

Chapter 1

Psychological Research

The Whys and Hows of the Scientific Method

Consider the following questions as you read Chapter 1

- Why do psychologists use the scientific method?
- How do psychologists use the scientific method?
- What are the canons of the scientific method?
- What is the difference between basic and applied research?
- How does basic and applied research interact to increase our knowledge about behavior?

As an instructor of an introductory psychology course for psychology majors, I ask my first-semester freshman students the question, “What is a psychologist?” At the beginning of the semester, students typically say that a psychologist listens to other people’s problems to help them live happier lives. By the end of the semester and their first college course in psychology, these same students will respond that a psychologist studies behavior through research. These students have learned that psychology is a science that investigates behaviors, mental processes, and their causes. That is what this book is about: how psychologists use the scientific method to observe and understand behaviors and mental processes.

The goal of this text is to give you a step-by-step approach to designing research in psychology, from the purpose of research (discussed in this chapter) and the types of questions psychologists ask about behavior, to the methods used by psychologists to observe and understand behavior and, finally, how psychologists describe their findings to others in the field.

WHY PSYCHOLOGISTS CONDUCT RESEARCH

Think about how you know the things you know. How do you know the earth is round? How do you know it is September? How do you know that there is a poverty crisis in some

part of Africa? There are probably many ways that you know these things. In some cases, you may know things because you used your *intuition* or previous knowledge to *deduce* these facts. For example, you may know from past experience that where you live, in the month of September, days tend to be warm but start to get cooler, especially at night. Therefore, remembering the characteristics of the weather you are experiencing, and knowing you are still living in the same location as past years, you can deduce that the month is September from your knowledge base. You may have first learned that the earth is round from an authority figure like your parents, teachers, or text authors. You may have also *observed* that the earth is round by viewing photographs of the earth taken from space. You may know there is a poverty crisis in some parts of Africa from *authority figures* as well (e.g., magazine and newspaper reporters, Bono). These are the primary ways that we learn new facts: intuition, deduction, authority, and observation.

Suppose something occurred that caused you to suspect that the authority figures you have learned these facts from are not reliable sources of information. Perhaps they have been caught lying about other facts. You might also consider a situation where you do not have enough previous experience with a topic to use your intuition to determine the information for yourself. In these situations, what is the best way for you to find the facts? The answer is *observation*. If you had reason to believe, for example, that the poverty crisis in some part of Africa is not being represented accurately, you could go there yourself and *observe* what is going on to find out if people are representing the true conditions. (In the case of poverty in some parts of Africa, you would probably find out that they are being accurately represented.)



Intuition: relying on common sense as a means of knowing about the world

Deduction: using logical reasoning and current knowledge as a means of knowing about the world

Authority: relying on a knowledgeable person or group as a means of knowing about the world

Observation: relying on what one observes as a means of knowing about the world

This is why psychologists conduct behavioral research; it is the best way to make certain that the information they have about behavior is accurate. By conducting careful and systematic observations, they can be certain that they are getting the most accurate knowledge they can about behavior. This does not mean that every study conducted will yield accurate results. There are many cases where the observations collected by different researchers conflict, but this is an important part of the process. Different ways of observing a behavior may yield different observations and these different observations help us to better understand how behaviors occur. See Table 1.1 for some examples of the different ways of knowing information.

Using Science to Understand and Explain Behavior

Observation is really what sets scientific fields apart from other fields of study. Someone who wants to know about the political situation during the Civil War may read historical documents and use his or her intuition to describe the situation based on these documents. He or she might also read books by experts (authority figures) on the Civil War period or

Table 1.1 Examples of Ways of Knowing Information

| <i>Way of Knowing</i> | <i>Example</i> |
|-----------------------|--|
| Intuition | I suddenly recognize the solution to a crossword puzzle. |
| Deduction | The sun is setting to my right, so if I turn right, I am facing west. |
| Authority | I know that a high white blood cell count indicates an infection because that is what my high school biology teacher said. |
| Observation | The results of a survey indicate that most Americans get an average of 6 to 8 hours of sleep per night (Moore, 2004). |

books on important figures that lived during that time. However, historians typically cannot observe the historical event they are studying. Psychologists have an advantage in that the behavior they want to learn about is happening in humans and other animals in the world around them. The best way to learn about it is to just observe it.

