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Scientific Understanding of Behavior

LEARNING OBJECTIVES

- Explain the reasons for understanding research methods.
- Describe the scientific approach to learning about behavior and contrast it with pseudoscientific research.
- Define and give examples of the four goals of scientific research: description, prediction, determination of cause, and explanation of behavior.
- Discuss the three elements for inferring causation: temporal order, covariation of cause and effect, and elimination of alternative explanations.
- Define and describe basic and applied research.

What are the causes of aggression and violence? How do we remember things, what causes us to forget, and how can memory be improved? What are the effects of stressful environments on health? How do early childhood experiences affect later development? What are the best ways to treat depression? How can we reduce prejudice and intergroup conflict?

Curiosity about questions such as these is probably the most important reason that many students decide to take courses in the behavioral sciences. Scientific research provides us with the best means of addressing such questions and providing answers. In this book, we will examine the methods of scientific research in the behavioral sciences. In this introductory chapter, we will focus on ways in which knowledge of research methods can be useful in understanding the world around us. Further, we will review the characteristics of a scientific approach to the study of behavior and the general types of research questions that concern behavioral scientists.

USES OF RESEARCH METHODS

Informed citizens in our society increasingly need knowledge of research methods. Daily newspapers, general-interest magazines, and other media continually report research results: "Happiness Wards Off Heart Disease," "Recession Causes Increase in Teen Dating Violence," "Breast-Fed Children Found Smarter," "Facebook Users Get Worse Grades in College." Articles and books make claims about the beneficial or harmful effects of particular diets or vitamins on one's sex life, personality, or health. Survey results are frequently reported that draw conclusions about our beliefs concerning a variety of topics. The key question is, how do you evaluate such reports? Do you simply accept the findings because they are supposed to be scientific? A background in research methods will help you to read these reports critically, evaluate the methods employed, and decide whether the conclusions are reasonable.

Many occupations require the use of research findings. For example, mental health professionals must make decisions about treatment methods, assignment of clients to different types of facilities, medications, and testing procedures. Such decisions are made on the basis of research; to make good decisions, mental health professionals must be able to read the research literature in the field and apply it in their professional lives. Similarly, people who work in business environments frequently rely on research to make decisions about marketing strategies, ways of improving employee productivity and morale, and methods of selecting and training new employees. Educators must keep up with research on topics such as the effectiveness of different teaching strategies or programs to deal with special student problems. Knowledge of research methods and the ability to evaluate research reports are useful in many fields.

It is also important to recognize that scientific research has become increasingly prominent in public policy decisions. Legislators and political leaders at all levels of government frequently take political positions and propose legislation

based on research findings. Research may also influence judicial decisions: A prime example of this is the *Social Science Brief* that was prepared by psychologists and accepted as evidence in the landmark 1954 case of *Brown v. Board of Education* in which the U.S. Supreme Court banned school segregation in the United States. One of the studies cited in the brief was conducted by Clark and Clark (1947), who found that when allowed to choose between light-skinned and dark-skinned dolls, both Black and White children preferred to play with the light-skinned dolls (see Stephan, 1983, for a further discussion of the implications of this study).

Behavioral research on human development has influenced U.S. Supreme Court decisions related to juvenile crime. In 2005, for instance, the Supreme Court decided that juveniles could not face the death penalty (*Roper v. Simmons*), and the decision was informed by neurological and behavioral research showing that the brain, social, and character differences between adults and juveniles make juveniles less culpable than adults for the same crimes. Similarly, in the 2010 Supreme Court decision *Graham v. Florida*, the Supreme Court decided that juvenile offenders could not be sentenced to life in prison without parole for non-homicide offenses. This decision was influenced by a friend of the court brief filed by the American Psychological Association that cited research in developmental psychology and neuroscience. The court majority pointed to this research in their conclusion that assessment of blame and standards for sentencing should be different for juveniles and adults because of juveniles' lack of maturity and poorly formed character development (Clay, 2010).

In addition, psychologists studying ways to improve the accuracy of eyewitness identification (e.g., Wells et al., 1998; Wells, 2001) greatly influenced recommended procedures for law enforcement agencies to follow in criminal investigations (U.S. Department of Justice, 1999) and provided science-based perspectives on the value of confessions.

