there, the information moves down the entire length of the axon via a brief traveling electrical charge called an *action potential*, which can be described in the following three steps:

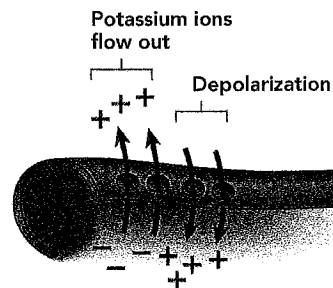


1 Resting potential

When an axon is not stimulated, it is in a polarized state, called the *resting potential*. "At rest," the fluid inside the axon has more negatively charged ions than the fluid outside. This results from the selective permeability of the axon membrane and a series of mechanisms, called *sodium-potassium pumps*, which pull potassium ions in and pump sodium ions out of the axon. The inside of the axon has a charge of about -70 millivolts relative to the outside.

2 Action potential initiation

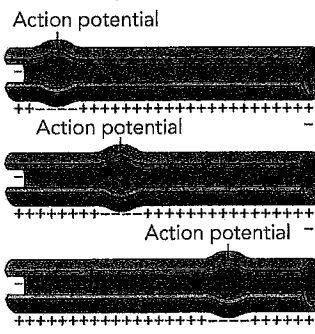
When an "at rest" axon membrane is stimulated by a sufficiently strong signal, it produces an action potential (or depolarization). This action potential begins when the first part of the axon opens its "gates" and positively charged sodium ions rush through. The additional sodium ions change the previously negative charge inside the axon to a positive charge—thus depolarizing the axon.



3 Spreading of action potential and repolarization

The initial depolarization (or action potential) of Step 2 produces a subsequent imbalance of ions in the adjacent axon membrane. This imbalance thus causes the action potential to spread to the next section. Meanwhile, "gates" in the axon membrane of the initially depolarized section open and potassium ions flow out, thus allowing the first section to repolarize and return to its resting potential.

Flow of depolarization



© ImageSource/SuperStock

Overall summary

The sequential process of depolarization and repolarization moving the action potential from the cell body to the terminal buttons is similar to fans at an athletic event doing the "wave." One section of fans first stands up and waves their arms (action potential initiation), then sits down (resting potential), and then the "wave" spreads on. Note that this is an "all-or-nothing" event.

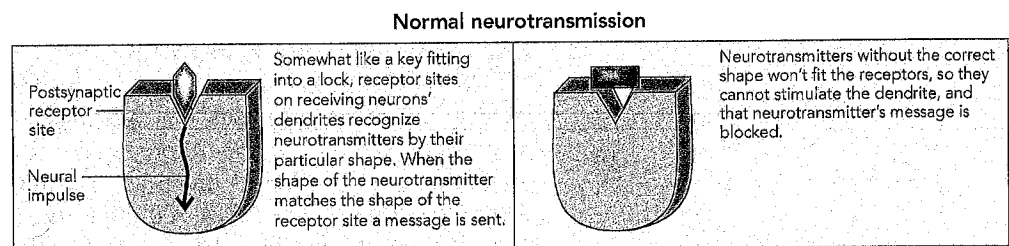
FIGURE 2.10 HOW POISONS AND DRUGS AFFECT OUR BRAINS | psychology and you

Foreign chemicals, like poisons and drugs, can mimic or block ongoing actions of neurotransmitters, thus interfering with normal functions.



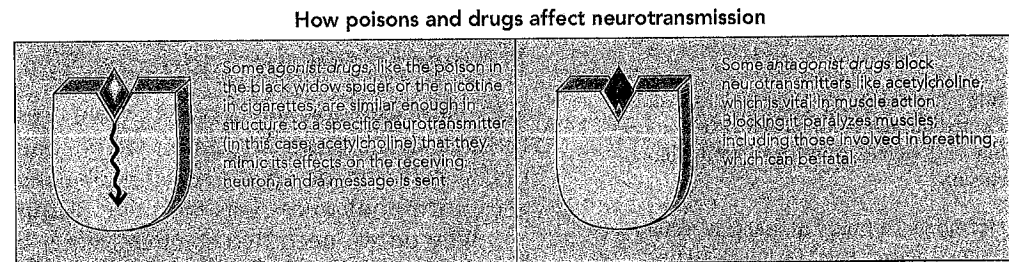
altrendo images/Stockbyte/Getty Images, Inc.

Most snake venom and some poisons, like *botulinum* toxin (Botox®), seriously affect normal muscle contraction. Ironically, these same poisons are sometimes used to treat certain medical conditions involving abnormal muscle contraction—as well as for some cosmetic purposes.



A Normal neurotransmitter activation

B Blocked neurotransmitter activation



C Agonist drug "mimics" neurotransmitter

D Antagonist drug fills receptor space and blocks neurotransmitter

whereas between neurons the messages are carried across the *synaptic gap* via chemicals called **neurotransmitters**.

Researchers have discovered hundreds of substances that function as neurotransmitters. For example, some **agonist drugs** enhance or "mimic" the action of particular neurotransmitters, whereas **antagonist drugs** block or inhibit the effects (Figure 2.10)

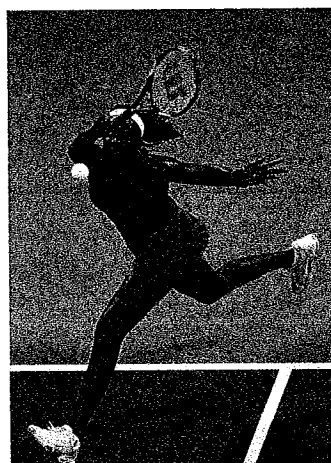
One benefit of studying the brain and its neurotransmitters is that it will help us understand some common medical problems. For example, we know that decreased levels of the neurotransmitter dopamine are associated with Parkinson's disease (PD), whereas excessively high levels of dopamine appear to contribute to some forms of schizophrenia. **Table 2.1** presents additional examples of the better-understood neurotransmitters.

Neurotransmitter A chemical messenger released by neurons that travels across the synapse and allows neurons to communicate with one another.

Agonist drug A substance that mimics and enhances a neurotransmitter's effect.

Antagonist drug A substance that blocks normal neurotransmitter functioning.

TABLE 2.1 HOW NEUROTRANSMITTERS AFFECT US



AP/Wide World Photos

Which neurotransmitters best explain this professional tennis player's skills, or those involved in your own athletic abilities?

Neurotransmitter	Known or Suspected Effects
Acetylcholine (ACh)	Muscle action, learning, memory, REM (rapid-eye-movement) sleep, emotion; decreased ACh plays a suspected role in Alzheimer's disease
Dopamine (DA)	Movement, attention, memory, learning, and emotion; excess DA associated with schizophrenia; too little DA linked with Parkinson's disease; also plays a role in addiction and the reward system
Endorphins	Mood, pain, memory, learning, blood pressure, appetite, and sexual activity
Epinephrine (or adrenaline)	Emotional arousal, memory storage, and metabolism of glucose necessary for energy release
GABA (gamma-aminobutyric acid)	Neural inhibition in the central nervous system; tranquilizing drugs, like Valium, increase GABA's inhibitory effects and thereby decrease anxiety
Norepinephrine (NE) [or noradrenaline (NA)]	Learning, memory, dreaming, emotion, waking from sleep, eating, alertness, wakefulness, reactions to stress; low levels of NE associated with depression; high levels of NE linked with agitated, manic states
Serotonin	Mood, sleep, appetite, sensory perception, arousal, temperature regulation, pain suppression, and impulsivity; low levels of serotonin associated with depression

In addition, neurotransmitters are released from a neuron's terminal buttons into the **synapse**, a small open gap between neurons. In contrast, hormones are released from endocrine glands directly into our bloodstream. The messages are then carried by the blood throughout our bodies to any cell that will listen. Like our global e-mail recipients who may forward our message on to other people, messages from hormones are often forwarded on to other parts of the body. For example, a small part of the brain called the hypothalamus releases hormones that signal the pituitary (another small brain structure), which in turn stimulates or inhibits the release of other hormones.

Our hormone-releasing endocrine system has several important functions. It helps regulate long-term bodily processes, such as growth and sexual characteristics. It also maintains ongoing bodily processes, such as digestion and elimination. Finally, hormones control the body's response to emergencies. In times of crisis, the hypothalamus sends messages through two pathways—the neural system and the endocrine system (primarily the pituitary gland). The pituitary sends hormonal messages to the adrenal glands (located right above the kidneys). The adrenal glands then release *cortisol*, a stress hormone that boosts energy and blood sugar levels, *epinephrine* (commonly called adrenaline), and *norepinephrine* (or nonadrenaline). (Remember that these same chemicals also can serve as neurotransmitters.)

Synapse The gap between the axon tip of the sending neuron and the dendrite and/or cell body of the receiving neuron; during an action potential, neurotransmitters are released and flow across the synapse.

RETRIEVAL PRACTICE: NEURAL BASES OF BEHAVIOR

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

- An action potential is _____.
 - the likelihood that a neuron will take action when stimulated
 - the tendency for a neuron to be potentiated by neurotransmitters
 - a neural impulse that carries information along the axon of a neuron
 - the firing of a nerve, either toward or away from the brain
- Too much of the neurotransmitter _____ may be related to schizophrenia, whereas too little may be related to Parkinson's disease.
 - acetylcholine
 - dopamine
 - norepinephrine
 - serotonin
- Chemicals manufactured by endocrine glands and circulated in the bloodstream to change or maintain bodily functions are called _____.
 - vasopressors
 - gonadotropins
 - hormones
 - steroids
- Chemical messengers that are released by axons and travel across the synapse are called _____.
 - chemical agonists
 - neurotransmitters
 - synaptic transmitters
 - neuroactivists

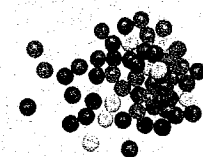
Think Critically

- Why is it valuable for scientists to understand how neurotransmitters work at a molecular level?
- What are some examples of how hormones affect your daily life?

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Why can spending the first few months of life in an orphanage lead to long-term problems in cognitive functioning?

How can a chemical in the brain lead rats to binge-eat M&Ms?



HINT: LOOK IN THE MARGIN FOR Q2 AND Q3

Central Nervous System (CNS)

The central nervous system (CNS) is the branch of the nervous system that makes us unique. Most other animals can smell, run, see, and hear far better than we can. But thanks to our CNS, we can process information and adapt to our environment in ways that no other animal can. Unfortunately, our CNS is also incredibly fragile. Unlike neurons in the PNS that can regenerate and require less protection, neurons in the CNS can suffer serious and permanent damage. However, the brain may not be as “hard wired” as we once thought.

Scientists long believed that after the first two or three years of life most animals, including humans, were unable to repair or replace damaged neurons in the brain or spinal cord. We now know that the brain is capable of lifelong **neuroplasticity** and **neurogenesis**.

Neuroplasticity

Rather than being a fixed, solid organ, the brain is capable of changing its structure and function as a result of usage and experience (Bowden et al., 2013; Marcotte et al., 2013). This “rewiring” is what makes our brains so wonderfully adaptive. For example, it makes it possible for us to learn a new sport or a foreign language.

Remarkably, this rewiring has even helped “remodel” the brain following strokes. Psychologist Edward Taub and his colleagues (2004, 2012) have had success working with stroke patients (**Figure 2.13**).