Some behaviors, such as mental processes, cannot be directly observed (e.g., thoughts or memories). Thus, psychologists have developed techniques for inferring information about mental processes through observation of specific behaviors that are affected by the mental processes. Psychologists then attempt to understand mental processes through observation of these behaviors and then investigation of the factors that influence those behaviors. That is what this book (and the course you are taking) is all about—understanding the methods psychologists use to observe, measure, and study behavior and mental processes (Figure 1.1).

Research is the foundation of the field of psychology. Many people think of the *helping* professions when they think about what psychologists do. This is because most people with a graduate degree in psychology work in these helping (or related) professions (American Psychological Association, 2003). However to do their jobs well, helping professionals, such as clinicians and counselors, need to understand the findings from research about behavior so that they know what types of treatments and therapies can best help their clients. The research studies conducted in psychology also help clinicians and counselors understand what constitutes “normal” behavior and what behaviors might be considered “abnormal.”

Thinking about the field of biology may help you understand how influential research is in the field of psychology. In the biological field, there are researchers who investigate the way our bodies react physically to the world around us (e.g., after being exposed to a virus). This knowledge helps other researchers determine which drugs may be effective in helping us improve these physical reactions (e.g., reduce our symptoms as we fight the virus). Finally, the knowledge gained in biological research helps doctors correctly diagnose and treat their patients (e.g., what symptoms indicate the presence of a particular virus and which drugs are most effective in treating these symptoms). The field of psychology works

a lot like the field of biology (although the term *psychologist* applies to both scientists and practitioners in psychology, sometimes causing confusion). Some researchers investigate what causes certain types of behaviors (e.g., distraction in people with attention deficit hyperactivity disorder, or ADHD). Other researchers investigate what treatments are effective in reducing these behaviors (e.g., rewarding someone for staying on task). Finally, some psychologists work with clients to help them deal with problem behaviors. For example, school psychologists work with teachers and parents to develop a reward system for students with ADHD who have difficulty completing work in class because they become easily distracted. The research that investigated the behaviors associated with ADHD and the factors that can reduce those behaviors was necessary for the school psychologist to be able to develop an effective treatment plan for the student.

Figure 1.1 Psychologists May Study Communication Differences Between Men and Women by Observing Their Behavior While They Talk to Each Other



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HOW PSYCHOLOGISTS USE THE SCIENTIFIC METHOD



Empiricism: gaining knowledge through systematic observation of the world

Determinism: the assumption that phenomena have identifiable causes

Parsimony: the assumption that the simplest explanation of a phenomenon is most likely to be correct

Testability: the assumption that explanations of behavior can be tested and falsified through observation

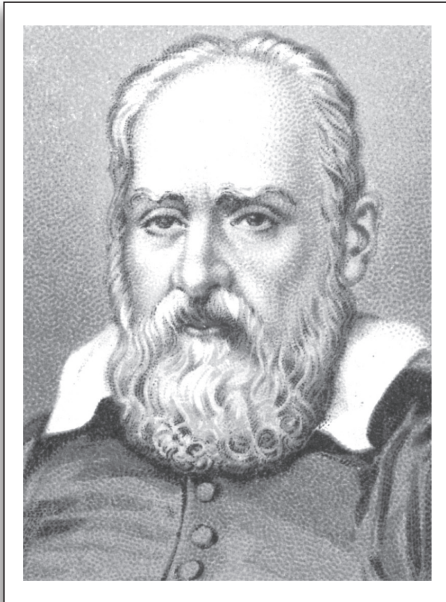
Our starting place for conducting research studies in psychology is an understanding of the assumptions that come along with the methods of science. We need to keep some concepts in mind when we use the scientific method to understand behavior. As discussed earlier, scientific study requires observations. It is the primary aspect of the scientific method. However, there are actually four primary facets or *canons* (i.e., rules or principles that guide a field of study) that define the scientific method. They are empiricism, determinism, parsimony, and testability.