Research is also important when developing and assessing the effectiveness of programs designed to achieve certain goals—for example, to increase retention of students in school, influence people to engage in behaviors that reduce their risk of contracting HIV, or teach employees how to reduce the effects of stress. We need to be able to determine whether these programs are successfully meeting their goals.

THE SCIENTIFIC APPROACH

We opened this chapter with several questions about human behavior and suggested that scientific research is a valuable means of answering them. How does the scientific approach differ from other ways of learning about behavior? People have always observed the world around them and sought explanations for what they see and experience. However, instead of using a scientific approach, many people rely on **intuition** and **authority** as ways of knowing.

The Limitations of Intuition and Authority

Intuition Most of us either know or have heard about a married couple who, after years of trying to conceive, adopt a child. Then, within a very short period of time, they find that the woman is pregnant. This observation leads to a common belief that adoption increases the likelihood of pregnancy among couples who are having difficulties conceiving a child. Such a conclusion seems intuitively reasonable, and people usually have an explanation for this effect—for example, the adoption reduces a major source of marital stress, and the stress reduction in turn increases the chances of conception (see Gilovich, 1991).

This example illustrates the use of intuition and anecdotal evidence to draw general conclusions about the world around us. When you rely on intuition, you accept unquestioningly what your own personal judgment or a single story about one person's experience tells you. The intuitive approach takes many forms. Often, it involves finding an explanation for our own behaviors or the behaviors of others. For example, you might develop an explanation for why you keep having conflicts with your roommate, such as "he hates me" or "having to share a bathroom creates conflict." Other times, intuition is used to explain intriguing events that you observe, as in the case of concluding that adoption increases the chances of conception among couples having difficulty conceiving a child.

A problem with intuition is that numerous cognitive and motivational biases affect our perceptions, and so we may draw erroneous conclusions about cause and effect (cf. Fiske & Taylor, 1984; Gilovich, 1991; Nisbett & Ross, 1980; Nisbett & Wilson, 1977). Gilovich points out that there is in fact no relationship between adoption and subsequent pregnancy, according to scientific research investigations. So why do we hold this belief? Most likely it is because of a cognitive bias called *illusory correlation* that occurs when we focus on two events that stand out and occur together. When an adoption is closely followed by a pregnancy, our attention is drawn to the situation, and we are biased to conclude that there must be a causal connection. Such illusory correlations are also likely to occur when we are highly motivated to believe in the causal relationship. Although this is a natural thing for us to do, it is not scientific. A scientific approach requires much more evidence before conclusions can be drawn.

Authority The philosopher Aristotle was concerned with the factors associated with persuasion or attitude change. In his *Rhetoric*, Aristotle describes the relationship between persuasion and credibility: "Persuasion is achieved by the speaker's personal character when the speech is so spoken as to make us think him credible. We believe good men more fully and readily than others." Thus, Aristotle would argue that we are more likely to be persuaded by a speaker who seems prestigious, trustworthy, and respectable than by one who appears to lack such qualities.

Many of us might accept Aristotle's arguments simply because he is considered a prestigious authority—a convincing and influential source—and his

writings remain important. Similarly, many people are all too ready to accept anything they learn from the Internet, news media, books, government officials, or religious figures. They believe that the statements of such authorities must be true. The problem, of course, is that the statements may not be true. The scientific approach rejects the notion that one can accept *on faith* the statements of any authority; again, more evidence is needed before we can draw scientific conclusions.

Skepticism, Science, and the Empirical Approach

The scientific approach to acquiring knowledge recognizes that both intuition and authority can be sources of ideas about behavior. However, scientists do not unquestioningly accept anyone's intuitions—including their own. Scientists recognize that their ideas are just as likely to be wrong as anyone else's. Also, scientists do not accept on faith the pronouncements of anyone, regardless of that person's prestige or authority. Thus, scientists are very skeptical about what they see and hear. Scientific **skepticism** means that ideas must be evaluated on the basis of careful logic and results from scientific investigations.

If scientists reject intuition and blind acceptance of authority as ways of knowing about the world, how do they go about gaining knowledge? The fundamental characteristic of the scientific method is **empiricism**—the idea that knowledge is based on observations. Data are collected that form the basis of conclusions about the nature of the world. The scientific method embodies a number of rules for collecting and evaluating data; these rules will be explored throughout the book.

