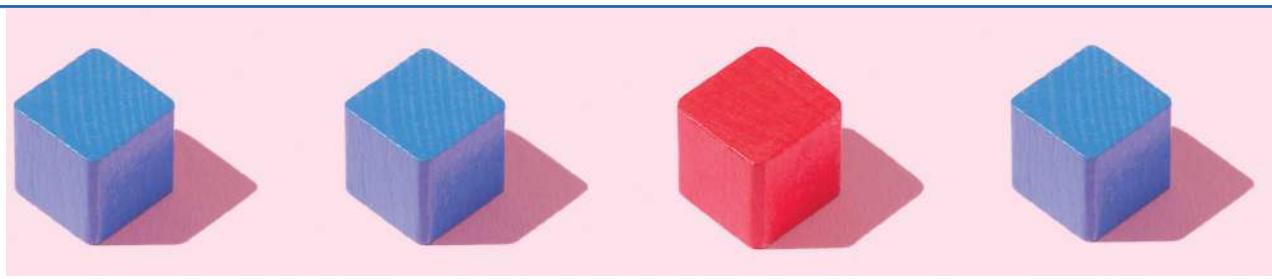

1 Psychology, Science, and Life

LEARNING OBJECTIVES

- Identify and describe the four basic goals of science.
- Explain why falsifiability is important in scientific research.
- Define the five different ways of knowing.
- Explain the advantages of using the scientific approach to knowing.
- Describe the importance of culture on approaches to knowledge.
- Describe the four characteristics of scientific research.
- Explain how science is driven by government, culture, and society.
- Explain how researchers try to generalize from laboratory research to the natural world.
- Differentiate between science and pseudoscience.
- Identify the general characteristics of pseudoscience.

KEY TERMS

A priori method
Authority
Control
Data-driven
Description
Empirical approach
Explanation
Falsifiability
Hypothesis
Junk science
Objective
Peer review
Prediction
Pseudoscience
Public
Replicable
Scientific approach
Tenacity
Theory
Verifiable

CHAPTER PREVIEW

You probably know a great deal about people and some interesting and important facts about psychology, but you probably know relatively little about psychological research. This book will show you how research helps you learn more about people from a psychological

point of view and how research contributes to your life. You can be certain of one thing: there are no simple explanations.

When you read through this chapter, you will learn that there are different ways of knowing about behavior. As a beginning psychologist, you will get a glimpse about why some types of knowledge are more useful than others. In addition, you will see that people can be resistant to changing what they believe. For instance, a lot of people believe in extra-sensory perception (ESP) or other paranormal phenomena, even though the scientific evidence for it just isn't there. One reason for such beliefs is that most people don't approach life the same way that scientists do, so the evidence they accept is sometimes pretty shaky.

Finally, this chapter will introduce you to some of the cautions you should be aware of when you read about psychological research in the popular media. Journalists are not scientists and scientists are not journalists, so there is a lot of potential for miscommunication between the two.

Why are Research Methods Important Tools for Life?

The great thing about psychology is that people are both interesting and complicated, and we get to learn more about them. As you learn more, you will see that there can be a big difference between what we think we know about behavior and what is actually true. That is why you need this course – it will help you understand the world around you.

Your course on research begins the process of learning about how psychological knowledge emerges and can be applied to people's lives. For instance, you can see in the Box *Can We Prevent Child Abuse?* how theoretical research in psychology has led to some success in reducing child abuse.

Can We Prevent Child Abuse?

Parental maltreatment of children is a problem that appears all too often. Undoubtedly, the causes are multifaceted, so preventing it is difficult. If it were easy, we would have figured it out by now.

Fortunately, research has provided some clues that might help prevent the abuse. Psychologist Steven Reznick developed the Infant Intentionality Questionnaire that assesses the degree to which adults perceive intentionality in the behavior of young children. That is, do the infants do what they do with an intention or purpose in mind (Berlin, Dodge, & Reznick, 2013; Feldman & Reznick, 1996)? Prior to his work, nobody had studied parental perceptions of negative versus positive behaviors.

Reznick and his colleagues asked parents questions about intention (e.g., *Do babies ignore their mothers to be annoying?*) and found that some parents think that their babies are annoying them on purpose. In those cases, child maltreatment can be twice as likely as when parents do not see negative intent.

