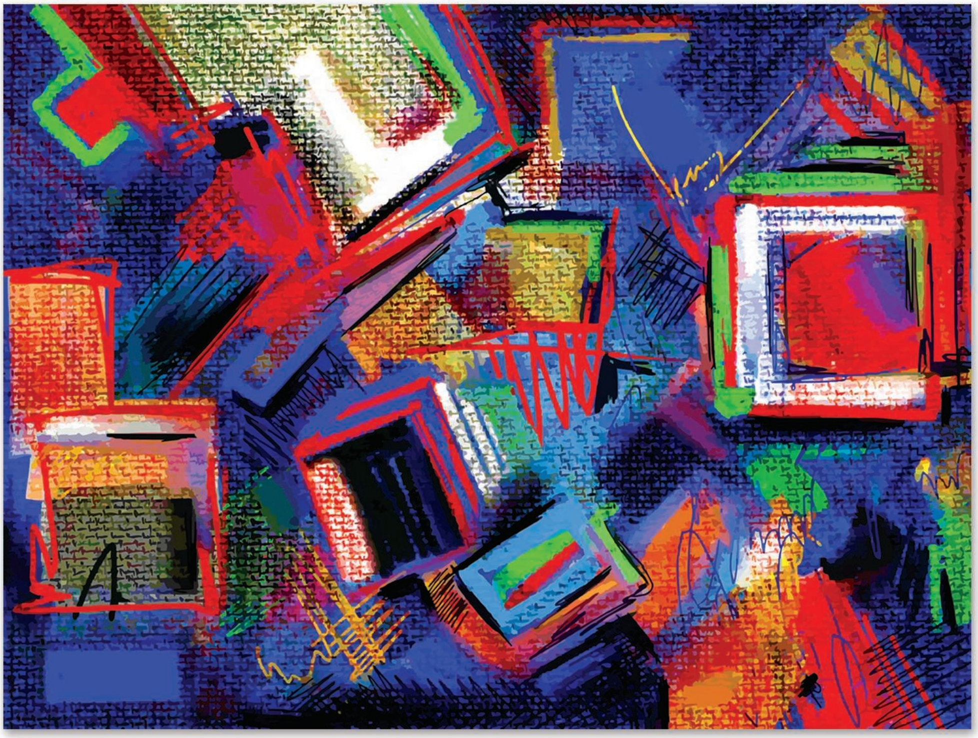
Tenth Edition

Research Design and Methods

A Process Approach



McGraw Hill Education

Kenneth S. Bordens
Bruce Barrington Abbott

Research Design and Methods

A Process Approach

TENTH EDITION

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McGraw Hill Education

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We dedicate this book to our wives, Ricky Karen Bordens and Stephanie Abbott, and to our children and grandchildren.

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PREFACE

This, the tenth edition of *Research Design and Methods: A Process Approach*, retains the general theme that characterized prior editions. As before, we take students through the research process, from getting and developing a research idea, to designing and conducting a study, through analyzing and reporting data. Our goals continue to be to present students with information on the research process in a lively and engaging way and to highlight the numerous decisions they must make when designing and conducting research. We also continue to stress how their early decisions in the process affect how data are collected, analyzed, and interpreted later in the research process. Additionally, we have continued the emphasis on the importance of ethical conduct, both in the treatment of research subjects and in the conduct of research and reporting research results.

In this edition we have rewritten material to improve clarity and organization, provided new examples, updated the material in numerous areas to reflect changes in current requirements and practice, and added more than 70 new references.

CHANGES IN THE TENTH EDITION

The substantive changes in the Tenth Edition are listed below by chapter. Listed changes do not include minor improvements that were made in writing and organization.

CHAPTER 1: EXPLAINING BEHAVIOR

The sections on protoscience and pseudoscience have been updated. A new section has been added on the emergence of new, conflicting information as a reason why a scientific explanation may fail. There is also an updated example of research on distracted walking (Byington & Schwebel, 2013).

CHAPTER 2: DEVELOPING AND EVALUATING THEORIES OF BEHAVIOR

The section of theory versus hypothesis has been rewritten. We added a section on theory versus law to deal with laws less quantitative.

CHAPTER 3: GETTING IDEAS FOR RESEARCH

The section on theory as a source of research ideas has been partially rewritten to use a different example based on the Rescorla-Wagner theory of conditioning. A new figure presents a graph showing the overexpectation effect predicted by the Rescorla-Wagner model of classical conditioning.