The power of the scientific approach can be seen all around us. Whether you look at biology, chemistry, medicine, physics, anthropology, or psychology, you will see amazing advances over the past 25, 50, or 100 years. We have a greater understanding of the world around us, and the applications of that understanding have kept pace. Goodstein (2000) describes an "evolved theory of science" that defines the characteristics of scientific inquiry. These characteristics are summarized below.

Data play a central role. For scientists, knowledge is primarily based on observations. Scientists enthusiastically search for observations that will verify their ideas about the world. They develop theories, argue that existing data support their theories, and conduct research that can increase our confidence that the theories are correct. Observations can be criticized, alternatives can be suggested, and data collection methods can be called into question. But in each of these cases, the role of data is central and fundamental. Scientists have a "show me, don't tell me" attitude.

Scientists are not alone. Scientists make observations that are accurately reported to other scientists and the public. You can be sure that many other scientists will follow up on the findings by conducting research that replicates and extends these observations.

Science is adversarial. Science is a way of thinking in which ideas do battle with other ideas in order to move ever closer to truth. Research can be conducted to test any idea; supporters of the idea and those who disagree with the idea can report their research findings, and these can be evaluated by others. Some ideas, even some very good ideas, may prove to be wrong if research fails to provide support for them. Good scientific ideas are testable. They can be supported or they can be falsified by data—the latter concept called **falsifiability** (Popper, 2002). If an idea is falsified when it is tested, science is thereby advanced because this result will spur the development of new and better ideas.

Scientific evidence is peer reviewed. Before a study is published in a top-quality scientific journal, other scientists who have the expertise to carefully evaluate the research review it. This process is called **peer review.** The role of these reviewers is to recommend whether the research should be published. This review process ensures that research with major flaws will not become part of the scientific literature. In essence, science exists in a free market of ideas in which the best ideas are supported by research and scientists can build upon the research of others to make further advances.

Integrating Intuition, Skepticism, and Authority

The advantage of the scientific approach over other ways of knowing about the world is that it provides an objective set of rules for gathering, evaluating, and reporting information. It is an open system that allows ideas to be refuted or supported by others. This does not mean that intuition and authority are unimportant, however. As noted previously, scientists often rely on intuition and assertions of authorities for ideas for research. Moreover, there is nothing wrong with accepting the assertions of authority as long as we do not accept them as scientific evidence. Often, scientific evidence is not obtainable, as, for example, when a religious figure or text asks us to accept certain beliefs on faith. Some beliefs cannot be tested and thus are beyond the realm of science. In science, however, ideas must be evaluated on the basis of available evidence that can be used to support or refute the ideas.

There is also nothing wrong with having opinions or beliefs as long as they are presented simply as opinions or beliefs. However, we should always ask whether the opinion can be tested scientifically or whether scientific evidence exists that relates to the opinion. For example, opinions on whether exposure to media violence increases aggression are only opinions until scientific evidence on the issue is gathered.

As you learn more about scientific methods, you will become increasingly skeptical of the research results reported in the media and the assertions of scientists as well. You should be aware that scientists often become authorities when they express their ideas. When someone claims to be a scientist, should we be more willing to accept what he or she has to say? First, ask about the credentials of the individual. It is usually wise to pay more attention to someone with an established reputation in the field and attend to the reputation of the

institution represented by the person. It is also worthwhile to examine the researcher's funding source; you might be a bit suspicious when research funded by a drug company supports the effectiveness of a drug manufactured by that company, for example. Similarly, when an organization with a particular social-political agenda funds the research that supports that agenda, you should be skeptical of the findings and closely examine the methods of the study.

You should also be skeptical of pseudoscientific research. **Pseudoscience** is "fake" science in which seemingly scientific terms and demonstrations are used to substantiate claims that have no basis in scientific research. The claim may be that a product or procedure will enhance your memory, relieve depression, or treat autism or post-traumatic stress disorder. The fact that these are all worthy outcomes makes us very susceptible to believing pseudoscientific claims and forgetting to ask whether there is a valid scientific basis for the claims. In Chapter 2, we will discuss a procedure called *facilitated communication* that has been used by therapists working with children with autism. These children lack verbal skills for communication; to help them communicate, a facilitator holds the child's hand while the child presses keys to type messages on a keyboard. This technique produces impressive results, as the children are now able to express themselves. In Chapter 2, we will explore the scientific research that demonstrated that the facilitators, not the children, controlled the typing. The problem with all pseudoscience is that hopes are raised and promises will not be realized. Often the techniques can be dangerous as well. In the case of facilitated communication, a number of facilitators typed messages accusing a parent of physically or sexually abusing the child. Some parents were actually convicted of child abuse. In these legal cases, the scientific research on facilitated communication was used to help the defendant parent. Cases such as this have led to a movement to promote the exclusive use of evidence-based therapies—therapeutic interventions grounded in scientific research findings that demonstrate their effectiveness (cf. Lilienfied, Lynn, & Lohr, 2004). Figure 1.1 lists some of the characteristics of pseudoscientific claims you may hear about.