Neurogenesis

Our brains continually replace lost cells with new cells that originate deep within the brain and migrate to become part of its circuitry. The source of these newly created cells is neural **stem cells**—rare, immature cells that can grow and develop into any type of cell. Their fate depends on the chemical signals they receive. Experiments and clinical trials on both human and nonhuman animals have used stem cells for bone marrow transplants, and to repopulate or replace cells devastated by injury or disease. This research offers hope to patients suffering from strokes, Alzheimer’s, Parkinson’s, epilepsy, stress, and depression (e.g., Austin & Rini, 2013; Inden et al., 2013; Kim et al., 2013; Yin et al., 2012). In addition, stem cell injections into the eyes of patients with untreatable eye diseases and severe visual problems have led to dramatic improvements in vision (Schwartz et al., 2012).

realworldpsychology

Stem Cell Therapy Will stem cell transplants allow people paralyzed from spinal cord injuries to walk again? Scientists have had some success transplanting stem cells into spinal cord-injured nonhuman animals (Cusimano et al., 2012; Lee et al., 2011; Rossi, 2011; Sieber-Blum, 2010; Wang et al., 2013). When the damaged spinal cord was viewed several weeks later, the implanted cells had survived and spread throughout the injured area. More important, the transplant animals also showed some improvement in previously paralyzed parts of their bodies. Medical researchers have also recently begun testing the safety of embryonic stem cell therapy for human paralysis patients, and future trials may determine whether these cells will repair damaged spinal cords and/or improve sensation and movement in paralyzed areas (Conger, 2011; Curt et al., 2012; Robbins, 2013).



Courtesy Taub Therapy Clinic/UAB Media Relations

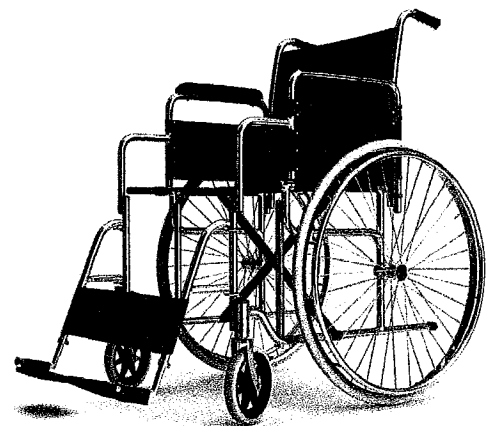
FIGURE 2.13 A BREAKTHROUGH IN NEUROSCIENCE

By immobilizing the unaffected arm or leg and requiring rigorous and repetitive exercise of the affected limb, psychologist Edward Taub and colleagues “recruit” stroke patients’ intact brain cells to take over for damaged cells. The therapy has restored function in some patients as long as 21 years after their strokes.

Neuroplasticity The brain’s ability to reorganize and change its structure and function throughout the life span.

Neurogenesis The process by which new neurons are generated.

Stem cells Immature (uncommitted) cells that have the potential to develop into almost any type of cell, depending on the chemical signals they receive.



© 26ISO/Stockphoto

We're all born with numerous reflexes, many of which fade over time (**Figure 2.15**). But even as adults, we still blink in response to a puff of air in our eyes, gag when something touches the back of the throat, and urinate and defecate in response to pressure in the bladder and rectum.

psychology and you **Sexual Response Reflexes** Reflexes even influence our sexual responses. Certain stimuli, such as the stroking of the genitals, can lead to arousal and the reflexive muscle contractions of orgasm in both men and women. However, in order for us to have the passion, thoughts, and emotion we normally associate with sex, the sensory information from the stroking and orgasm must be carried by the spinal cord to the appropriate areas of the brain that receive and interpret these specific sensory messages.



Kovalchynsky Mykola/Shutterstock

Peripheral Nervous System (PNS)

The peripheral nervous system (PNS) is just what it sounds like—the part that involves nerves *peripheral* to (or outside) the brain and spinal cord. The chief function of the peripheral nervous system (PNS) is to carry information to and from the central nervous system (CNS). It links the brain and spinal cord to the body's sense receptors, muscles, and glands.

The PNS is subdivided into the somatic nervous system and the autonomic nervous system. The **somatic nervous system (SNS)** consists of all the nerves that connect to sensory receptors and skeletal muscles. The name comes from the term *soma*, which means “body,” and the somatic nervous system plays a key role in communication throughout the entire body. In a kind of two-way street, the somatic nervous system (also called the skeletal nervous system) first carries sensory information to the brain and spinal cord (CNS) and then carries messages from the CNS to skeletal muscles.

Somatic nervous system (SNS) A subdivision of the peripheral nervous system (PNS) that connects the central nervous system (CNS) to sensory receptors and controls skeletal muscles.

Think Critically

- 1 What might happen if infants lacked these reflexes?
- 2 Can you explain why most infant reflexes disappear within the first year?

FIGURE 2.15 TESTING FOR REFLEXES | psychology and you

If you have a newborn or young infant in your home, you can easily (and safely) test for these simple reflexes. (Most infant reflexes disappear within the first year of life. If they reappear in later life, it generally indicates damage to the central nervous system.)



A Rooting reflex

Lightly stroke the cheek or side of the mouth, and watch how the infant automatically (reflexively) turns toward the stimulation and attempts to suck.



B Grasping reflex

Place your finger or an object in the infant's palm and note the automatic grasp.



C Babinski reflex

Lightly stroke the sole of the infant's foot, and the big toe will move toward the top of the foot, while the other toes fan out.

Photos by Eunice Leaver-Mavrides/Courtesy Catherine Sanderson

FIGURE 2.17 AUTONOMIC NERVOUS SYSTEM AND SEXUAL AROUSAL | psychology and you

The complexities of sexual interaction—and, in particular, the difficulties couples sometimes have in achieving sexual arousal or orgasm—illustrate the balancing act between the sympathetic and parasympathetic nervous systems.



Piotr Marcinski/Shutterstock

A Parasympathetic dominance

Sexual arousal and excitement require that the body be relaxed enough to allow increased blood flow to the genitals—in other words, the nervous system must be in *parasympathetic dominance*. Parasympathetic nerves carry messages from the central nervous system directly to the sexual organs, allowing for a localized response (increased blood flow and genital arousal).



© 4774344sean/iStockphoto

B Sympathetic dominance

During strong emotions, such as anger, anxiety, or fear, the body shifts to *sympathetic dominance*, which causes blood flow to the genitals and other organs to decrease because the body is preparing for “fight or flight.” As a result, the person is unable (or less likely) to become sexually aroused. Any number of circumstances—performance anxiety, fear of unwanted pregnancy or disease, or tensions between partners—can trigger sympathetic dominance.



Voices from the Classroom

Burn Prevention—Thanks to the CNS and PNS To explain the importance of how well the CNS and PNS communicate with one another, I often ask my students to raise their hands if they have ever have been burned. Every student, every single time raises his or her hand. But, hands quickly drop when I ask, “How many have been burned more than 20 times?” Ultimately, I’m left only with people who work in environments with hot stimuli (i.e., bakers, cooks, welders, etc.). I explain that during the process of being burned, our PNS does an excellent job of sending info about hot stimuli sensed from the five senses to the CNS. The CNS then quickly learns to associate and detect hot stimuli picked up by the PNS: from the sounds of boiling water, the feel the heat from a red hot stove surface, the smell of something burning, to recognizing the flicking shadows of a flame. Once we’ve learned these associations between “hot stimuli” and being burned, getting burned again is a rare experience—thanks to the excellent relay system between the CNS and PNS!

Professor R. D. Landis

Weatherford Community College

Weatherford, Texas

tissue to study the effects on behavior and mental processes). By the mid-1800s, this research had produced a basic map of the nervous system, including some areas of the brain. Early researchers also relied on clinical observations and case studies of living people who had experienced injuries, diseases, and disorders that affected brain functioning.

Modern researchers still use such methods, but they also employ other techniques to examine biological processes that underlie our behavior (**Table 2.2**). For example, recent advances in brain science have led to various types of brain-imaging scans, which can be used in both clinical and laboratory settings. Most of these methods are relatively *noninvasive*—that is, their use does not involve breaking the skin or entering the body.

Brain Organization

Having studied the tools scientists use for exploring the brain, we can now begin our tour. Let's talk first about brain size and complexity, which vary significantly from species to species. For example, fish and reptiles have smaller, less complex brains than do cats and dogs. The most complex brains belong to whales, dolphins, and higher primates, such as chimps, gorillas, and humans. The billions of neurons that make up the human brain control much of what we think, feel, and do. Certain brain structures are specialized to perform certain tasks, a process known as *localization of function*. However, most parts of the brain perform integrating, overlapping functions.



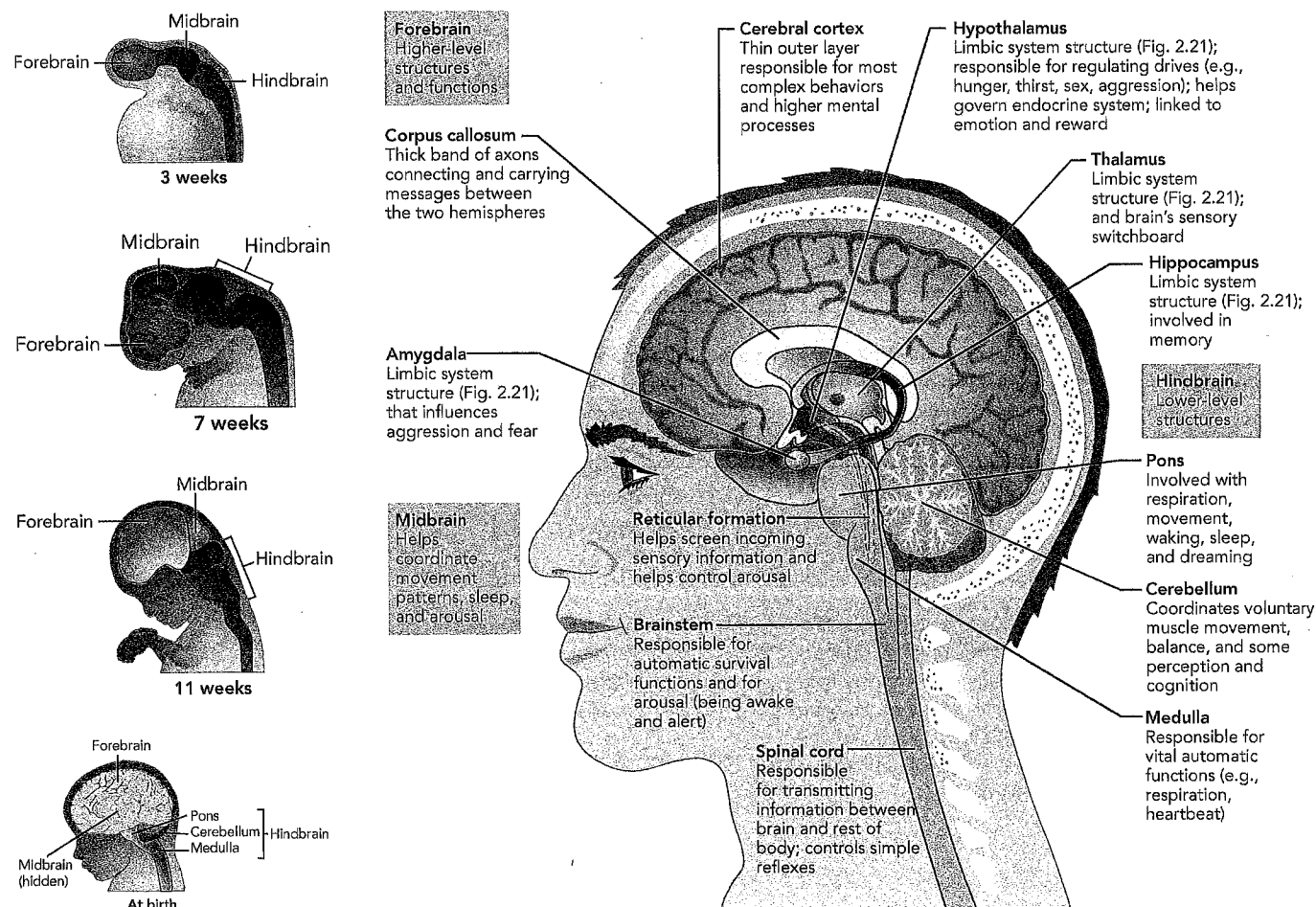
Science Pictures Limited/Photo Researchers

A photo of the human brain

This deceased human's brain is sliced down the center, split into right and left halves. Like the diagram below, only the right half of the brain is shown in this photo.