The section on primary versus secondary sources focusing on the danger of relying too heavily on secondary sources is now illustrated by a new example based on misrepresentations of the “Little Albert” study by Watson and Rayner.

The sections on identifying whether a scholarly journal is refereed or nonrefereed, and how to determine the quality of a journal, were updated to reflect information available on the Internet. The section on other sources of research information has been updated to include mention of Internet sources.

The entire main section on performing library research has been revised and updated in recognition of students’ greater familiarity with digital resources. A new figure shows an image of the screen during a search using PsycINFO via EBSCOhost. An early portion of the section on reading a research report discussing obtaining a copy has been shortened to reflect the ease of obtaining pdf copies of reports via search engines and other Internet sources.

The section on statistical significance now mentions preregistration as a technique designed to reduce the file-drawer phenomenon.

The introductory portion of the section on peer review has been expanded and a new final portion added to address suggestions for improving the process. A new figure shows survey results showing percentage of authors reporting problems with peer review, broken down by type of problem.

The section on values reflected in research has been partially rewritten and a new section added on combatting values and ideological homogeneity in science. A new table addresses areas in which ideological bias can be addressed.

CHAPTER 4: CHOOSING A RESEARCH DESIGN

There is a new example of correlational research: playing violent video games and bullying (Lam, Cheng, & Liu, 2013). There is also a new example of experimental research: playing violent video games and aggression (Hollingdale & Greitemeyer, 2014). A new example of a study involving simulation has been added (Bode & Codling, 2013).

CHAPTER 5: MAKING SYSTEMATIC OBSERVATIONS

The description of “Clever Hans” has been rewritten and a photograph added showing Hans and his owner, Wilhelm Von Osten. A paragraph describing automation of experiments using computers was deleted as it is now felt to be unnecessary.

CHAPTER 6: CHOOSING AND USING RESEARCH SUBJECTS

The section on nonrandom sampling has been updated. The section on debriefing now discusses situations in which it may be ethically permissible to forego debriefing.

Public opinion about the use of animals in research has been updated to reflect the results of more recent polling on the subject. The list of characteristics relating to attitudes toward animal research has been expanded. Use of “organ on a chip” technology added a technique that may reduce the use of animals in medical research.

CHAPTER 7: UNDERSTANDING ETHICAL ISSUES IN THE RESEARCH PROCESS

A paragraph was added to the section reviewing government regulations relating to ethics, calling attention to the Ethical Research Involving Children (ERIC) project.

The section covering Internet research and ethical research practice was expanded to include mention of the guidelines put out by the Association of Internet Researchers (AoIR). The main points are provided in a new table.

The section discussing the Institutional Review Board (IRB) has been expanded to mention that some IRBs may require you to file annual reports of your progress on your research, and to note that some journals now require submission of your IRB proposal and approval before they will send your paper out for review. Final notes on the IRB have been expanded to note how IRB requirements and actions may act as a hindrance to research.

The table showing the APA Ethical Code for the Care and Use of Animal Subjects has been updated to reflect the 2012 revision and has been placed in a new table.

The section on research misconduct now has a paragraph discussing how fraudulent results can find their way into popular culture and as a result, become difficult to root out. The section on dealing with research fraud now opens by discussing how fraud can be detected. The same section now lists five ways that journals can help to guard against research fraud and expands the discussion of whistleblowers to include the Office of Research Integrity’s *Whistleblower Bill of Rights.*

CHAPTER 8: DOING NONEXPERIMENTAL RESEARCH

The section on conducting observational research has been largely rewritten, including a revised section on establishing the accuracy and reliability of observations. The initial portion of the section on designing a questionnaire now includes advice to “put yourself in a respondent’s state of mind.” The subsection discussing open-ended questions has been expanded to differentiate several categories of open-ended questions. The subsection on restricted items now includes four general guidelines to follow when writing restricted items.

CHAPTER 9: DOING SURVEY RESEARCH

The section offering a final note on survey techniques now notes that hard-copy mail surveys remain popular as they continue to be effective in producing relatively high participation rates. In the section on simple random sampling, problems are noted arising from the popularity of electronic forms of communication, including cell phones and social media. The section on sample size has been rewritten.