- Hypotheses generated are typically not testable.
- If scientific tests are reported, methodology is not scientific and validity of data is questionable.
- Supportive evidence tends to be anecdotal or to rely heavily on authorities that are so-called experts in the area of interest. Genuine scientific references are not cited.
- Claims ignore conflicting evidence.
- Claims are stated in scientific-sounding terminology and ideas.
- Claims tend to be vague, rationalize strongly held beliefs, and appeal to preconceived ideas.
- Claims are never revised.

FIGURE 1.1
Some characteristics of pseudoscience

Finally, we are all increasingly susceptible to false reports of scientific findings circulated via the Internet. Many of these claim to be associated with a reputable scientist or scientific organization, and then they take on a life of their own. A recent widely covered report, supposedly from the World Health Organization, claimed that the gene for blond hair was being selected out of the human gene pool. Blond hair would be a disappearing trait! General rules to follow are (1) be highly skeptical of scientific assertions that are supported by only vague or improbable evidence, and (2) take the time to do an Internet search for supportive evidence. You can check many of the claims that are on the Internet on www.snopes.com and www.truthorfiction.com.

GOALS OF BEHAVIORAL SCIENCE

Scientific research on behavior has four general goals: (1) to describe behavior, (2) to predict behavior, (3) to determine the causes of behavior, and (4) to understand or explain behavior.

Description of Behavior

The scientist begins with careful observation, because the first goal of science is to describe behavior—which can be something directly observable (such as running speed, eye gaze, or loudness of laughter) or something less observable (like perceptions of attractiveness). Cunningham and his colleagues examined judgments of physical attractiveness over time (Cunningham, Druen, & Barbee, 1997). Male college students in 1976 rated the attractiveness of a large number of females shown in photographs. The same photographs were rated in 1993 by another group of students. The judgments of attractiveness of the females were virtually identical; standards of attractiveness apparently changed very little over this time period. In another study, Cunningham compared the facial characteristics of females who were movie stars in the 1930s and 1940s with those of female stars of the 1990s. Such measures included eye height, eye width, nose length, cheekbone prominence, and smile width, among others. These facial characteristics were highly similar across the two time periods, again indicating that standards of attractiveness remain constant over time.

Researchers are often interested in describing the ways in which events are systematically related to one another. Do jurors judge attractive defendants more leniently than unattractive defendants? Are people more likely to be persuaded by a speaker who has high credibility? In what ways do cognitive abilities change as people grow older? Do students who study with a television set on score lower on exams than students who study in a quiet environment? Do taller people make more money than shorter people? Do men find women wearing red clothing more attractive than women wearing a dark blue color?

Prediction of Behavior

Another goal of science is to predict behavior. Once it has been observed with some regularity that two events are systematically related to one another (e.g., greater attractiveness is associated with more lenient sentencing), it becomes possible to make predictions. One implication of this process is that it allows us to anticipate events. If you read about an upcoming trial of a very attractive defendant, you can predict that the person will likely receive a lenient sentence. Further, the ability to predict often helps us make better decisions. For example, if you study the behavioral science research literature on attraction and relationships, you will learn about factors that predict long-term relationship satisfaction. You may be able to then use that information when predicting the likely success of your own relationships. You can even take a test that was designed to measure these predictors of relationship success. Tests such as RELATE, FOCCUS, and PREPARE can be completed online by yourself, with a partner, or with the help of a professional counselor (Larson, Newell, & Nichols, 2002).