FIGURE 2.18 THE HUMAN BRAIN

Note on the left side of this figure how the forebrain, midbrain, and hindbrain radically change in their size and placement during prenatal development. The profile drawing in the middle highlights key structures and functions of the right half of the adult brain. As you read about each of these structures, keep this drawing in mind and refer to it as necessary. (The diagram shows the brain structures as if the brain were split vertically down the center and the left hemisphere were removed.)



Hindbrain

You're asleep and in the middle of a frightening nightmare. Your heart is racing, your breathing is rapid, and you're attempting to run away but find you can't move! Suddenly, your nightmare is shattered by a buzzing alarm clock. All your automatic behaviors and survival responses in this scenario are controlled or influenced by parts of the hindbrain. The **hindbrain** includes the medulla, pons, and cerebellum.

The **medulla** is essentially an extension of the spinal cord, with many neural fibers passing through it carrying information to and from the brain. It also controls many essential automatic bodily functions, such as respiration and heart rate.

The **pons** is involved in respiration, movement, sleeping, waking, and dreaming (among other things). It also contains axons that cross from one side of the brain to the other (*pons* is Latin for “bridge”).

The cauliflower-shaped **cerebellum** (Latin for “little brain”) is, evolutionarily, a very old structure. It coordinates fine muscle movement and balance (**Figure 2.19**). Researchers using functional magnetic resonance imaging (fMRI) have shown that parts of the cerebellum also are important for memory, sensation, perception, cognition, language, learning, and even “multitasking” (e.g., Bellebaum & Daum, 2011; Eichenbaum, 2013; Manganello et al., 2013; Thompson, 2005; Wu et al., 2013).

Midbrain

The **midbrain** helps us orient our eye and body movements to visual and auditory stimuli, and it works with the pons to help control sleep and level of arousal. It also contains a small structure, the *substantia nigra*, that secretes the neurotransmitter dopamine. Parkinson's disease, an age-related degenerative condition, is related to the deterioration of neurons in the substantia nigra and the subsequent loss of dopamine.

Running through the core of the hindbrain, midbrain, and brainstem is the **reticular formation (RF)**. This diffuse, finger-shaped network of neurons helps screen incoming sensory information and alert the higher brain centers to important events. Without our reticular formation, we would not be alert or perhaps even conscious.

Hindbrain The lower or hind region of the brain; collection of structures including the medulla, pons, and cerebellum.

Medulla The hindbrain structure responsible for vital, automatic functions, such as respiration and heartbeat.

Pons The hindbrain structure involved in respiration, movement, waking, sleep, and dreaming.

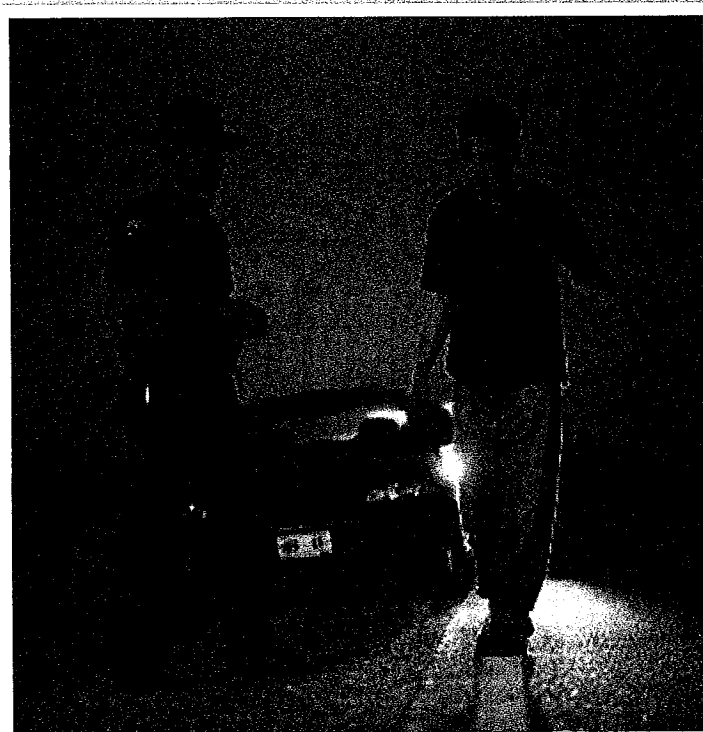
Cerebellum The hindbrain structure responsible for coordinating fine muscle movement, balance, and some perception and cognition.

Midbrain The collection of structures in the middle of the brain responsible for coordinating movement patterns, sleep, and arousal.

Reticular formation (RF) The diffuse set of neurons that helps screen incoming information and control arousal.

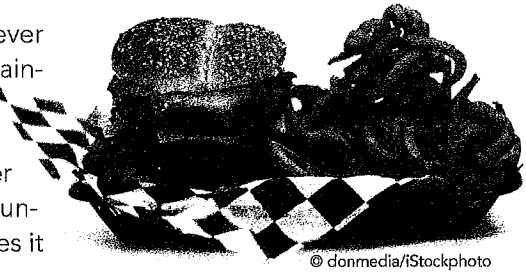
FIGURE 2.19 WALK THE LINE

Asking drivers to perform tasks like walking the white line is a somewhat common part of a field sobriety test for possible intoxication. Why? The cerebellum, responsible for smooth and precise movements, is one of the first areas of the brain to be affected by alcohol.



Bill Fritsch/Getty Images, Inc.

psychology and you **Diet and the Hypothalamus** Have you ever gone on a diet to try to lose weight or lost weight but then struggled to maintain your new weight? One of the reasons long-term weight loss is so hard for many people is that eating a high-fat diet can lead to long-term changes in the hypothalamus (Thaler et al., 2012). These changes make it harder for the body to regulate its weight, meaning that you will continue to feel hungry even when you have just eaten plenty of food. Sadly, this process makes it hard to stick to a diet and thereby increases the risk of obesity.



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Hanging down from the hypothalamus, the *pituitary gland* is usually considered the master endocrine gland because it releases hormones that activate the other endocrine glands. The hypothalamus influences the pituitary through direct neural connections and through release of its own hormones into the blood supply of the pituitary. The hypothalamus also directly influences some important aspects of behavior, such as eating and drinking patterns.

An interconnected group of forebrain structures, known as the **limbic system**, is located roughly along the border between the cerebral cortex and the lower-level brain structures (**Figure 2.21**). The limbic system is generally responsible for emotions, drives, and memory. In Chapter 7, you'll discover how the **hippocampus**, a key part of the limbic system, is involved in forming and retrieving our memories. However, the limbic system's major focus of interest is the **amygdala**, which is linked to the production and regulation of emotions—especially aggression and fear (Armony, 2013; LeDoux, 1998, 2002, 2007; Pinho et al., 2013; Whalen et al., 2013).

Another well-known function of the limbic system is its role as part of the so-called “pleasure center,” a set of brain structures whose stimulation leads to highly enjoyable feelings (Bjork et al., 2012; Kolb, 2013; Olds & Milner, 1954). Even though limbic system structures and neurotransmitters are instrumental in emotions, the frontal lobes of the cerebral cortex also play an important role.

Limbic system The interconnected group of forebrain structures involved with emotions, drives, and memory, as well as major physiological functions.

Hippocampus The sea-horse shaped part of the limbic system involved in forming and retrieving memories.

Amygdala A part of the limbic system that controls emotions, like aggression and fear, and the formation of emotional memory.

Cerebral cortex The thin surface layer on the cerebral hemispheres that regulates most complex behavior, including sensations, motor control, and higher mental processes.

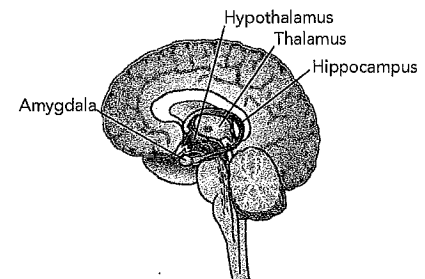


FIGURE 2.21 MAJOR BRAIN STRUCTURES COMMONLY ASSOCIATED WITH THE LIMBIC SYSTEM

The Cerebral Cortex

The gray, wrinkled **cerebral cortex**, the surface layer of the cerebral hemispheres, is responsible for most complex behaviors and higher mental processes. It plays such a vital role that many consider it the essence of life itself.

Although the cerebral cortex is only about one-eighth of an inch thick, it's made up of approximately 30 billion neurons and nine times as many glial cells. Its numerous wrinkles, called *convolutions*, significantly increase its surface area. Damage to the cerebral cortex is linked to numerous problems, including suicide, substance abuse, and dementia (McKee et al., 2012). Evidence suggests that such trauma is particularly common in athletes who experience head injuries in sports like football, ice hockey, boxing, and soccer (**Figure 2.22**).

Drew Hallowell/Philadelphia Eagles/Getty Images

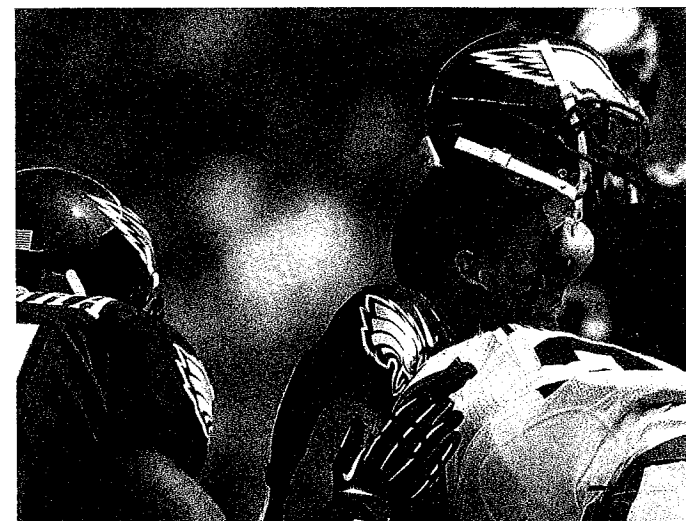


FIGURE 2.22 DAMAGE TO THE BRAIN realworldpsychology

On March 20, 2013, the owners of the National Football League voted to ban runners from leading with their helmets when they hit other players. This so-called “crown rule” is designed to help reduce concussions, as might have occurred on September 9, 2012, when Cleveland Browns running back Trent Richardson ran into Philadelphia Eagles safety Kurt Coleman, knocking his helmet into the air.

that damage to the frontal lobes (and other parts of the brain) may not be as permanent as we once thought—thanks to *neuroplasticity* and *neurogenesis*.