CHAPTER 10: USING BETWEEN-SUBJECTS AND WITHIN-SUBJECTS EXPERIMENTAL DESIGNS

In the section on randomizing error variance across groups, a paragraph was added about the fact that random assignment permits using inferential statistics to assess reliability. The following brief section on inferential statistics has been deleted. A new example of a single-factor randomized groups design has been provided (Guéguen, 2015). The factorial between-subjects design is illustrated with a new example (Rayner, Baxter, & Ilicic, 2015). Two new figures illustrate the design and present a graph of the results. An experiment by Gowin, Swann, Moeller, and Lane (2010) now illustrates the within-subjects factorial design.

CHAPTER 11: USING SPECIALIZED RESEARCH DESIGNS

No substantive changes were made.

CHAPTER 12: USING SINGLE-SUBJECT DESIGNS

No substantive changes were made.

CHAPTER 13: DESCRIBING DATA

The bar and line graphs for results of a multifactor design now display error bars around treatment means, based on a figure from a new study (Waldum & McDaniel, 2016). The table showing hypothetical scores from an introductory psychology class has been replaced by a stemplot of the same data so that students do not have to refer back several pages to the histogram of the same data, and grades have been added as labels to the score ranges.

CHAPTER 14: USING INFERENTIAL STATISTICS

The chapter has been reorganized to place the sections covering the power of a statistical test and statistical versus practical significance at the end of the section on the logic of inferential statistics. The introductory portion of the section on the logic of inferential statistics has been streamlined. The section on statistical significance has been rewritten.

The section on the meaning of statistical significance has been retitled as "Balancing Type I versus Type II Errors" to better capture its content. The example illustrating the use of *t* tests (Hess, Marwitz, & Kreutzer, 2003) has been extended to include a measure of power. A new section addressing the Bayesian approach to statistical analysis has been added just above the section on alternatives to inferential statistics. The Chapter Summary has been rewritten to better reflect the content of the chapter.

CHAPTER 15: USING MULTIVARIATE DESIGN AND ANALYSIS

The figure illustrating the logic of partial correlation has been revised. The section on structural equation modeling now introduces the term "measured variable" as used in SEM.

CHAPTER 16: REPORTING YOUR RESEARCH RESULTS

The section on getting ready to write has been revised to address electronic submission of papers to journals. The Results Section information now specifies what to do if you are using less well-known statistics. An example of reference formatting mistakes that can arise by block-copying references from a database (PsycINFO) has been added to the Reference Section discussion. The section on avoiding biased language now encourages writers to investigate whether certain terms may now be considered preferable to those previously deemed acceptable. The section on telling the world about your results has been rewritten and updated.

The tenth edition of *Research Design and Methods: A Process Approach* is now available online with Connect, McGraw-Hill Education's integrated assignment and assessment platform. Connect also offers SmartBook for the new edition, which is the first adaptive reading experience proven to improve grades and help students study more effectively. All of the title's website and ancillary content is also available through Connect, including:

- An Instructor's Manual for each chapter.
- A full Test Bank of multiple-choice questions that test students on central concepts and ideas in each chapter.
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Required=Results

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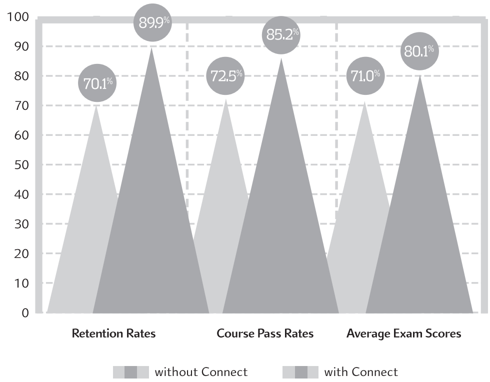

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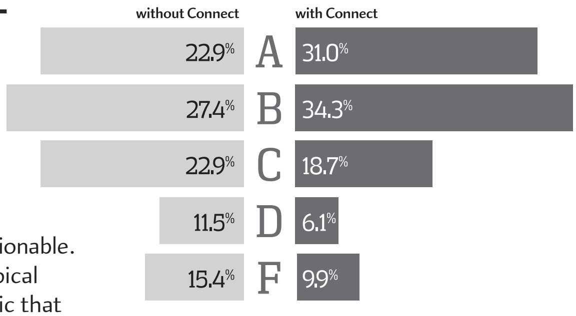

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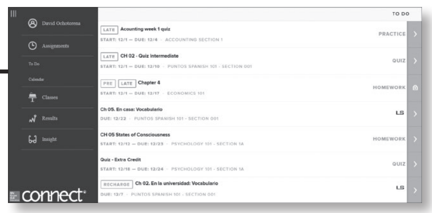

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ACKNOWLEDGMENTS

After ten editions, the list is long of those to whom we owe our thanks—past reviewers, editors, colleagues, and students who have contributed their time and talents to improve the text and make it successful. For the tenth edition we especially wish to single Jamie Laferrera, Brand Manager at McGraw, to Freelance Editors Erin Guendelsberger and Poornima Harikumar of ANSR Source; to our copy editor, Susan Nodine; to our Project Manager Sarita Yadav; to our indexer, Vikas Makkar; and to those other members of the McGraw-Hill staff who worked on the ancillaries and organized the text website where these resources are made available to students and instructors.