Determining the Causes of Behavior

A third goal of science is to determine the causes of behavior. Although we might accurately predict the occurrence of a behavior, we might not correctly identify its cause. Research shows that a child's aggressive behavior may be predicted by knowing how much violence the child views on television. Unfortunately, unless we know that exposure to television violence is a *cause* of behavior, we cannot assert that aggressive behavior can be reduced by limiting scenes of violence on television. A child who is highly aggressive may prefer to watch violence when choosing television programs. Or consider this example: Research by Elliot and Niesta (2008) indicates that men find women wearing red are more attractive than women wearing a color such as blue. Does the red clothing cause the perception of greater attractiveness? Or is it possible that attractive women choose to wear brighter colors (including red) and less attractive women choose to wear darker colors? Should a woman wear red to help her be perceived as more attractive? We can only recommend this strategy if we know that the color red causes perception of greater attractiveness. We are now confronting questions of cause and effect: To know how to *change* behavior, we need to know the *causes* of behavior.

Cook and Campbell (1979) describe three types of evidence (drawn from the work of philosopher John Stuart Mill) used to identify the cause of a behavior. It is not enough to know that two events occur together, as in the case of knowing that watching television violence is a predictor of actual aggression. To conclude causation, three things must occur:

1. There is a temporal order of events in which the cause *precedes* the effect. This is called **temporal precedence.** Thus, we need to know that television viewing occurred first and aggression followed.

2. When the cause is present, the effect occurs; when the cause is not present, the effect does not occur. This is called **covariation of cause and effect.** We need to know that children who watch television violence behave aggressively and that children who do not watch television violence do not behave aggressively.
3. Nothing other than a causal variable could be responsible for the observed effect. This is called elimination of **alternative explanations.** There should be no other plausible alternative explanation for the relationship. This third point about alternative explanations is very important: Suppose that the children who watch a lot of television violence are left alone more than are children who don't view television violence. In this case, the increased aggression could have an alternative explanation: lack of parental supervision. Causation will be discussed again in Chapter 4.

Explanation of Behavior

A final goal of science is to explain the events that have been described. The scientist seeks to understand *why* the behavior occurs. Consider the relationship between television violence and aggression: Even if we know that TV violence is a cause of aggressiveness, we need to explain this relationship. Is it due to imitation or "modeling" of the violence seen on TV? Is it the result of psychological desensitization to violence and its effects? Or does watching TV violence lead to a belief that aggression is a normal response to frustration and conflict? Further research is necessary to shed light on possible explanations of what has been observed. Usually, additional research like this is carried out by testing theories that are developed to explain particular behaviors.

Description, prediction, determination of cause, and explanation are all closely intertwined. Determining cause and explaining behavior are particularly closely related because it is difficult ever to know the true cause or all the causes of any behavior. An explanation that appears satisfactory may turn out to be inadequate when other causes are identified in subsequent research. For example, when early research showed that speaker credibility is related to attitude change, the researchers explained the finding by stating that people are more willing to believe what is said by a person with high credibility than by one with low credibility. However, this explanation has given way to a more complex theory of attitude change that takes into account many other factors that are related to persuasion (Petty & Cacioppo, 1986). In short, there is a certain amount of ambiguity in the enterprise of scientific inquiry. New research findings almost always pose new questions that must be addressed by further research; explanations of behavior often must be discarded or revised as new evidence is gathered. Such ambiguity is part of the excitement and fun of science.

BASIC AND APPLIED RESEARCH

Basic Research

Basic research tries to answer fundamental questions about the nature of behavior. Studies are often designed to address theoretical issues concerning phenomena such as cognition, emotion, motivation, learning, neuropsychology, personality development, and social behavior. Here are descriptions of a few journal articles that pertain to some basic research questions:

Kool, W., McGuire, J., Rosen, Z., & Botvinick, M. (2010). Decision making and the avoidance of cognitive demand. *Journal of Experimental Psychology: General*, *139*, 665–682. doi:10.1037/a0020198

Past research documented that people choose the least physically demanding option when choosing among different behaviors. This study investigated choices that differed in the amount of required cognitive effort. As expected, the participants chose to pursue options with the fewest cognitive demands.