Temporal Lobes

The **temporal lobes** are responsible for hearing, language comprehension, memory, and some emotional control. The *auditory cortex*, which processes sound, is located at the top front of each temporal lobe. This area is responsible for receiving incoming sensory information and sending it on to the parietal lobes, where it is combined with other sensory information.

A part of the left temporal lobe called *Wernicke's area* aids in language comprehension. About a decade after Broca's discovery, German neurologist Carl Wernicke noted that patients with damage in this area could not understand what they read

Temporal lobes The two lobes on each side of the brain above the ears that are involved in audition (hearing), language comprehension, memory, and some emotional control.



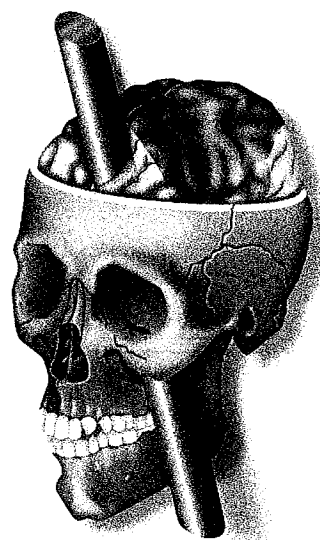
PSYCHSCIENCE

PHINEAS GAGE—MYTHS VERSUS FACTS

In 1848, a 25-year-old railroad foreman named Phineas Gage had a metal rod (13½ pounds, 3 feet 7 inches long, and 1¼ inches in diameter) accidentally blown through the front of his face, destroying much of his brain's left frontal lobe. Amazingly, Gage was immediately able to sit up, speak, and move around, and he did not receive medical treatment until about 1½ hours later. After his wound healed, he tried to return to work, but was soon fired. The previously friendly, efficient, and capable foreman was now "fitful, impatient, and lacking in deference to his fellows" (Macmillan, 2000). In the words of his friends: "Gage was no longer Gage" (Harlow, 1868).

This so-called "American Crowbar Case" is often cited in current texts and academic papers as one of the earliest in-depth studies of an individual's survival after massive damage to the brain's frontal lobes. The evidence is clear that Gage did experience several dramatic changes in his behavior and personality after the accident, but the extent and permanence of these changes are in dispute. Most accounts of post-accident Gage report him as impulsive and unreliable until his death. However, more reliable evidence later showed that Gage spent many years driving stagecoaches—a job that required high motor, cognitive, and interpersonal skills (Macmillan, 2000, 2008; Macmillan & Lena, 2010).

So why bother reporting this controversy? As you'll note throughout this text, we discuss several popular misconceptions in psychology in order to clarify and correct them. Phineas Gage's story is particularly important because it highlights how a small set of reliable facts can be distorted and shaped to fit existing beliefs and scientific theories. For example, at the time of Gage's accident, little was known about how the brain functions, and damage to it was believed to be largely irreversible. Can you see how our current research techniques (e.g., Van Horn et al., 2012), along with our new understanding of *neurogenesis* and *neuroplasticity*, might now explain the previously ignored evidence of Gage's significant recovery in later life?



RESEARCH CHALLENGE

- 1 Based on the information provided, did the researchers in this study of Phineas Gage use descriptive, correlational, and/or experimental research?
- 2 If you chose:
 - descriptive research, is this a naturalistic observation, survey/interview, case study, or archival research?
 - correlational research, is this a positive, negative, or zero correlation?
 - experimental research, label the IV, DV, experimental group(s), and control group.

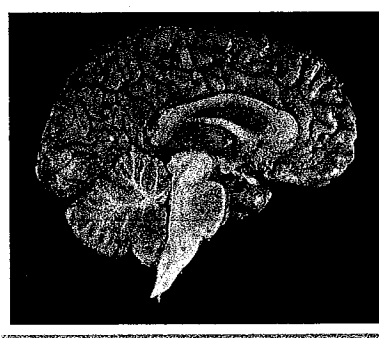
>>CHECK YOUR ANSWERS IN APPENDIX B.

NOTE: The information provided in this study is admittedly limited, but the level of detail is similar to what is presented in most textbooks and public reports of research findings. Answering these questions, and then comparing your answers to those in the Appendix, will help you become a better critical thinker and consumer of scientific research.

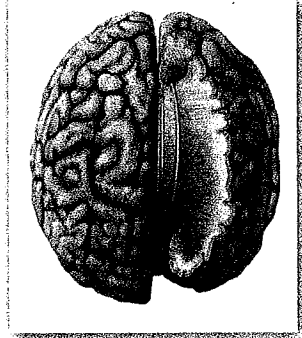
FIGURE 2.26 VIEWS OF THE CORPUS CALLOSUM

In the photo on the left, a human brain was sliced vertically from the top to the bottom to expose the corpus callosum, which conveys information between the two hemispheres of the cerebral cortex. In the illustration on the right, a brain was cut horizontally, which shows how fibers, or *axons*, of the corpus callosum link to both the right and left hemispheres. Note: The deep, extensive cuts shown in these photos are to reveal the corpus callosum. In split-brain surgeries on live patients, only fibers within the corpus callosum itself are cut.

Martin M. Rotter/SPL/Photo Researchers, Inc.



© Carol Donner/PhotoakeUSA.com



Two Brains in One?

We mentioned earlier that the brain's left and right cerebral hemispheres control opposite sides of the body. Each hemisphere also has separate areas of specialization. This is another example of localization of function, technically referred to as *lateralization*.

Early researchers believed the right hemisphere was subordinate or nondominant to the left, with few special functions or abilities. In the 1960s, landmark **split-brain surgeries** began to change this view.

The primary connection between the two cerebral hemispheres is a thick, ribbon-like band of neural fibers under the cortex called the **corpus callosum** (Figure 2.26). In some rare cases of severe epilepsy, when other forms of treatment have failed, surgeons cut the corpus callosum to stop the spread of epileptic seizures from one hemisphere to the other. Because this operation cuts the only direct communication link between the two hemispheres, it reveals what each half of the brain can do in isolation from the other. The resulting research has profoundly improved our understanding of how the two halves of the brain function.

For example, when someone has a brain stroke and loses his or her ability to speak, we know this generally points to damage on the left hemisphere, because this is where *Broca's area*, which controls speech production, is located (refer back to Figure 2.24). However, we now know that when specific regions of the brain are injured or destroyed their functions can sometimes be picked up by a neighboring region—even the opposite hemisphere.

Split-brain surgery The cutting of the corpus callosum to separate the brain's two hemispheres; used medically to treat severe epilepsy; also provides information on the functions of the two hemispheres.

Corpus callosum A bundle of neural fibers that connects the brain's two hemispheres.

realworldpsychology The Myth of the "Neglected Right Brain"

Popular accounts of split-brain research have led to some exaggerated claims and unwarranted conclusions about differences between the left and right hemispheres. For example, courses and books directed at "right-brain thinking" and "drawing on the right side of the brain" often promise to increase our intuition, creativity, and artistic abilities by "waking up" our neglected and underused right brain. Contrary to this myth, research has clearly shown that the two hemispheres work together in a coordinated, integrated way, each making important contributions (Barnes, 2013).

If you are a member of a soccer or basketball team, you can easily understand this principle. Just as you and your teammates often specialize in different jobs, such as offense and defense, the hemispheres also somewhat divide their workload. However, like good team players, each of the two hemispheres is generally aware of what the other is doing.



© Debbi Smimoff/iStockphoto

Although most split-brain surgery patients generally show very few outward changes in their behavior, other than fewer epileptic seizures, the surgery does create a few unusual responses. For example, one split-brain patient reported that when he dressed himself, he sometimes pulled his pants down with his left hand and up with his right (Gazzaniga, 2009). The subtle changes in split-brain patients normally

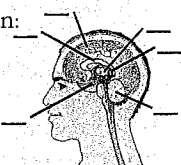
RETRIEVAL PRACTICE: A TOUR THROUGH THE BRAIN

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

1. Label the following structures/areas of the brain:

- | | |
|--------------------|--------------------|
| a. corpus callosum | b. amygdala |
| c. cerebellum | d. thalamus |
| e. hippocampus | f. cerebral cortex |



2. Label the four lobes of the brain:

- | | |
|-------------|--------------|
| a. frontal | b. parietal |
| c. temporal | d. occipital |



3. The _____ lobes are largely responsible for motor control, speech production, and higher functions, such as thinking, personality, and memory.

- | | |
|-------------|--------------|
| a. cortical | b. frontal |
| c. parietal | d. occipital |

4. Although the left and right hemispheres sometimes perform different, specialized functions, they are normally in close communication and share functions, thanks to the _____.

- | | |
|---------------|-------------------------------|
| a. thalamus | b. sympathetic nervous system |
| c. cerebellum | d. corpus callosum |

Think Critically

1 Imagine that you are giving a speech. Name the cortical lobes involved in the following behaviors:

- | | |
|---|---|
| a. Seeing faces in the audience | b. Hearing questions from the audience |
| c. Remembering where your car is parked when you are ready to go home | d. Noticing that your new shoes are too tight and hurting your feet |

2 What are some everyday examples of the different functions of the two hemispheres?

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Why are former NFL athletes at increased risk of depression, dementia, and suicide?



HINT: LOOK IN THE MARGIN FOR 

Summary

1 OUR GENETIC INHERITANCE

36

- Neuroscience/biopsychology studies how biological processes relate to behavioral and mental processes.
- **Genes** (dominant or recessive) hold the code for inherited traits. **Behavioral geneticists** use studies of twins and families with biological and adopted children to help determine **heritability**, the relative influences of heredity and environment on various traits.
- **Evolutionary psychology** suggests that many behavioral commonalities emerged and remain in human populations through **natural selection** because they helped ensure our "genetic survival."

2 NEURAL BASES OF BEHAVIOR

40

- **Neurons**, supported by **glial cells**, receive and send electrochemical signals to other neurons and to the rest of the body. Their major components are **dendrites**, a **cell body**, and an **axon**.

- Within a neuron, a neural impulse, or **action potential**, moves along the axon. Neurons communicate with each other using **neurotransmitters**, which are released at the **synapse** and attach to the receiving neuron. Neurons receive input from many synapses. Hundreds of different neurotransmitters regulate a wide variety of physiological processes. Many **agonist** and **antagonist drugs** and poisons act by mimicking or interfering with neurotransmitters.
- The **endocrine system** uses **hormones** to broadcast messages throughout the body. The system regulates long-term bodily processes, maintains ongoing bodily processes, and controls the body's response to emergencies.