Finally, we offer a special thanks to our wives, Stephanie Abbott and Ricky Karen Bordens, for their support and encouragement, and to our families.

Kenneth S. Bordens
Bruce B. Abbott

CHAPTER 1

Explaining Behavior

CHAPTER OUTLINE

What Is Science, and What Do Scientists Do?
- Science as a Way of Thinking
- How Do Scientists Do Science?
- Basic and Applied Research
- Framing a Problem in Scientific Terms

Learning About Research: Why Should You Care?

Exploring the Causes of Behavior

Explaining Behavior
- Science, Protoscience, Nonscience, and Pseudoscience
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- Failures Due to Faulty Inference
- Pseudoexplanations
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Methods of Inquiry
- The Method of Authority
- The Rational Method
- The Scientific Method
- The Scientific Method at Work: Using a Cell Phone While Walking
- The Steps of the Research Process

Summary

Key Terms

On September 21, 2008, after a day of playing basketball with his friends, 14-year-old Christopher Cepeda and four of his buddies began their journey home on foot. Along the way they came to a busy stretch of Highway 27, where a grassy median separated four lanes of traffic that sped by at 65 mph. The boys made it safely across the two northbound lanes and, upon seeing a tan, 1998 Buick sedan approaching in the southbound lane, they paused in the median. Christopher, distracted as he typed out a text message on his cell phone, never saw the car and stepped out into its path. The car struck the young teenager, throwing him into the windshield and then onto the pavement. In spite of the quick response from local emergency crews, Christopher succumbed to his injuries.

A number of states have enacted laws banning the practice of texting while driving. Studies have demonstrated that texting while driving results in a degradation of driving skills (e.g., Drews, Pasupathi, & Strayer, 2008). Attention has now shifted to the problem of "distracted walking." This occurs when a person is so engrossed in doing something on a cell phone that the distracted person fails to identify potentially dangerous conditions. Sometimes the consequences of walking while using a cell phone are harmless, even funny. For example, a video posted on YouTube shows a young woman walking in a mall who is so engrossed in her cell phone that she doesn't notice a fountain and falls right into it. We can all laugh at the poor woman's fate, knowing that she was not seriously hurt. However, as in the case of Christopher Cepeda, distracted walking can have tragic consequences.

It seems obvious why texting while walking may lead to accidents: Distracted by the task of reading or composing messages, the person fails to notice potential dangers such as obstacles in the pathway or oncoming vehicles. Yet, most of the time, we somehow manage to engage in a variety of activities while walking—including interacting with a cell phone—without suffering nasty consequences.

Why does cell phone use while walking sometimes lead to accidents but more often does not? Attempting to answer this question, we could engage in endless speculation. Is it simply a matter of chance? Do some individuals become more absorbed in their activities on the cell phone than others and thus become less likely to notice a potential danger? Does the specific activity on the phone matter (e.g., texting as opposed to talking)? Are drugs and alcohol a factor?

Questions such as these almost cry out for answers. This is where science and scientists come in. Whereas most of us content ourselves with answers that merely *seem* reasonable, scientists go well beyond mere speculation: They formulate ways to determine clearly the relationship between such factors and one's ability to walk safely while interacting on a cell phone and then design research studies to test those relationships.

This book is about how the initial curiosity sparked by an event such as the Cepeda accident gets transformed into a testable research question and eventually into a research study yielding data that are analyzed. Only through this process can we move beyond dinner table speculations and into the realm of scientific explanation.

WHAT IS SCIENCE, AND WHAT DO SCIENTISTS DO?

The terms *science* and *scientist* probably conjure up a variety of images in your mind. A common image is that of a person in a white lab coat surrounded by bubbling flasks and test tubes, working diligently to discover a cure for some dreaded disease. Alternatively, our lab-coated scientist might be involved in some evil endeavor that will threaten humankind. Books, movies, and television have provided such images. Just think about the classic horror films of the 1940s and 1950s (e.g., *Frankenstein*), and it is not hard to see where some of these images come from.