Rydell, R. J., Rydell, M. T., & Boucher, K. L. (2010). The effect of negative performance stereotypes on learning. *Journal of Personality and Social Psychology, 99*, 883–896. doi:10.1037/a0021139

Female participants studied a tutorial on a particular approach to solving math problems. After completing the first half of the tutorial, they were given math problems to solve. At this point, a stereotype was invoked. Some participants were told that the purpose of the experiment was to examine reasons why females perform poorly in math. The other participants were not given this information. The second half of the tutorial was then presented and a second math performance measure was administered. The participants receiving the negative stereotype information did perform poorly on the second math test; the other participants performed the same on both math tests.

Jacovina, M. E., & Gerreg, R. J. (2010). How readers experience characters' decisions. *Memory & Cognition, 38,* 753–761. doi:10.3758/MC.38.6.753

This study focused on the way that readers process information about decisions that a story's characters make along with the consequences of the decisions. Participants read a story in which there was a match of the reader's decision preference and outcome (e.g., the preferred decision was made and there were positive consequences) or there was a mismatch (e.g., the preferred choice was made but there were negative outcomes). Readers took longer to read the information about decision outcomes when there was a mismatch of decision preference and outcome.

Applied Research

The research articles listed above were concerned with basic processes of behavior and cognition rather than any immediate practical implications. In contrast, **applied research** is conducted to address issues in which there are practical

problems and potential solutions. To illustrate, here are a few summaries of journal articles about applied research:

Ramesh, A., & Gelfand, M. (2010). Will they stay or will they go? The role of job embeddedness in predicting turnover in individualistic and collectivistic cultures. *Journal of Applied Psychology, 95*, 807–823. doi:10.1037/a0019464

In the individualistic United States, employee turnover was predicted by the fit between the person's skills and the requirements of the job. In the more collectivist society of India, turnover was more strongly related to the fit between the person's values and the values of the organization.

Young, C., Fang, D., & Zisook, S. (2010). Depression in Asian-American and Caucasian undergraduate students. *Journal of Affective Disorders*, *125*, 379–382. doi:10.1016/j.jad.2010.02.124

Asian-American college students reported higher levels of depression than Caucasian students. The results have implications for campus mental health programs.

Braver, S. L., Ellman, I. M., & Fabricus, W. V. (2003). Relocation of children after divorce and children's best interests: New evidence and legal considerations. *Journal of Family Psychology, 17,* 206–219. doi:10.1037/0893-3200.17.2.206

College students whose parents had divorced were categorized into groups based on whether the parent had moved more than an hour's drive away. The students whose parents had not moved had more positive scores on a number of adjustment measures.

Killen, J. D., Robinson, T. N., Ammerman, S., Hayward, C., Rogers, J., Stone, C., . . . Schatzberg, A. F. (2004). Randomized clinical trial of the efficacy of Bupropion combined with nicotine patch in the treatment of adolescent smokers. *Journal of Clinical and Consulting Psychology, 72,* 722–729. doi:10.1037/0022-006X.72.4.729

A randomized clinical trial is an experiment testing the effects of a medical procedure. In this study, adolescent smokers who received the antidepressant Bupropion along with a nicotine patch had the same success rate in stopping smoking as a group who received the nicotine patch alone.

Hyman, I., Boss, S., Wise, B., McKenzie, K., & Caggiano, J. (2010). Did you see the unicycling clown? Inattentional blindness while walking and talking on a cell phone. *Applied Cognitive Psychology*, *24*, 597–607. doi:10.1002/acp.1638

Does talking on a cell phone while walking produce an inattentional blindness—a failure to notice events in the environment? In one study, pedestrians walking across a campus square while using a cell phone walked more slowly and changed directions more frequently than others walking in the same location. In a second study, a clown rode a unicycle on the square. Pedestrians were asked if they noticed a clown on a unicycle after they had crossed the square. The cell phone users were much less likely to notice than pedestrians walking alone, with a friend, or while listening to music.

TABLE 1.1 Test yourself

Examples of research questions	Basic	Applied
1. Is extraversion related to sensation-seeking?		
2. Do video games such as *Grand Theft Auto* increase aggression among children and young adults?		
3. How do neurons generate neurotransmitters?		
4. Does memory process visual images and sound simultaneously?		
5. How can a city increase recycling by residents?		
6. Which strategies are best for coping with natural disasters?		