This research has potential implications for preventing abuse. When parents were identified as at risk for maltreating their children, therapy involving cognitive reframing (i.e., changing the way parents think about their children's behavior) had positive effects in reducing the scale of the problem (Bugental et al., 2010).

This kind of research, which began as a theoretical exploration of infant thought, is a good example of how theoretical research can lead to useful applications to life.

We don't have to rely on such extreme applications of psychological research. For example, scientists have suggested that some people suffer from addiction to indoor tanning (Kourosh, Harrington, & Adinoff, 2010; Zeller, Lazovich, Forster, & Widome, 2006), even showing withdrawal symptoms when the physiological effects of tanning are blocked (Kaur et al., 2006). Further, adolescents who are addicted to their cell phones may experience a change in brain chemistry (which reverses when they are treated for their addiction; Smartphone addiction, 2017).

Similarly, two decades ago, when the internet was still a novelty, mental health professionals warned of the possibility of internet addiction, particularly among college students (e.g., Kandell, 1998; Young, 1998). When does going online a lot turn into addiction? If such addiction exists, we need research on how best to identify it.

In fact, a diagnostic questionnaire exists to spot it (Young, 1998). Take a look at the box *Are You Addicted to the Internet?* to see how a person is tested for the addiction. Research will also help us treat those who are afflicted. Recently, investigators have studied ways to treat such addiction, showing that positive psychology approaches can be effective (Khazaei, Khazaei, & Ghanbari-H., 2017).

Are You Addicted to the Internet?

Psychologist Kimberly Young (1998) adapted a questionnaire for diagnosing gambling addiction so it could be used to spot internet addiction. It comprised the eight questions below. She judged people as addicted if they answered *Yes* to five or more questions. (That is the criterion for the related questionnaire on gambling addiction.)

1. Do you feel preoccupied with the internet (think about previous online activity or anticipate next online session)?
2. Do you feel the need to use the internet with increasing amounts of time in order to achieve satisfaction?
3. Have you repeatedly made unsuccessful efforts to control, cut back, or stop internet use?
4. Do you feel restless, moody, depressed, or irritable when attempting to cut down or stop internet use?
5. Do you stay online longer than originally intended?
6. Have you jeopardized or risked the loss of a significant relationship, job, educational, or career opportunity because of the internet?
7. Have you lied to family members, a therapist, or others to conceal the extent of involvement with the internet?
8. Do you use the internet as a way of escaping from problems or of relieving a dysphoric mood (e.g., feelings of helplessness, guilt, anxiety, depression?) (Young, 1998, p. 238).

After reviewing the eight questions, do you think that they constitute a valid measure of internet addiction? Young (1998) found that those who responded *Yes* to at least five items experienced problems from their internet use that others did not. Over half of those who showed signs of addiction indicated that their excessive internet use affected personal relationships, academic work, and work life. Thus, this brief questionnaire seems to have validity in spotting people whose internet use is affecting their lives.

Another complex question relating to everyday life has involved something as seemingly noncontroversial as the *Baby Einstein* DVDs that purport to enhance language learning. Researchers have found that with increasing exposure to the *Baby Einstein* videos, language development actually slows down (Zimmerman, Christakis, & Meltzoff, 2007). In fact, Christakis (2009) has claimed that there is no experimental evidence indicating that the DVDs enhance language development in infants. The developer of the videos makes the opposite claim. So how should we respond?

The only way to address such issues is to do research, which means that we need to create knowledge where it does not already exist. It might sound strange to think of "creating" knowledge, but that is exactly what happens in research. You end up with information that didn't exist before. This is one of the exciting parts of doing

research: when you complete a study, you know something that nobody else in the world knows.

Why Learning About Research is Important

Even if you don't choose a career as a researcher, you can still benefit from understanding research. For one thing, many jobs in the business world and in the helping professions require knowledge of statistics and research.

Further, research can provide interesting and useful insights into your everyday behaviors. For example, do you take notes in class with your laptop? According to the research, that probably isn't a good idea. For one thing, students everywhere, such as those in Singapore (Zhang, 2015), Australia (Gupta & Irwin, 2016), Denmark (Aargaard, 2015), and the United States (Ravizza, Uitvlugt, & Fenn, 2017), find it hard to resist the temptation to connect to the internet during class, a behavior that is associated with lower grades (Ravizza et al., 2017). Furthermore, students who can see others using laptops to access the internet are distracted and score lower on tests.