Although these images may be entertaining, they do not accurately capture what science actually is and what real scientists do. Simply put, **science** is a set of methods used to collect information about phenomena in a particular area of interest and build a reliable base of knowledge about them. This knowledge is acquired via *research,* which involves a scientist identifying a phenomenon to study, developing hypotheses, conducting a study to collect data, analyzing the data, and disseminating the results. Science also involves developing theories to help better describe, explain, and organize scientific information that is collected. At the heart of any science (psychology included) is information that is obtained through observation and measurement of phenomena. So, for example, if I want to know if text messaging while walking is a serious threat to safety, I must go out and make relevant observations. Science also requires that any explanations for phenomena can be modified and corrected if new information becomes available. Nothing in science is taken as an absolute truth. And, regardless of what you may have seen in the media, there is no such thing as "settled science." All scientific observations, conclusions, and theories are *always* open to modification and perhaps even abandonment as new evidence arises.

Of course, a **scientist** is someone who does science. A scientist is a person who adopts the methods of science in his or her quest for knowledge. However, this simple definition does not capture what scientists do. Despite the stereotyped image of the scientist hunkered over bubbling flasks, scientists engage in a wide range of activities designed to acquire knowledge in their fields. These activities take place in a variety of settings and for a variety of reasons. For example, you have scientists who work for pharmaceutical companies trying to discover new medications for the diseases that afflict humans. You have scientists who brave the bitter cold of the Arctic to take ice samples that they can use to track the course of global climate change. You have scientists who sit in observatories with their telescopes pointed to the heavens, searching for and classifying celestial bodies. You have scientists who sit for hours in carefully constructed blinds observing and recording the natural behavior of animals in the wild. You have scientists who work at universities and conduct studies to acquire knowledge in their chosen fields (e.g., psychology, biology, or physics). In short, science is a diverse activity involving a diverse group of people doing a wide range of things. Despite these differences, all scientists have a common goal: to acquire knowledge through the application of scientific methods and techniques.

Science as a Way of Thinking

It is important for you to understand that science is not just a means of acquiring knowledge; it is also a way of thinking and of viewing the world. A scientist approaches a problem by carefully defining its parameters, seeking out relevant information, and subjecting proposed solutions to rigorous testing. The scientific view of the world leads a person to be skeptical about what he or she reads or hears in the popular media. Having a scientific outlook leads a person to question the validity of provocative statements made in the media and to find out what scientific studies say about those statements. In short, an individual with a scientific outlook does not accept everything at face value.

Let's see how thinking like a scientist might be applied. Imagine that you are having difficulty relaxing while taking important exams, resulting in poor performance. One night while watching television you see an advertisement for something that might help you relax. According to the advertisement, a new extract of lavender has been discovered that, when inhaled, will help you relax. There are several testimonials from users of the product to back up the claims made in the ad. The question is whether to shell out the money for the lavender scent.

A person who is *not* thinking like a scientist will pull out a credit card and place the order. A person who *is* thinking like a scientist will question the validity of the claims made in the ad and make an effort to find out whether the lavender scent will in fact reduce stress and improve performance. This involves taking the time and making the effort to track down relevant research on the effectiveness of aromatherapy, specifically the effects of lavender scent on stress. Imagine you do a quick literature search and find an article by Howard and Hughes (2008) that tested the effect of a lavender scent against a placebo scent (a scent without any purported therapeutic value) and against no scent on stress responses. Howard and Hughes, you discover, found that scents had no effect on stress unless participants were specifically led to expect the scents to have an effect. In short, the effect of the lavender scent could be explained by expectation effects. So, you decide to save your money.

This is but one example of how thinking like a scientist leads one to question a claim and look for *empirical evidence*—evidence based on observation or experimentation—to verify that claim. There are many other situations where thinking like a scientist can better allow you to evaluate the validity of a claim or a conclusion. For example, during an election year we are bombarded with poll after poll about candidates and who is in the lead. Rather than accepting on face value that candidate X has a lead over candidate Y, you should obtain a copy of the actual survey results (often available online at the pollster's website), and then look at the sample employed and how the questions were worded. As we will see in later chapters, biased samples and question wording can affect the validity of survey findings.

How Do Scientists Do Science?