3 NERVOUS SYSTEM ORGANIZATION

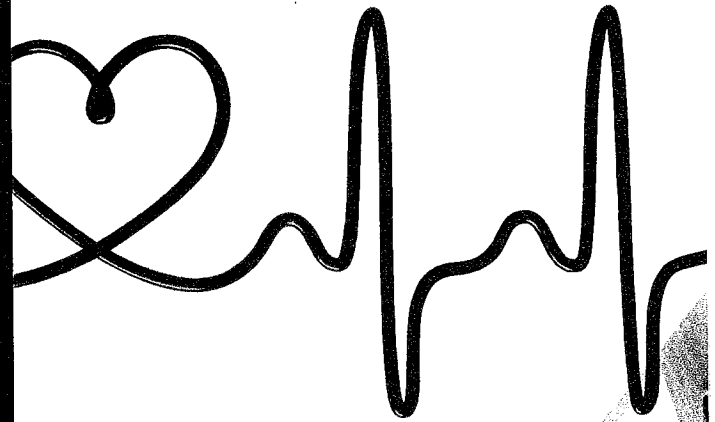
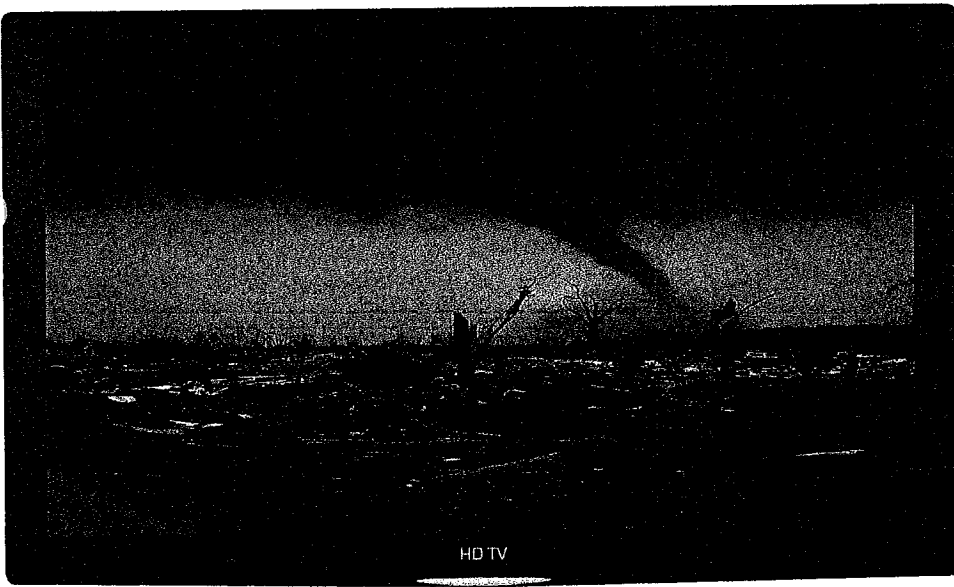
46

- The **central nervous system (CNS)** includes the brain and spinal cord. The CNS allows us to process information and adapt to our environment in ways that no other animal can. The spinal cord transmits information between the brain and the rest of the body, and it initiates involuntary **reflexes**. Although the CNS is

Key Terms

RETRIEVAL PRACTICE Write a definition for each term before turning back to the referenced page to check your answer.

- action potential 40
- agonist drug 43
- amygdala 57
- antagonist drug 43
- association areas 60
- autonomic nervous system (ANS) 50
- axon 40
- behavioral genetics 36
- cell body 40
- central nervous system (CNS) 46
- cerebellum 55
- cerebral cortex 57
- corpus callosum 61
- dendrites 40
- endocrine system 44
- endorphin 44
- evolutionary psychology 36
- forebrain 56
- frontal lobes 58
- gene 36
- glial cells 40
- heritability 38
- hindbrain 55
- hippocampus 57
- hormone 44
- hypothalamus 56
- limbic system 57
- medulla 55
- midbrain 55
- myelin sheath 42
- natural selection 39
- neurogenesis 47
- neuron 40
- neuroplasticity 47
- neurotransmitter 43
- occipital lobes 60
- parasympathetic nervous system 50
- parietal lobes 60
- peripheral nervous system (PNS) 46
- pons 55
- reflex 48
- reticular formation (RF) 55
- somatic nervous system (SNS) 49
- split-brain surgery 61
- stem cells 47
- sympathetic nervous system 50
- synapse 45
- temporal lobes 59
- thalamus 56



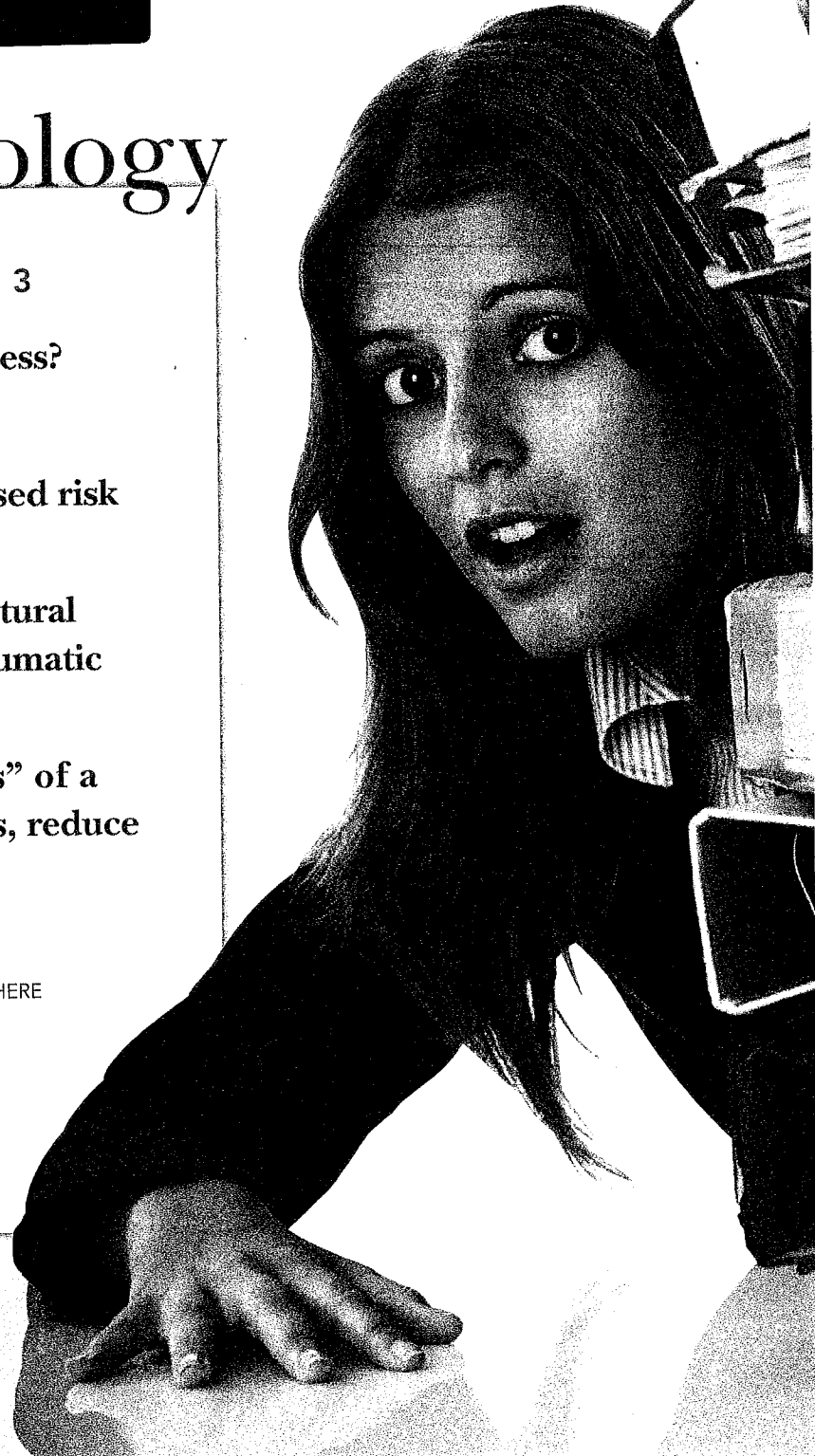
realworldpsychology

THINGS YOU'LL LEARN IN CHAPTER 3

- Q1 Does the use of social media lead to stress?
- Q2 Can loneliness make you sick?
- Q3 Are people with stressful jobs at increased risk of experiencing a heart attack?
- Q4 Does watching televised coverage of natural disasters increase symptoms of posttraumatic stress disorder?
- Q5 Could thinking about the “silver linings” of a stressful event, or sharing it with others, reduce depression?

THROUGHOUT THE CHAPTER, MARGIN ICONS FOR Q1–Q5 INDICATE WHERE THE TEXT ADDRESSES THESE QUESTIONS.

Erasing stress: © Ashumskiy/iStockphoto, Sad face and happy face: © Stepan Popov/iStockphoto, 3d smart phone with apps: ©3Dmask/iStockphoto, Flat screen tv: @luismmolina/iStockphoto, Tornado: ©Clint Spencer/iStockphoto, Stethoscope: @JuSun/iStockphoto, Business woman over worked: @erikreis/iStockphoto



TEST YOURSELF: MEASURING LIFE CHANGES

psychology and you

To score yourself on the Social Readjustment Rating Scale (SRRS), add up the “life change units” for all life events you have experienced during the last year and compare your score with the following standards: 0–150 = No significant problems; 150–199 = Mild life crisis (33% chance of illness); 200–299 = Moderate life crisis (50% chance of illness); 300 and above = Major life crisis (80% chance of illness).

Life Events	Life Change Units	Life Events	Life Change Units
Death of spouse	100	Trouble with in-laws	29
Divorce	73	Outstanding personal achievement	28
Marital separation	65	Spouse begins or stops work	26
Jail term	63	Begin or end school	26
Death of a close family member	63	Change in living conditions	25
Personal injury or illness	53	Revision of personal habits	24
Marriage	50	Trouble with boss	23
Fired at work	47	Change in work hours or conditions	20
Marital reconciliation	45	Change in residence	20
Retirement	45	Change in schools	20
Change in health of family member	44	Change in recreation	19
Pregnancy	40	Change in church activities	19
Sex difficulties	39	Change in social activities	18
Gain of a new family member	39	Mortgage or loan for lesser purchase (car, major appliance)	17
Business readjustment	39	Change in sleeping habits	16
Change in financial state	38	Change in number of family get- togethers	15
Death of a close friend	37	Change in eating habits	15
Change to different line of work	36	Vacation	13
Change in number of arguments with spouse	35	Christmas	12
Mortgage or loan for major purchase	31	Minor violations of the law	11
Foreclosure on mortgage or loan	30		
Change in responsibilities at work	29		
Son or daughter leaving home	29		

Source: Reprinted from the *Journal of Psychosomatic Research*, Vol. III; Holmes and Rahe: “The Social Readjustment Rating Scale,” 213–218, 1967, with permission from Elsevier.

But the SRRS is not foolproof. For example, it only shows a correlation between stress and illness; it does not prove that stress actually causes illnesses. Moreover, not all stressful situations are **cataclysmic events**, such as a terrorist attack, or single events like a death or a birth. **Chronic stress**, such as war, a bad marriage, poor working conditions, or a repressive political climate, can be significant, too (**Figure 3.2**) (Cardeña et al., 2013; Enoch, 2011; Filipović et al., 2013). Even persistent environmental noise is associated with measurable hormonal and brain changes (Fooladi, 2012). Interestingly, women with high levels of emotional exhaustion become more sensitive to sound after an acute stress task (Hasson et al., 2013).

Cataclysmic event A stressful occurrence that occurs suddenly and generally affects many people simultaneously.