It also seems to be the case that taking notes on a laptop results in less learning than taking notes by hand. The reason is that when you take notes by hand, you have to think about what to write, whereas if you use a laptop, you may simply type verbatim notes without thinking about the meaning of the material (Mueller & Oppenheimer, 2014).

In addition, knowing about research is important because every day you will be bombarded by claims that scientists have made breakthroughs in understanding various phenomena and by advertisers who imply that their research has led to a successful product. In reality, so-called "breakthroughs" don't really exist. If you look at the path of research on a single topic, you will see that each experiment adds a little more to our knowledge base. That knowledge accumulates until the scientists are confident that they have a good idea of what is going on. At that point, they may make significant claims about the topic because they have a long history of building up their understanding.

For example, in 2013, the journal *Science* declared immunotherapy the breakthrough of the year. In reality, the study of that issue had started in 1996 and every year thereafter other scientists followed up on the original ideas. So the breakthrough was a culmination of many years of research, not a single momentous event.

We can probably trust the validity of research that has progressed like that because there was continuous research to find out what was correct and to rule out errors. This is the pattern of activity in any scientific discipline. Claims of a radically new idea that nobody thought of before very often turn out to be wrong because we have found that those ideas typically do not pan out.

It will be useful for you to be able to evaluate whether to believe what you hear. A course in research will help you learn how to think critically about the things people tell you. Is their research sound? Is the conclusion they draw the best one? Do they have something to gain from getting certain results? This process of critical thinking is a hallmark of science, but it is also a useful tool in everyday life.

Answering Important Questions

There are many important scientific questions in need of answers. The journal *Science* (Kennedy & Norman, 2005) listed what some scientists see as the top 25 questions that society needs to address. At least five of these are associated with psychology:

- What is the biological basis of consciousness?
- How are memories stored and retrieved?
- How did cooperative behavior evolve?
- To what extent are genetic variation and personal health linked?
- Will the world's population outstrip the world's capability to accommodate 10 billion people?

These questions deal with behavior, either directly or indirectly. As such, psychologists will need to be involved in providing portions of the answers to each of these questions.

Of the next 100 important questions, 13 are at least partially psychological and behavioral. These questions appear in Table 1.1, along with the areas of psychology to

TABLE 1.1 Psychological questions listed among the top unanswered questions in *Science* (2005) magazine and the areas of psychology associated with them.

Area of psychology	Question
Social psychology	What are the roots of human culture?
Cognitive psychology	What are the evolutionary roots of language and music?
Biological bases of behavior/Cognitive psychology	Why do we sleep?
Personality/Learning	Why do we dream?
Biological bases of behavior	What synchronizes an organism's circadian clocks?
Comparative psychology/Learning	How do migrating organisms find their way?
Social psychology/biological bases of behavior	What is the biological root of sexual orientation?
Abnormal psychology	What causes schizophrenia?
Developmental psychology	Why are there critical periods for language learning?
Personality theory/Biological bases of behavior	How much of personality is genetic?
Biological bases of behavior	Do pheromones influence human behavior?
Developmental psychology/Biological bases of behavior	What causes autism?
Personality theory	Is morality hardwired into the brain?

which they relate. As you can see, regardless of your specific interest in psychology, you will be able to find important questions to answer.

After you complete this course in research methods, you will be able to apply your new knowledge to areas outside of psychology. The research skills you pick up here will let you complete solid psychological research projects but will also help you understand the world around you.

Why We Do Research

People are curious, social beings. As a result, most of us are interested in what others are up to and why. You have been observing others since childhood. You have probably become a sophisticated observer of others' behaviors and can predict pretty well how your friends will react if you act a certain way, at least some of the time. How did you gain this knowledge? Throughout your life, you have done things and then you observed the effect you had on others. One of the differences between scientific and nonscientific observation, though, is that scientists develop systematic plans, and we work to reduce error in recording observations. In the end, though, curiosity and enjoyment in finding out about behavior underlies the reason why researchers do their work.