In their quest for knowledge about a phenomenon, scientists can use a wide variety of techniques, each suited to a particular purpose. Take the question about using a cell phone while walking. You, as a scientist, could approach this issue in several ways. For example, you could examine health records on injuries incurred while talking on a cell phone during walking. You would then examine your data to see if there is a relationship between using a cell phone and being injured while walking. If you found that there was a greater frequency of accidents when using a cell phone, this would verify the role of cell phones in pedestrian accident injuries.

Another way you could approach this problem is to conduct a controlled experiment. You could have participants navigate through a controlled environment while either using or not using a cell phone. If you find that participants bump into more objects when using a cell phone, you would have verified the effects of distracted walking on accidents.

QUESTIONS TO PONDER

1. What is science, and what do scientists do?
2. What is meant by the statement that science is a way of thinking? (Explain.)
3. How do scientists obtain knowledge on issues that interest them?

Basic and Applied Research

Scientists work in a variety of areas to identify phenomena and develop valid explanations for them. The goals established by scientists working within a given field of research may vary according to the nature of the research problem being considered. For example, the goal of some scientists is to discover general laws that explain particular classes of behaviors. In the course of developing those laws, psychologists study behavior in specific situations and attempt to isolate the variables affecting behavior. Other scientists within the field are more interested in tackling practical problems than in finding general laws. For example, they might be interested in determining which of several therapy techniques is best for treating severe phobias.

An important distinction has been made between basic research and applied research along the lines just presented.

Basic Research **Basic research** is conducted to investigate issues relevant to the confirmation or disconfirmation of theoretical or empirical positions. The major goal of basic research is to acquire general information about a phenomenon, with little emphasis placed on applications to real-world examples of the phenomenon (Yaremko, Harari, Harrison, & Lynn, 1982). For example, research on the memory process may be conducted to test the efficacy of interference as a viable theory of forgetting. The researcher would be interested in discovering something about the forgetting process while testing the validity of a theoretical position. Applying the results to forgetting in a real-world situation would be of less immediate interest.

Applied Research The focus of **applied research** is somewhat different from that of basic research. Although you may still work from a theory when formulating your hypotheses, your primary goal is to generate information that can be applied directly to a real-world problem. A study by Jodi Quas and her colleagues (2007) provides a nice example of an applied study. In a number of criminal and civil trials, children may be called to testify about something (such as abuse) that may have happened to them. One concern is that children's memories may not be as accurate as adult memories or that it may be easier to implant memories into children than adults. Quas et al. investigated a number of factors that can affect the accuracy of children's memory. They found that children who were interviewed multiple times about an event that never occurred showed greater memory accuracy and less susceptibility to suggestion than children interviewed once. Results such as these can help law enforcement officers design interviews for children that will maximize memory accuracy. Further examples of applied research can be found in the areas of clinical, environmental, and industrial psychology (among others).

Overlap Between Basic and Applied Research The distinction between applied and basic research is not always clear. Some research areas have both basic and applied aspects. The Quas et al. study provides a good example of research that has both applied and basic implications. Their results can inform law enforcement personnel and others who may have to interview young children how to best approach the interview process. In addition to these applied implications, this research has basic implications as well because the results tell us something about developmental changes in how memory works and the factors that affect memory accuracy.

Even applied research is not independent of theories and other research in psychology. The defining quality of applied research is that the researcher attempts to conduct a study the results of which can be applied directly to a real-world event. To accomplish this task, you must choose a research strategy that maximizes the applicability of findings.

Framing a Problem in Scientific Terms

Kelly (1963) characterized each person as a scientist who develops a set of strategies for determining the causes of behavior observed. We humans are curious about our world and like to have explanations for the things that happen to us and others. After reading about Christopher Cepeda's accident, you may have thought about potential explanations for the accident. For example, you might have questioned whether using a cell phone while walking is uniquely distracting compared to other distractions (e.g., talking with friends).

Usually, the explanations we come up with are based on little information and mainly reflect personal opinions and biases. The everyday strategies we use to explain what we observe frequently lack the rigor to qualify as truly scientific approaches. In most cases, the explanations for everyday events are made on the spot, with little attention given to ensuring their accuracy. We simply develop an explanation and, satisfied with its plausibility, adopt it as true. We do not consider exploring whether our explanation is correct or whether there might be other, better explanations.