Chronic stress A continuous state of arousal in which demands are perceived as greater than the inner and outer resources available for dealing with them.

abuse, alcoholism, and money problems can all place severe stress on a family (Aboa-Éboulé, 2008; Newman & Roberts, 2013; Rosenström et al., 2011).

Stress can also arise when we experience **conflict**—that is, when we are forced to make a choice between at least two incompatible alternatives. There are three basic types of conflict; **approach-approach**, **approach-avoidance**, and **avoidance-avoidance** (Table 3.1).

Generally, approach-approach conflicts are the easiest to resolve and produce the least stress. Avoidance-avoidance conflicts, on the other hand, are usually the most difficult and take the longest to resolve because either choice leads to unpleasant results. Furthermore, the longer any conflict exists, or the more important the decision, the more stress a person will experience.

The minor **hassles** of daily living also can pile up and become a major source of stress. We all share many hassles, such as time pressures and financial concerns. But our reactions to them vary. Persistent hassles can lead to a form of physical,

Conflict A forced choice between two or more incompatible goals or impulses.

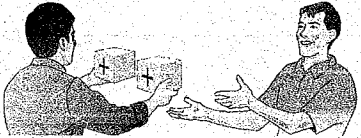
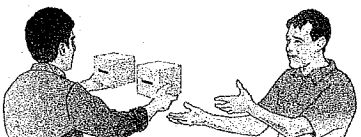
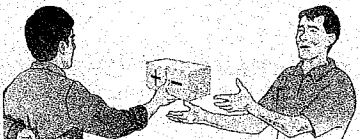
Approach-approach conflict The forced choice between two options, both of which have equally desirable characteristics.

Approach-avoidance conflict The forced choice within one option, which has equally desirable and undesirable characteristics.

Avoidance-avoidance conflict The forced choice between two options, both of which have equally undesirable characteristics.

Hassle Any small problem of daily living that accumulates and sometimes become a major source of stress.

TABLE 3.1 TYPES OF CONFLICT

Conflict	Description/Resolution	Example/Resolution
Approach-approach 	Forced choice between two options, both of which have equally desirable characteristics Generally easiest and least stressful conflict to resolve	Two equally desirable job offers, but you must choose one of them You make a pro/con list and/or "flip a coin" 
Avoidance-avoidance 	Forced choice between two options, both of which have equally undesirable characteristics Difficult, stressful conflict, generally resolved with a long delay and considerable denial	Two equally undesirable job offers, but you must choose one of them because you're broke You make a pro/con list and/or "flip a coin" and then delay the decision, hoping for additional job offers 
Approach-avoidance 	Forced choice within one option, which has equally desirable and undesirable characteristics Moderately difficult choice, often resolved with a partial approach	One high-salary job offer that requires you to relocate to an undesirable location away from all your friends and family You make a pro/con list and/or "flip a coin;" if you take the job, you decide to only live in the new location for a limited time (a partial approach) 

Think Critically

The expression on this man's face indicates that he's experiencing some form of conflict.

- 1 Can you explain how this could be both an avoidance-avoidance and/or an approach-avoidance conflict?
- 2 What might be the best way resolve this conflict?

Lisa Peardon/Taxi/Getty

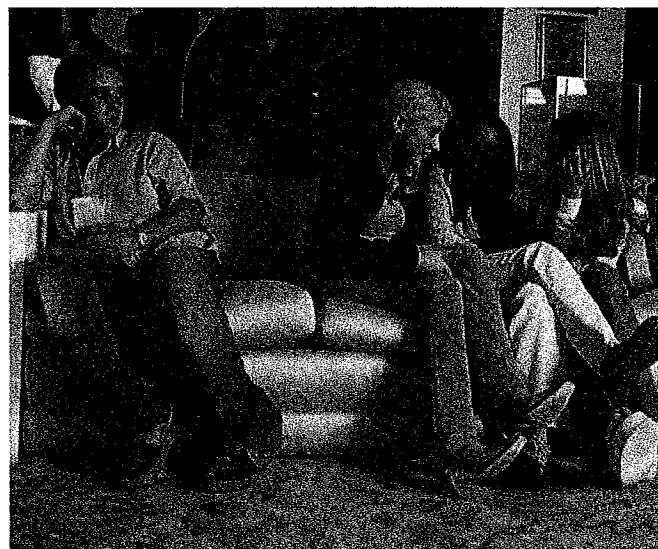
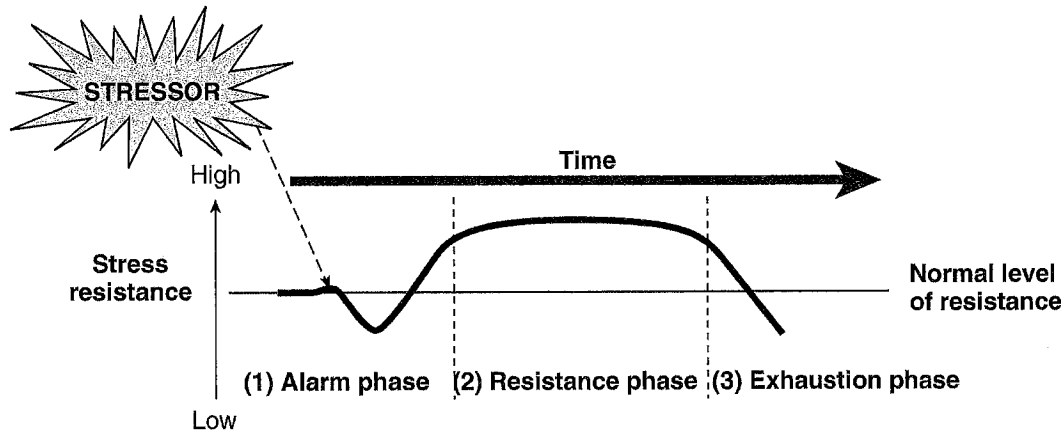


FIGURE 3.3 GENERAL ADAPTATION SYNDROME (GAS)

The three phases of this syndrome (*alarm*, *resistance*, and *exhaustion*) focus on the biological response to stress—particularly the “wear and tear” on the body that results from prolonged stress.

- 1 Alarm phase**
 When surprised or threatened, your body enters an alarm phase during which your resistance to stress is temporarily suppressed, while your arousal is high (e.g., increased heart rate and blood pressure) and blood is diverted to your skeletal muscles to prepare for “fight-or-flight” (Chapter 2).
- 2 Resistance phase**
 If the stress continues, your body rebounds to a phase of increased resistance. Physiological arousal remains higher than normal, and there is an outpouring of stress hormones. During this resistance stage, people use a variety of coping methods. For example, if your job is threatened, you may work longer hours and give up your vacation days.



- 3 Exhaustion phase**
 Your body's resistance to stress can only last so long before exhaustion sets in. During this final phase, you become more susceptible to serious illnesses, and to experience possibly irreversible damage to your body. Selye maintained that one outcome of this exhaustion phase for some people is the development of *diseases of adaptation*, including asthma, and high blood pressure. Unless a way of relieving stress is found, the eventual result may be complete collapse and death.

Some researchers believe these differences are hormonal in nature. Although oxytocin is released during stress in both men and women, the female's higher level of estrogen tends to enhance oxytocin, which results in more calming and nurturing feelings. In contrast, the hormone testosterone, which men produce in higher levels during stress, reduces the effects of oxytocin.

What is Selye's most important take-home message? *Our bodies are relatively well designed for temporary stress but poorly equipped for prolonged stress.* The same biological processes that are adaptive in the short run, such as the fight-or-flight response, can be hazardous in the long run (e.g., Dougall et al., 2013; Viena et al., 2012).

To understand these dangers, we need to first describe how our bodies (ideally) respond to stress. As you can see in **Figure 3.4**, once our brains identify a stressor, our **SAM** (sympatho-adreno-medullary) **system** and **HPA** (hypothalamic-pituitary-adrenocortical) **axis** then work together to increase our arousal and energy levels to deal with the stress. Once the stress is resolved, these systems turn off, and our bodies return to normal, baseline functioning, known as **homeostasis**.

Unfortunately, given our increasingly stressful modern lifestyle, our bodies are far too often in a state of elevated, chronic arousal, which can wreak havoc on our health. Some of the most damaging effects of stress are on our *immune system* and our *cognitive functioning*.

Stress and the Immune System

The discovery of the relationship between stress and our immune system has been very important. When people are under stress, the immune system is less able to regulate the normal inflammation system, which makes us more susceptible to diseases, such as cancer, bursitis, colitis, Alzheimer's disease, rheumatoid arthritis,

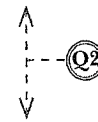
SAM system Our body's initial, rapid-acting stress response, involving the sympathetic nervous system and the adrenal medulla; called the sympatho-adreno-medullary (SAM) system.

HPA axis Our body's delayed stress response, involving the hypothalamus, pituitary, and adrenal cortex; also called the hypothalamic-pituitary-adrenocortical (HPA) axis.

Homeostasis Our body's tendency to maintain a relatively balanced and stable internal state, such as a constant internal temperature.

How does this happen? *Cortisol*, a key element of the HPA axis, plays a critical role in the long-term negative effects of stress. Although increased cortisol levels initially help us fight stressors, if these levels stay high, which occurs when stress continues over time, the body's disease-fighting immune system is suppressed. For example, one study found that people who are lonely—which is another type of chronic stressor—have an impaired immune response, leaving their bodies vulnerable to infections, allergies, and many of the other illnesses cited above (Jaremka et al., 2013).

Knowledge that psychological factors have considerable control over infectious diseases has upset the long-held assumption in biology and medicine that these diseases are strictly physical. The clinical and theoretical implications are so important that a new interdisciplinary field, called **psychoneuroimmunology**, has emerged (Stowell et al., 2013). It studies the effects of psychological and other factors on the immune system.



Psychoneuroimmunology The interdisciplinary field that studies the effects of psychological and other factors on the immune system.

Stress and Cognitive Functioning

What happens to our brain and thought processes when we're under immediate stress? As we've just seen, cortisol helps us deal with immediate dangers by mobilizing our energy resources. It also helps us create memories for short-term, highly emotional events, which explains the so-called *flashbulb memories* discussed in Chapter 7. Can you see why scientists believe that our increased memories for emotional events may have evolved to help us remember what to avoid or protect in the future?

realworldpsychology **Short-Term Stress** Although short-term stress can solidify our memories for highly emotional, “flashbulb” events, it also can interfere with the retrieval of existing memories, the laying down of new memories, and general information processing (Almela et al., 2011; Guenzel et al., 2013; Pechtel & Pizzagalli, 2011; Schwabe & Wolf, 2013). This interference with cognitive functioning helps explain why you may forget important information during a big exam and why people may become dangerously confused during a fire and be unable to find the fire exit. The good news is that once the cortisol washes out, memory performance generally returns to normal levels.



Luis Alvarez/Getty Images

What happens during prolonged stress? Long-term exposure to cortisol can permanently damage cells in the hippocampus, a key part of the brain involved in memory (Chapter 7). Furthermore, once the hippocampus has been damaged, it cannot provide proper feedback to the hypothalamus, so cortisol continues to be secreted, and a vicious cycle can develop (**Figure 3.5**).