At this point, you may be wondering if there is a definitive way to know whether a study should be considered basic or applied. The distinction between basic and applied research is a convenient typology but is probably more accurately viewed as a continuum. Notice in the listing of applied research studies that some are more applied than others. The study on adolescent smoking is very much applied—the data will be valuable for people who are planning smoking cessation programs for adolescents. The study on depression among college students would be valuable on campuses that have mental health awareness and intervention programs for students. The study on child custody could be used as part of an argument in actual court cases. It could even be used by counselors working with couples in the process of divorce. The study on cell phone use is applied because of the widespread use of cell phones and the documentation of the problems they may cause. However, the study would not necessarily lead to a solution to the problem. All of these studies are grounded in applied issues and solutions to problems, but they differ in how quickly and easily the results of the study can actually be used. Table 1.1 gives you a chance to test your understanding of this distinction.

A major area of applied research is called **program evaluation,** which assesses the social reforms and innovations that occur in government, education, the criminal justice system, industry, health care, and mental health institutions. In an influential paper on "reforms as experiments," Campbell (1969) noted that social programs are really experiments designed to achieve certain outcomes. He argued persuasively that social scientists should evaluate each program to determine whether it is having its intended effect. If it is not, alternative programs should be tried. This is an important point that people in all organizations too often fail to remember when new ideas are implemented; the scientific approach

dictates that new programs should be evaluated. Here are three sample journal articles about program evaluation:

Reid, R., Mullen, K., D'Angelo, M., Aitken, D., Papadakis, S., Haley, P., . . . Pipe, A. L. (2010). Smoking cessation for hospitalized smokers: An evaluation of the "Ottawa Model." *Nicotine & Tobacco Research*, *12*, 11–18. doi:10.1093/ntr/ntp165

A smoking cessation program for patients was implemented in nine Canadian hospitals. Smoking rates were measured for a year following the treatment. The program was successful in reducing smoking.

Grossman, J. B., & Tierney, J. P. (1998). Does mentoring work? An impact study of the Big Brothers Big Sisters program. *Evaluation Review, 22,* 403–426. doi:10.1177/0193841X9802200304

An experiment was conducted to evaluate the impact of participation in the Big Brothers Big Sisters program. The 10- to 16-year-old youths participating in the program were less likely to skip school, begin using drugs or alcohol, or get into fights than the youths in the control group.

Kumpfer, K., Whiteside, H., Greene, J., & Allen, K. (2010). Effectiveness outcomes of four age versions of the Strengthening Families Program in statewide field sites. *Group Dynamics: Theory, Research, and Practice*, *14*(3), 211–229. doi:10.1037/a0020602

A large-scale Strengthening Families Program was implemented over a 5-year period with over 1,600 high-risk families in Utah. For most measures of improvement in family functioning, the program was effective across all child age groups.

Much applied research is conducted in settings such as large business firms, marketing research companies, government agencies, and public polling organizations and is not published but rather is used within the company or by clients of the company. Whether or not such results are published, however, they are used to help people make better decisions concerning problems that require immediate action.

Comparing Basic and Applied Research

Both basic and applied research are important, and neither can be considered superior to the other. In fact, progress in science is dependent on a synergy between basic and applied research. Much applied research is guided by the theories and findings of basic research investigations. For example, one of the most effective treatment strategies for specific phobia—an anxiety disorder characterized by extreme fear reactions to specific objects or situations—is called *exposure therapy* (Chambless et al., 1996). In exposure therapy, people who suffer from a phobia are exposed to the object of their fears in a safe setting while a therapist trains

them in relaxation techniques in order to counter-program their fear reaction. This behavioral treatment emerged from the work of Pavlov and Watson, who studied the processes by which animals acquire, maintain, and critically lose reflexive reactions to stimuli (Wolpe, 1982).

In recent years, many in our society, including legislators who control the budgets of research-granting agencies of the government, have demanded that research be directly relevant to specific social issues. The problem with this attitude toward research is that we can never predict the ultimate applications of basic research. Psychologist B. F. Skinner, for example, conducted basic research in the 1930s on operant conditioning, which carefully described the effects of reinforcement on such behaviors as bar pressing by rats. Years later, this research led to many practical applications in therapy, education, and industrial psychology. Research with no apparent practical value ultimately can be very useful. The fact that no one can predict the eventual impact of basic research leads to the conclusion that support of basic research is necessary both to advance science and to benefit society.