If we do give more thought to our explanations, we often base our thinking on hearsay, conjecture, anecdotal evidence, or unverified sources of information. These revised explanations, even though they reduce transient curiosity, remain untested and are thus of questionable validity. In the Christopher Cepeda case, you might come to the conclusion that texting while walking distracts a person from important environmental cues that signal danger. Although this explanation seems plausible (and may even be correct!), without careful testing it remains mere speculation. To make matters worse, we have a tendency to look for information that will confirm our prior beliefs and assumptions and to ignore or downplay information that does not conform to those beliefs and assumptions. So, if you believe that texting on cell phones causes pedestrian accidents, you might seek out newspaper articles that report on such accidents and fail to investigate the extent to which texting while walking does not lead to an accident. At the same time, you may ignore information that conflicts with your beliefs. The human tendency to seek out information that confirms what is already believed is known as **confirmation bias**.

Unfounded but commonly accepted explanations for behavior can have widespread consequences when the explanations become the basis for social policy. For example, segregation of Blacks in the South was based on stereotypes of assumed racial differences in intelligence and moral judgment. These beliefs sound ludicrous today and have failed to survive a scientific analysis. Such mistakes might have been avoided if lawmakers of the time had relied on objective information rather than on prejudice.

To avoid the trap of easy, untested explanations for behavior, we need to abandon the informal, unsystematic approach to explanation and adopt an approach that has proven its ability to find explanations of great power and generality. This approach, called the *scientific method,* and how you can apply it to answer questions about behavior are the central topics of this book.

LEARNING ABOUT RESEARCH: WHY SHOULD YOU CARE?

Students sometimes express the sentiment that learning about research is a waste of time because they do not plan on a career in science. Although it is true that a strong background in science is essential if you plan to further your career in psychology after you graduate, it is also true that knowing about science is important even if you do *not* plan to become a researcher.

The layperson is bombarded by science every day. When you read about the controversy over stem-cell research or climate change, you are being exposed to science. When you read about a “scientific” poll on a political issue, you are being exposed to science. When you hear about a new cure for a disease, you are being exposed to science. When you are persuaded to buy one product over another, you are being exposed to science. Science, on one level or another, permeates our everyday lives. To deal rationally with your world, you must be able to analyze critically the information thrown at you and separate scientifically verified facts from unverified conjecture.

Often, popular media such as television news programs present segments that *appear* scientific but on further scrutiny turn out to be flawed. One example was a segment on the ABC television news show *20/20* on sexual functions in women after a hysterectomy. In the segment, three women discussed their post-hysterectomy sexual dysfunction. One woman reported, "It got to the point where I couldn't have sex. I mean, it was so painful . . . we couldn't do it." The testimonials of the three patients were backed up by a number of medical experts who discussed the link between hysterectomy and sexual dysfunction.

Had you watched this segment and looked no further, you would have come away with the impression that post-hysterectomy sexual dysfunction is common. After all, all the women interviewed experienced it, and the experts supported them. However, your impression would not be correct. When we examine the research on post-hysterectomy sexual functioning, the picture is not nearly as clear as the one portrayed in the *20/20* segment. In fact, there are studies showing that after hysterectomy, women may report an *improvement* in sexual function (Rhodes, Kjerulff, Langenberg, & Guzinski, 1999). Other studies show that the type of hysterectomy a woman has undergone makes a difference. If the surgery involves removing the cervix (a total hysterectomy), there is more sexual dysfunction after surgery than if the cervix is left intact (Saini, Kuczynski, Gretz, & Sills, 2002). Finally, the Boston University School of Medicine's Institute for Sexual Medicine reports that of 1,200 women seen at its Center for Sexual Medicine, very few of them complained of post-hysterectomy sexual dysfunction (Goldstein, 2003).

As this examples suggests, whether you plan a career in research or not, it is to your benefit to learn how research is done. This will put you in a position to evaluate information that you encounter that is supposedly based on "science."

EXPLORING THE CAUSES OF BEHAVIOR

Psychology is the science of behavior and mental processes. The major goals of psychology are (1) to build an organized body of knowledge about its subject matter and (2) to describe mental and behavioral processes and develop reliable explanations for these processes. For example, psychologists interested in aggression and the media would build a storehouse of knowledge concerning how various types of media violence (e.g., movies, television shows, cartoons, or violent video games) affect aggressive behavior. If it were shown that exposure to violence in the media increases aggression, the psychologist would seek to explain how this occurs.

How do you, as a scientist, go about adding to this storehouse of knowledge? The principal method for acquiring knowledge and uncovering causes of behavior is *research*. You identify a problem and then systematically set out to collect information about the problem and develop explanations.