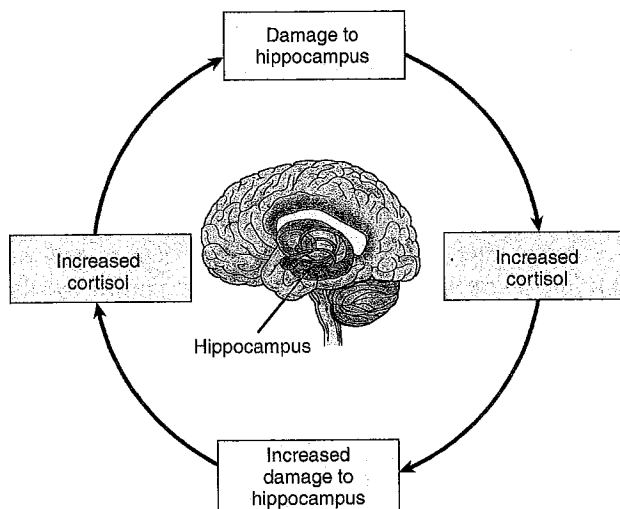


FIGURE 3.5 STRESS AND THE BRAIN

Cortisol released in response to stress damages the brain, triggering a vicious cycle.

evidence that stress can lead to ulcers. Studies found that people who live in stressful situations have a higher incidence of ulcers than people who don't. And numerous experiments with laboratory animals have shown that stressors, such as shock or confinement to a very small space for a few hours, can produce ulcers in some laboratory animals (Andrade & Graeff, 2001; Bhattacharya & Muruganandam, 2003; Gabry et al., 2002; Takahashi et al., 2012).

The relationship between stress and ulcers seemed well established until researchers identified a bacterium (*Helicobacter pylori*, or *H. pylori*) that appears to be associated with ulcers. Later studies confirmed that this bacterium clearly damages the stomach wall, and that antibiotic treatment helps many patients. However, approximately 75% of normal, healthy people's stomachs also have the bacterium. This suggests that the bacterium may cause the ulcer, but only in people who are compromised by stress. Furthermore, behavior modification and other psychological treatments, used alongside antibiotics, can help ease ulcers. In other words, although stress *by itself* does not cause ulcers, it is a contributing factor, along with biological factors (Fink, 2011).

Cancer

Cancer is among the leading causes of death for adults in the United States. It occurs when a particular type of primitive body cell begins rapidly dividing and then forms a tumor that invades healthy tissue. In a healthy person, whenever cancer cells start to multiply, the immune system checks the uncontrolled growth by attacking the abnormal cells (**Figure 3.6**). Unless destroyed or removed, the tumor eventually damages organs and causes death. More than 100 types of cancer have been identified. They appear to be caused by an interaction between environmental factors (such as diet, smoking, and pollutants) and inherited predispositions. *Psych Science* describes how one type of environmental factor, child abuse, contributes to the development of cancer.

Note that research does *not* support the popular myths that stress *causes* cancer or that positive attitudes can fight it off (Coyne & Tennen, 2010; Lilienfeld et al., 2010; Surtees et al., 2009). However, stress does increase the spread of cancer cells to other organs, including the bones, which decreases the likelihood of survival (Campbell et al., 2012).

But this is not to say that developing a positive attitude and reducing our stress levels aren't worthy health goals (Dempster et al., 2011; O'Brien & Moorey, 2010; Quick et al., 2013). As you read earlier, prolonged stress causes the adrenal glands to release hormones that negatively affect the immune system, and a compromised immune system is less able to resist infection or to fight off cancer cells (Bernabé et al., 2011; Flint et al., 2013; Hassan et al., 2013; Krukowski et al., 2011). For example, when researchers disrupted the sleep of 21 healthy people over a period of six weeks, they found increases in blood sugar and decreases in metabolism, which may lead to obesity as well as diabetes (Buxton et al., 2012).

psychology and you

Stress and Illness Think about a time when you were experiencing stress, such as studying for a difficult exam, having a fight with a loved one, or struggling to pay your bills. Both minor and major stressors can decrease the effectiveness of your immune system and thereby lead to both short- and long-term health problems.

You'll be happy to know about all of the available resources for coping with stress, in addition to sleep, that are listed at the end of this chapter. Keep in mind that reducing stress can, at least in some cases, have a substantial impact on psychological as well as physical health. For example, some research suggests that women with breast cancer who receive a psychological intervention to teach them strategies for reducing stress show an increase in quality of life as well as length of survival



FIGURE 3.6 THE IMMUNE SYSTEM IN ACTION

Stress can compromise the immune system, but the actions of a healthy immune system are shown here. The round red structures are leukemia cells. Note how the yellow killer cells are attacking and destroying the cancer cells.



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iStockphoto

Symptoms of such disease include *angina* (chest pain due to insufficient blood supply to the heart) and *heart attack* (death of heart muscle tissue).

When the body is stressed, the autonomic nervous system releases epinephrine (adrenaline) and cortisol into the bloodstream. These hormones increase heart rate and release fat and glucose from the body's stores to give muscles a readily available source of energy. If no physical fight-or-flight action is taken (and this is most likely the case in our modern lives), the fat that was released into the bloodstream is not burned as fuel. Instead, it may adhere to the walls of blood vessels. These fatty deposits are a major cause of blood-supply blockage, which, in turn, causes heart attacks.

Type A and Type B Behavior Patterns

The effects of stress on heart disease may be amplified if a person tends to be hard driving, competitive, ambitious, impatient, and hostile—a **Type A** behavior pattern. The opposite of the Type A pattern is the **Type B** behavior pattern, which is characterized by a laid-back, relaxed attitude toward life.

Among Type A characteristics, hostility is the strongest predictor of heart disease (Allan, 2011; Buneviciute et al., 2013; Mommersteeg & Pouwer, 2012). In particular, the constant stress associated with cynical hostility—constantly being “on watch” for problems—translates physiologically into higher blood pressure, heart rates, and levels of stress-related hormones. People who are hostile, suspicious, argumentative, and competitive also tend to have more interpersonal conflicts. This can heighten autonomic activation, leading to increased risk of cardiovascular disease (Boyle et al., 2004; Bunde & Suls, 2006; Haukkala et al., 2010; Williams, 2010).

Health psychologists have developed two types of behavior modification for Type A people. The shotgun approach aims to eliminate or modify all Type A behaviors. The major criticism of this approach is that it eliminates not only undesirable Type A behaviors but also desirable traits, such as ambition. In contrast, the target behavior approach focuses on only Type A behaviors that are likely to cause heart disease—namely, cynical hostility.

Positive Affect (Emotion)

Have you ever wondered why some people survive in the face of great stress (personal tragedies, demanding jobs, or an abusive home life) while others do not? One answer may be that these “survivors” have a unique trait called **positive affect**, meaning they have a sense of pleasure in their environment, including feelings of happiness, joy, enthusiasm, and contentment (**Figure 3.7**). Interestingly, people who are high in positive affect also experience fewer colds, strokes, and auto accidents (Kim & Park, 2012; Ostir et al., 2001; Pressman & Cohen, 2005).

Positive states are also associated with longer life expectancy. One study of more than 2,000 women found that those who are higher on extraversion and positive affect live on average 2 to 3 years longer than those who are low on these measures (Terracciano et al., 2008). Positive affect is even associated with a lower risk of mortality in patients with diabetes, which is a leading cause of death in the United States (Moskowitz et al., 2008).

Of course, having a Type A personality and lacking a positive affect are not the only risk factors associated with heart disease. Other factors include smoking, obesity, a high-fat diet, and lack of exercise (Go et al., 2013; Lim et al., 2013; Scarborough et al., 2012). In addition, a large, meta-analysis of the correlation between job strain and coronary heart disease found that people with stressful jobs are 23% more likely to experience a heart attack than those without stressful jobs (Kivimäki et al., 2012).

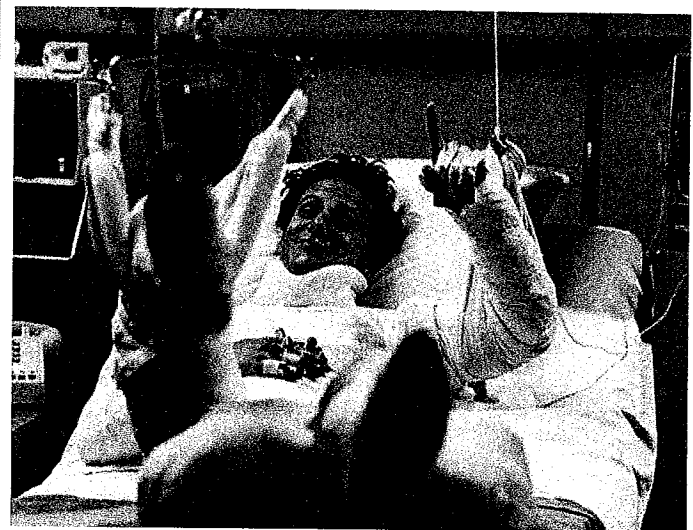
Type A A pattern of behaviors and emotions that includes intense ambition, competition, exaggerated time urgency, and a cynical, hostile outlook; hostility increases the risk of coronary heart disease.

Type B A pattern of behaviors and emotions, characterized by a laid-back, relaxed attitude toward life.

Positive affect Demonstrating a sense of pleasure in the environment, including feelings of happiness, joy, enthusiasm, and contentment.

FIGURE 3.7 POSITIVE PSYCHOLOGY IN ACTION

Based on his smile and cheery wave, it looks like this patient may be one of those lucky people with a naturally positive outlook on life. Can you see how this approach might help him cope and recuperate from his serious injuries?



Stuart Hughes/Corbis

TABLE 3.3 FIVE IMPORTANT TIPS FOR COPING WITH CRISIS

1. If you have experienced a traumatic event, recognize your feelings about the situation and talk to others about your fears. Know that these feelings are a normal response to an abnormal situation.
2. If you know someone who has been traumatized, be willing to patiently listen to their account of the event, pay attention to their feelings, and encourage them to seek counseling, if necessary.
3. Be patient with people. Tempers are short in times of crisis, and others may be feeling as much stress as you.
4. Recognize normal crisis reactions, such as sleep disturbances and nightmares, withdrawal, reversion to childhood behaviors, and trouble focusing on work or school.
5. Take time with your children, spouse, life partner, friends, and coworkers to do something you enjoy.

Source: American Counseling Association, 2006, and adapted from Pomponio, 2002.

RETRIEVAL PRACTICE: STRESS AND ILLNESS

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

1. Which of the following is true?
 - a. Stress is a leading cause of cancer.
 - b. Positive attitudes can prevent cancer.
 - c. Both of these options.
 - d. None of these options.
2. Stress may contribute to heart disease by releasing _____ and _____, which increase the level of fat in the blood.
 - a. angina; cortisol
 - b. hormones; GABA
 - c. cynical hostility; hormones
 - d. epinephrine (adrenaline); cortisol
3. Research suggests that one particular Type A characteristic is *most* associated with heart disease. What characteristic is this?
 - a. intense ambition
 - b. impatience
 - c. cynical hostility
 - d. time urgency
4. People who experience flashbacks, nightmares, and impaired functioning following a life-threatening or other horrifying event may be _____.
 - a. suffering from a psychosomatic illness
 - b. experiencing posttraumatic stress disorder
 - c. having a psychotic breakdown
 - d. weaker than people who take such events in stride

Think Critically

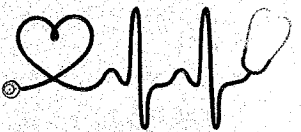
- 1 What does it mean to say that stress is a contributing factor to gastric ulcers?
- 2 At different times in your life, how has stress contributed to your own illnesses, and what can you do to avoid or decrease future illnesses?