Behavioral research is important in many fields and has significant applications to public policy. This chapter has introduced you to the major goals and general types of research. All researchers use scientific methods, whether they are interested in basic, applied, or program evaluation questions. The themes and concepts in this chapter will be expanded in the remainder of the book. They will be the basis on which you evaluate the research of others and plan your own research projects as well.

This chapter emphasized that scientists are skeptical about what is true in the world; they insist that propositions be tested empirically. In the next two chapters, we will focus on two other characteristics of scientists. First, scientists have an intense curiosity about the world and find inspiration for ideas in many places. Second, scientists have strong ethical principles; they are committed to treating those who participate in research investigations with respect and dignity.

ILLUSTRATIVE ARTICLE: INTRODUCTION

Most chapters in this book include a chapter closing feature called *Illustrative Article,* which is designed to relate some of the key points in the chapter to information in a published journal article. In each case you will be asked to obtain a copy of the article using some of the skills that will be presented in Chapter 2, read the article, and answer some questions that are closely aligned with the material in the chapter.

For this chapter, instead of reading articles from scientific journals, we invite you to read two columns in which *New York Times* columnist David Brooks describes the value and excitement he has discovered by reading social science research literature. His enthusiasm for research is summed up by his comment that "a day without social science is like a day without sunshine." The two articles

can be found via the *New York Times* website or using a newspaper database in your library that includes the *New York Times*:

Brooks, D. (2010, December 7). Social science palooza. *New York Times,* p. A33. Retrieved from www.nytimes.com/2010/12/07/opinion/07brooks.html

Brooks, D. (2011, March 18). Social science palooza II. *New York Times,* p. A29. Retrieved from www.nytimes.com/2011/03/18/opinion/18brooks.html

After reading the newspaper columns, consider the following:

1. Which of the articles that Brooks describes did you find most interesting (i.e., you would like to conduct research on the topic, you would be motivated to read the original journal article). Why do you find this interesting?
2. Of all the articles described, which one would you describe as being the most applied and which one most reflects basic research? Why?

Study Terms

Alternative explanations (p. 10)
Applied research (p. 11)
Authority (p. 3)
Basic research (p. 11)
Covariation of cause and effect (p. 10)
Empiricism (p. 5)
Falsifiability (p. 6)
Goals of behavioral science (p. 8)
Intuition (p. 3)
Peer review (p. 6)
Program evaluation (p. 13)
Pseudoscience (p. 7)
Skepticism (p. 5)
Temporal precedence (p. 9)

Review Questions

1. Why is it important for anyone in our society to have knowledge of research methods?
2. Why is scientific skepticism useful in furthering our knowledge of behavior? How does the scientific approach differ from other ways of gaining knowledge about behavior?
3. Provide definitions and examples of description, prediction, determination of cause, and explanation as goals of scientific research.
4. Describe the three elements for inferring causation.
5. Describe the characteristics of the way that science works, according to Goodstein (2000).
6. How does basic research differ from applied research?

Activity Questions

1. Read several editorials in your daily newspaper and identify the sources used to support the assertions and conclusions. Did the writer use intuition, appeals to authority, scientific evidence, or a combination of these? Give specific examples.
2. Imagine a debate on the following assertion: Behavioral scientists should only conduct research that has immediate practical applications. Develop arguments that support (pro) and oppose (con) the assertion.
3. Imagine a debate on the following assertion: Knowledge of research methods is unnecessary for students who intend to pursue careers in clinical and counseling psychology. Develop arguments that support (pro) and oppose (con) the assertion.
4. A newspaper headline says, "Eating Disorders May Be More Common in Warm Places." You read the article to discover that a researcher found that the incidence of eating disorders among female students at a university in Florida was higher than at a university in Pennsylvania. Assume that this study accurately describes a difference between students at the two universities. Discuss the finding in terms of the issues of identification of cause and effect and explanation. Come back to this question after you have read the next few chapters. For more information, see Sloan, D. M. (2002). Does warm weather climate affect eating disorder pathology? *International Journal of Eating Disorders, 32,* 240–244.
5. Identify ways that you might have allowed yourself to accept beliefs or engage in practices that you might have rejected if you had engaged in scientific skepticism. For example, we continually have to remind some of our friends that a claim made in an e-mail may be a hoax or a rumor. Provide specific details of the experience(s). How might you go about investigating whether the claim is valid?

Answers

TABLE 1.1:

basic = 1, 3, 4 applied = 2, 5, 6