Robert Cialdini (1994) offers a simple yet effective analogy to describe the process of studying behavior: He likens science to a hunting trip. Before you go out to "bag" your prey, you must first scout out the area within which you are going to hunt. On a hunting trip, scouting involves determining the type and number of prey available in an area. Cialdini suggests that in science "scouting" involves making systematic observations of naturally occurring behavior.

Sometimes scouting may not be necessary. Sometimes the prey falls right into your lap without you having to go out and find it. Cialdini tells a story of a young woman who was soliciting for a charity. Initially, Cialdini declined to give a donation. However, after the young woman told him that "even a penny would help," he found himself digging into his wallet. As he reflected on this experience, he got to wondering why he gave a donation after the "even a penny would help" statement. This led him to a series of studies on the dynamics of compliance. In a similar manner, as you read about the Christopher Cepeda case, you might already have begun to wonder about the factors that contribute to distraction-related accidents. As we describe in Chapter 3, "scouting" can involve considering many sources.

The second step that Cialdini identifies is "trapping." After you have identified a problem that interests you, the next thing to do is identify the factors that might affect the behavior that you have scouted. Then, much like a hunter closing in on prey, you systematically study the phenomenon and identify the factors that are crucial to explaining that phenomenon. For example, after wondering whether talking on a cell phone while walking causes accidents, you could set up an experiment to test this. You could have participants walk through a building over a predesignated route. Participants in one condition would walk through the building while talking on a cell phone, and participants in another would do the task without talking on a cell phone. You could record the number of times a participant bumps into objects while walking through the building. If you find that participants talking on a cell phone bump into more objects than those not talking on a cell phone, you have evidence that talking on a cell phone while walking causes pedestrians to make more potentially dangerous errors while walking.

QUESTIONS TO PONDER

1. How do basic and applied research differ, and how are they similar?
2. How are problems framed in research terms?
3. What is confirmation bias, and what are its implications for understanding behavior?
4. Why should you care about learning about research, even if you are not planning a career in research?
5. What are the two steps suggested by Cialdini (1994) for exploring the causes of behavior, and how do they relate to explaining behavior?

EXPLAINING BEHAVIOR

Imagine that, after narrowly avoiding being hit by a car when you stepped into an intersection while texting on your phone, you find yourself depressed, unable to sleep, and lacking appetite. After a few weeks of feeling miserable, you find a therapist whom you have heard can help alleviate your symptoms. On the day of your appointment you meet with your new therapist. You begin by mapping out a therapy plan with your therapist. You and she identify stressful events you have experienced, current situations that are distressing to you, and events in your past that might relate to your current symptoms. Next you identify an incident that is causing you the most distress (in this case, your near-accident) and your therapist has you visualize things relating to your memory of the event. She also has you try to reexperience the sensations and emotions related to the accident.

So far you are pretty satisfied with your therapy session because your therapist is using techniques you have read about and that are successful in relieving symptoms like yours. What occurs next, however, puzzles you. Your therapist has you follow her finger with your eyes as she moves it rapidly back and forth across your field of vision. Suddenly, she stops and tells you to let your mind go blank and attend to any thoughts, feelings, or sensations that come to mind. You are starting to wonder just what is going on. Whatever you come up with, your therapist tells you to visualize and has you follow her finger once again with your eyes. On your way home after the session you wonder just what the finger exercise was all about.

When you get home, you do some research on the Internet and find that your therapist was using a technique called Eye Movement Desensitization and Reprocessing (EMDR) therapy. You read that the eye movements are supposed to reduce the patient's symptoms rapidly. Because you did not experience this, you decide to look into what is known about EMDR therapy. What you find surprises you. You find a number of websites touting the effectiveness of EMDR. You read testimonials from therapists and patients claiming major successes using the treatment. You also learn that many clinical psychologists doubt that the eye movements are a necessary component of the therapy. In response, advocates of EMDR have challenged critics to prove that EMDR does not work. They suggest that those testing EMDR are not properly trained in the technique, so it will not work for them. They also suggest that the eye movements are not necessary and that other forms of stimulation, such as the therapist tapping her fingers on the client's leg, will work. You are becoming skeptical. What you want to find is some real scientific evidence concerning EMDR.

Science, Protoscience, Nonscience, and Pseudoscience

We have noted that one goal of science is to develop explanations for behavior. This goal is shared by other disciplines as well. For example, historians may attempt to explain why Robert E. Lee ordered Pickett's Charge on the final day of the Battle of Gettysburg. Any explanation would be based on reading and interpreting historical documents and records. However, unless such explanations can be submitted to empirical testing, they are not considered scientific.