When you see the results of research, you might think that the results were pretty obvious. Once we know how a study turned out, it is easy to believe that it couldn't have turned out any differently. It turns out that we can be pretty poor predictors of how people think and behave. Take a look at the research results from actual studies described in the Box *Can You Predict the Results?* and select the result that seems most likely to have occurred. You may be surprised at the difficulty you have in spotting the actual outcome of the research.

Can You Predict the Results?

When people see research results, they sometimes comment that the outcome was pretty obvious. Are psychological results really all that easy to predict? For each of the following research scenarios, **circle the result** that indicates what you think the results were. Studies have been done that relate to all of the scenarios. The actual results of the study are at the end of the chapter.

1. Many people have aesthetic (i.e., plastic) surgery in order to boost their social and psychological well-being. Is it actually the case that the effect is to provide such a boost?
   a. The surgery has a negative long-term effect on well-being
   b. The surgery has no long-term effect on well-being
   c. The surgery has a positive long-term effect on well-being
2. In classroom tests, tests could be short (like quizzes) or long. What is the effect of test length on student performance?
   a. Long tests lead to worse performance
   b. Test length is unrelated to test performance
   c. Long tests lead to better performance

3. Researchers have studied the effect of sugar on children's behaviors. What seems to be the effect of sugar on behavior?
   a. Sugar tends to make children more hyperactive
   b. Sugar has no effect on hyperactivity
   c. Sugar tends to make children less hyperactive
4. What is the effect of administering the scent of peppermint to participants playing video games?
   a. Peppermint leads to worse performance
   b. Peppermint is unrelated to test performance
   c. Peppermint leads to better performance
5. People in long-term relationships are not always faithful to one another sexually. Psychologists have studied whether people can identify "cheaters" simply by looking at the faces of strangers of the opposite sex. Can people identify cheaters?
   a. Men can identify female cheaters accurately
   b. Men cannot identify cheaters accurately
   c. Men seldom identify women as cheaters when those women are not really cheaters
6. How do people try to help people achieve goals? Researchers asked participants to put themselves in the place of another person who was playing a video game. In order to help that person perform well in the game, were participants more likely to think that generating a positive or a negative state in the game player would help in the long run? Or was there no preference?
   a. Participants thought a positive mood would help the video game player in the long run
   b. Participants did not show a tendency to prefer either a positive or a negative mood
   c. Participants thought a negative mood would help the video game player in the long run

Description—A goal of science in which behaviors are systematically and accurately characterized.

As curious scientists, we generally work toward four increasingly difficult goals based on our observations: **description**, **explanation**, **prediction**, and **control of behavior**.

Description

Our tendency to act and then to observe others' reactions fulfills what seems to be a basic need for us: describing the world around us. In fact, when you can **describe** events around you, you have taken the first step in scientific discovery. In research, description involves a systematic approach to observing behavior.

In your course on behavioral research, you will learn how, as scientists, we systematically begin to understand why people act as they do. The biggest difference between what you do in your everyday observations and what scientists do is that scientists pay attention to a lot of details that we normally think of as unimportant. Unlike most of us in everyday, casual observation, researchers develop a systematic plan for making objective observations so we can generate complete and accurate descriptions.

For example, can you trust the information you get about people when you use an online dating site? Over half the people who have used internet dating sites

(54 percent) believe that they have gotten misleading information about others (Smith & Duggan, 2013). Researchers have also documented that people change the way they present themselves depending on whether interaction is face-to-face as opposed to online, with great deception online (Guadagno, Okdie, & Kruse, 2012).

However, people also use tactics to increase their perceived attractiveness without deception. A study of photographs on online dating sites revealed that women tend to post pictures of themselves that involve a downward camera angle (as if you were higher than they are), whereas men tend to use a straight-on shot. Research participants assigned higher ratings of attractiveness to the women in the photographs with a greater downward angle; they rated men no differently as a function of the camera angle. Interestingly, there was no sex difference among raters: women and men showed the same pattern of responses (Guadagno et al., 2012).

This is a good example of descriptive research. The investigators simply wanted to document differences in the way people present themselves (truthfully) online and to describe the reactions of people who might view such photographs.