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Are people with stressful jobs at increased risk of experiencing a heart attack?

Does watching televised coverage of natural disasters increase symptoms of posttraumatic stress disorder?

HINT: LOOK IN THE MARGIN FOR Q3 AND Q4



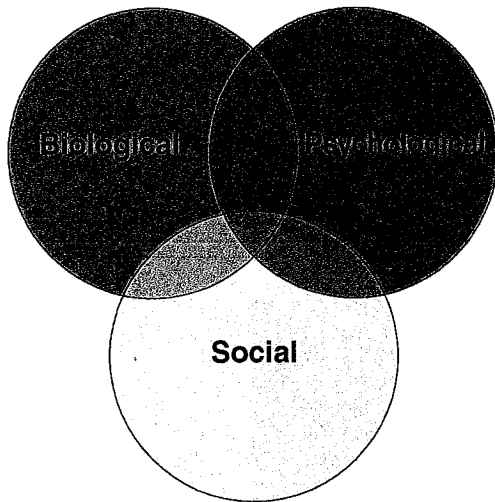


FIGURE 3.9 NICOTINE AND THE BIOPSYCHOSOCIAL MODEL

The three factors in the *biopsychosocial model* interact to help explain how smoking tobacco may lead to a serious, life-threatening addiction.

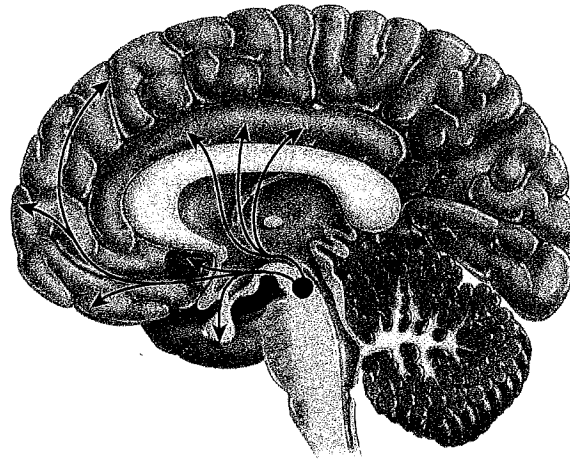


FIGURE 3.10 THE BRAIN'S REWARD CENTER PATHWAYS

Nicotine quickly increases the release of acetylcholine and norepinephrine in our brain, increasing alertness, concentration, memory, and feelings of pleasure. Nicotine also stimulates the release of dopamine, the neurotransmitter most closely related to reward centers in the brain (David et al., 2013; Lee & Messing, 2011; Marti et al., 2012).

In addition, to encouraging smokers to stop or to never start smoking, health psychologists also help people cope with conditions such as chronic pain, diabetes, and high blood pressure, as well as unhealthful behaviors such as inappropriate anger and/or lack of assertiveness. If you're interested in a career in this field, check with your college's counseling or career center, as well as the website www.wiley.com/college/huffman.

Coping with Stress

Because we can't escape stress, we need to learn how to effectively cope with it. Simply defined, *cop*ing is an attempt to manage stress in some effective way. It is not one single act but a process that allows us to deal with various stressors (Figure 3.11).

One of the biggest challenges during the process of coping is deciding whether to try to change the stressor itself or our emotional reactions to it. **Problem-focused coping** strategies work to deal directly with a stressor in order to eventually decrease or eliminate it (Graven & Grant, 2013; Jopp & Schmitt, 2010; Peng et al., 2012). We tend to choose this approach, and find it most effective, when we have some control over a stressful situation.

Many times, however, it seems that nothing can be done to alter the stressful situation, so we turn to **emotion-focused coping**, in which we attempt to relieve or regulate our emotional reactions. For example, suppose you were refused a highly desirable job. You might initially feel disappointed and/or rejected. But you could successfully cope with these feelings by reappraising the situation and deciding the job wasn't the right match for you or that you weren't really qualified or ready for it.

When faced with unavoidable stress, Freud believed that we often resort to **defense mechanisms**, in which we supposedly unconsciously distort reality to protect our egos and to avoid anxiety. Can you see how fantasizing about what you will do on your next vacation can help relieve stress? This shows how defense mechanisms can sometimes act as a beneficial type of emotion-focused coping. At other times, they can be destructive. For example, if we fail to get a highly coveted promotion at work, we may resort to elaborate excuses for our failure. This type of *rationalization* helps blunt the emotional impact of a stressful situation, but it also

Problem-focused coping The strategies we use to deal directly with a stressor to eventually decrease or eliminate it.

Emotion-focused coping The strategies we use to relieve or regulate the emotional impact of a stressful situation.

Defense mechanisms Freud's description of the strategies the ego supposedly uses to protect itself from anxiety, which distorts reality and may increase self-deception.

severe odds, as is often documented in news reports of people who have triumphed over seemingly unbeatable circumstances.

Similarly, having a good sense of humor is one of the best ways to reduce stress. The ability to laugh at oneself and at life's inevitable ups and downs allows us to relax and gain a broader perspective. In short: "Don't sweat the small stuff."

Perhaps one of the most important personal resources for stress management is a sense of personal control. People who believe they are the "masters of their own destiny" have what is known as an **internal locus of control**. Believing they control their own fate, they tend to make more effective decisions and healthier lifestyle changes, are more likely to follow treatment programs, and more often find ways to positively cope with a situation.

Conversely, people with an **external locus of control** believe that chance or outside forces beyond our control determine our fate. Therefore, they tend to feel powerless to change their circumstances, are less likely to make effective and positive changes, and are more likely to experience higher levels of stress (e.g., Bennett et al., 2013; Cheng et al., 2013; Rotter, 1966; Wulandari et al., 2013).

In addition to the individual's personality and internal resources, effective coping also depends on the available external resources. For example, recent research shows that **mindfulness-based stress reduction (MBSR)** programs are particularly effective in stress management and declines in mood disturbances. The practice of MBSR programs has even been linked to positive, and perhaps permanent brain changes (Hölzel et al., 2011; Hülshager et al., 2013; Roeser et al., 2013). Based on developing a state of consciousness that attends to ongoing events in a receptive and non-judgmental way, therapists have found MBSR programs useful for a variety of problems, most notably for anxiety- and stress-related disorders (Call et al., 2013). But it can be practiced by anyone.

One of the most effective and frequently overlooked external resources for stress management is *social support*. Having the support of others helps offset the stressful effects of divorce, the loss of a loved one, chronic illness, pregnancy, physical abuse, job loss, and work overload. When we are faced with stressful circumstances, our friends and family often help us take care of our health, listen, hold our hands, make us feel important, and provide stability to offset the changes in our lives. People who have greater social support also experience better health outcomes, including greater psychological well-being, greater physical well-being, faster recovery from illness, and a longer life expectancy (Creaven et al., 2013; Giles et al., 2005; Gremore et al., 2011; Slater et al., 2013).

Internal locus of control The belief that we control our own fate.

External locus of control The belief that chance or outside forces beyond our control determine our fate.

Mindfulness-based stress reduction (MBSR) A stress reduction strategy based on developing a state of consciousness that attends to ongoing events in a receptive and non-judgmental way.

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Surgery and Social Support

Did you know that individuals undergoing surgery who have high levels of social support experience less anxiety, receive lower doses of narcotics, and are released from the hospital 1.42 days faster than those with lower levels of support (Krohne & Slangen, 2005)? These findings help explain why married people live longer than unmarried people (Liu, 2009) and why people who experience a marital separation or divorce are at greater risk of an early death (Sbarra & Nieten, 2009). So what is the important take-home message from this emphasis on social support? *Don't be afraid to offer help and support to others and to ask for the same for yourself!*

Six additional external resources for healthy living and stress management are exercise, social skills, behavior change, stressor control, material resources, and relaxation (Archer, 2011; Chou et al., 2011; Krypel & Henderson-King, 2010; Marks et al., 2011; McLoyd, 2011; Quick et al., 2013). These resources are summarized in **Table 3.4** and *Psychology and You*.



Chris Schmidt/Getty Images

TEST YOURSELF: PRACTICING PROGRESSIVE RELAXATION

psychology and you

You can use progressive relaxation techniques anytime and anywhere you feel stressed, such as before or during an exam. Here's how:

1. Sit in a comfortable position, with your head supported.
2. Start breathing slowly and deeply.
3. Let your entire body relax. Release all tension. Try to visualize your body getting progressively more relaxed with each breath.
4. Systematically tense and release each part of your body, beginning with your toes. Curl them tightly while counting to 10. Now, release them. Note the difference between the tense and relaxed states. Next, tense your feet to the count of 10. Then relax them and feel the difference. Continue upward with your calves, thighs, buttocks, abdomen, back muscles, shoulders, upper arms, forearms, hands and fingers, neck, jaw, facial muscles, and forehead. Try practicing progressive relaxation twice a day for about 15 minutes each time. You will be surprised at how quickly you can learn to relax—even in the most stressful situations.

RETRIEVAL PRACTICE: HEALTH PSYCHOLOGY AND STRESS MANAGEMENT

Self-Test

Completing this self-test and comparing your answers with those in Appendix B provides immediate feedback and helpful practice for exams. Additional interactive, self-tests are available at www.wiley.com/college/huffman.

1. Which of the following is *true* of health psychology?
 - a. It studies the relationship between psychological behavior and physical health.
 - b. It studies the relationship between social factors and illness.
 - c. It emphasizes wellness and the prevention of illness.
 - d. All these statements are true.
2. Emotion-focused forms of coping are based on relieving or regulating our _____ when faced with stressful situations.
 - a. feelings
 - b. behavior
 - c. thoughts
 - d. all these options
3. Research suggests that people with a(n) _____ have less psychological stress than those with a _____.
 - a. external locus of control; internal locus of control
 - b. internal locus of control; external locus of control
 - c. attributional coping style; person-centered coping style
 - d. none of these options
4. Which of the following is *not* one of the ways to cope with stress outlined in the chapter?
 - a. exercise
 - b. sense of humor
 - c. social support
 - d. stimulant drugs

Think Critically

- 1 Why is it so difficult for people to quit smoking?
- 2 Which do you generally prefer: an emotion-focused style of coping or a problem-focused style of coping when faced with a stressful situation? Why?

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Could thinking about the “silver linings” of a stressful event, or sharing it with others, reduce depression?

HINT: LOOK IN THE MARGIN FOR Q5



Key Terms

RETRIEVAL PRACTICE Write a definition for each term before turning back to the referenced page to check your answer.

- approach–approach conflict 71
- approach–avoidance conflict 71
- avoidance–avoidance conflict 71
- burnout 72
- cataclysmic event 69
- chronic stress 69
- conflict 71
- defense mechanisms 83
- emotion-focused coping 83
- external locus of control 85
- frustration 72
- general adaptation syndrome (GAS) 72
- hassle 71
- health psychology 82
- homeostasis 73
- HPA axis 73
- internal locus of control 85
- mindfulness-based stress reduction (MBSR) 85
- positive affect 79
- posttraumatic stress disorder (PTSD) 80
- problem-focused coping 83
- psychoneuroimmunology 75
- SAM system 73
- stress 68
- stressor 68
- Type A behavior patterns 79
- Type B behavior patterns 79