Prediction

After you describe what people are likely to do in a certain situation, the next logical step is to expand your knowledge beyond simple description. The second step is to **predict** behavior. Naturally, we are sometimes wrong in our predictions because people are not easy to figure out.

Prediction—A goal of science in which a researcher can specify in advance those situations in which a particular behavior will occur.

Psychological science has been useful in understanding different facets of our lives. For instance, wouldn't it be nice to be able to make a good prediction about how long you are going to live? Naturally, any predictions are going to be imprecise for an individual, although we might be able to make general predictions for groups. For example, our predictions are going to be accurate on average for the lifespan of women and of men. In the USA, a female baby born in 2013 could be expected to live to the age of 81, a man to 78 (Actuarial life table, n.d.). Thus, we can use sex at birth as a reasonable predictor of longevity. Further, height in adulthood is also a predictor of longevity; taller adults live longer than shorter adults (Gunnell, 2001). However, there are so many factors that can influence our lifespan that a single variable is always going to have a lot of error. Still, a single psychological factor might be helpful.

Psychologists have worked to find psychological factors that predict longevity. One such factor is the trait of conscientiousness, one component of the Five Factor Model of personality. It turns out that a simple 10- to 15-minute measure of the five factors in the model can lead to a measurement of conscientiousness that predicts longevity reasonably well. The effect size, a measure of how strong the relation is between conscientiousness and mortality, is about .11. This does not seem like a large effect, but the effect size for an aspirin regimen to reduce the risk of heart disease is between .01 and .04 and is known to be very important. Thus, knowing a person's level of conscientiousness and the number of social relationships they have can be helpful in predicting longevity (Friedman, Kern, Hampson, & Duckworth, 2014; Kern, Della Porta, & Friedman, 2014; Kern & Friedman, 2008).

Of course, making predictions about any aspect of complicated human behavior involves many factors, so we need to put together different pieces of the puzzle in order to develop a comprehensive depiction. This fact is certainly true with respect to one's longevity. Still, this research on longevity gives a good example of predictive research. The descriptive research can establish that conscientiousness is an important predictor of longevity. The research described here goes one step further in making more specific predictions.

Because research is always at the edges of our knowledge, scientists sometimes make predictions that turn out to be wrong. When that happens, the investigator will try to figure out why and will attempt to make better ones next time. A big difference between casual and scientific predictions is that scientists generally specify in great detail what factors lead to a given outcome. For most of us in everyday life, we have a vague notion of what behaviors to expect from others and often accept our predictions as true if somebody behaves in ways that are roughly approximate to what we expected. There is a lot of room for error.

In understanding people, we find it helpful to describe and to predict their behaviors because it gives us a sense of control; we know in advance what will happen. At the same time, most of us want to know even more. We want to know *why* people act as they do. This is a difficult process because people's behaviors arise for a lot of reasons.

Explanation

Explanation—A goal of science in which a researcher achieves awareness of why behaviors occur as they do.

This leads to the third goal of science, **explanation**. When we truly understand the causes of behavior, we can explain them. This is where theory comes in. A theory helps us understand behavior in a general sense. In scientific use, a theory is a general, organizing principle. When we have enough relevant information about behavior, we can develop an explanatory framework that puts all of that information into a nice, neat package – that is, into a theory. A theory is simply the best set of ideas to explain phenomena of interest.

Hypothesis—A testable prediction regarding the empirical outcome of research.

In everyday life, people often use the word *theory* when they mean a ***hypothesis***, which scientists pose as expectations regarding the results of their research. So if a person says something like "Evolution is only a theory," that person probably has a misunderstanding about what a scientific theory really is.

In order to develop a theory, we look at the facts that we believe to be true and try to develop a coherent framework that links them to one another. The next step is to test the theory to see if it successfully predicts the results of new research. So we generate hypotheses, which are educated guesses, about behaviors, and we test those hypotheses with research. The research shows us whether our hypotheses are correct; if so, the theory receives further support.

If enough of our hypotheses support a theory, we regard the theory as useful in understanding why people act in a certain way; if those hypotheses do not support the theory, we need to revise or abandon it. When we conduct research, we should have an open mind about an issue; we might have preconceived ideas of what to expect, but if we are wrong, we should be willing to change our beliefs.