Empiricism

The first canon is empiricism and this is just what we discussed above—that the scientific method relies on observations. We have several important people to thank for the empirical nature of science. Galileo, for example, was an influential scientist who used observations to understand the world (Sharratt, 1996). Much of the learning up to Galileo's time (1564–1642) had relied on authority figures, such as Aristotle and Plato, and their ideas about the world to understand how the world worked. However, Galileo (Figure 1.2) and his contemporaries (e.g., Copernicus, Newton) claimed that to learn how the world works, one should observe it. When Galileo wanted to understand how our solar system worked, he *observed* the movement of the planets around the sun through a telescope, instead of simply accepting the authoritative position held by Aristotle that the earth was the center of the solar system and everything revolved around it. He made careful, systematic observations of the phenomena of interest to better understand those phenomena. What we do in psychology is not very different from what Galileo did. If developmental psychologists want to know about bullying behaviors in elementary school children, they go out and carefully observe specific playground behaviors among these children or systematically observe the behaviors of children who have been identified as bullies.

Why do psychologists observe behavior? Observing behavior gives researchers a more accurate understanding of the causes of behaviors than other methods of gaining knowledge. Relying on an authority to learn about behavior, for example, greatly limits our understanding of behaviors across large groups of individuals, because not all authority figures are equally reliable and some may have faulty information.

How do we use empiricism to learn about behavior? There are many different ways to do this. We can simply observe people in their normal environment (e.g., children on a playground at recess). We can ask them to complete a survey (e.g., have the subjects

Figure 1.2 Galileo

SOURCE: Copyright by Jupiter Unlimited, www.jupiterunlimited.com.

respond to items that help us measure their mood). We can ask them to come into a lab and complete a task on a computer (e.g., test their memory for different types of information). Each of these methods allows us to gather empirical measurements of behavior (observation techniques are discussed further in Chapter 3).

Determinism

Another important aspect of the scientific method is the adherence to determinism. This is the concept that phenomena in the world (and human behaviors) occur naturally and have identifiable causes (in extreme cases, determinism can indicate a denial of free will). In other words, by conducting studies to observe behavior, we can understand the factors that *cause* those behaviors to occur. One goal of psychological research is to be able to explain behavior by understanding the causes of different types of behavior. For example, why do people get depressed? What causes false memories? Does sleeplessness cause anxiety? Does anxiety cause sleeplessness? The assumption of determinism in psychological research is that each of these behaviors (depression, false memories, anxiety, and insomnia) has a specific cause

or set of causes and we can understand these causes through observation of behavior in different circumstances. For many behaviors studied by psychologists, multiple causes may affect the behaviors.

How is determinism used in psychological research? Because the goal of research is typically to gain a better understanding of behavior and its causes, researchers begin with a prediction (often based on predictions tested in and results from past studies) about what causes behavior and look for behaviors they can observe in their study that are consistent or inconsistent with that prediction. The specifics of how causes of behavior are studied are discussed in Chapter 3.

Parsimony

In the 1997 film *Contact*, Jodie Foster's character, Dr. Ellie Arroway, attempts to explain her beliefs as a scientist to Matthew McConaughey's character, Palmer Joss. She tells him that simpler explanations of the world are preferred over more complex explanations, particularly if there is no scientific evidence that a complex explanation is correct. She calls this concept "Occam's Razor" (after the Franciscan friar who suggested it as an important part of the scientific method). Parsimony is what Arroway is speaking of when she talks


about the preference for more simple explanations. In psychological research, we develop explanations of behavior starting with the simplest descriptions and expanding those descriptions only when it becomes clear that the behavior is more complex than our original description of it. In other words, simple explanations are preferred. It is assumed that the simpler explanation is more likely to be correct. More complex explanations should be developed only after simpler explanations have failed to be supported by research studies.

Why is parsimony useful in psychological research? Parsimony helps scientists test their ideas because it is easier to develop a study that might falsify a simple explanation than to develop a study that might falsify a more complex explanation. Falsification is an important part of the research process. This idea is relevant to the concept of testability as well and will be discussed further in the next section.

Testability

The fourth canon of science is testability. The scientific method can only be used to examine ideas that can be tested through observation. The only explanations of behavior that can be tested with the scientific method are those that can be contradicted with observations of behavior. *Why* is falsifiability important? It is important because a test of an explanation of a behavior that allows that explanation to be falsified provides a stronger test of that explanation. If we look only for evidence to support our explanations of behavior, we are likely to find that evidence and hold on to those explanations longer even if they are wrong. Seeking only confirmatory evidence and ignoring contradictory evidence is known as **the confirmation bias**. If, instead, we design research studies that can show us behaviors inconsistent with our explanations, we are more likely to find evidence

against them, if such evidence exists. It takes only a few studies with results inconsistent with an explanation of behavior to falsify it. However, it takes many studies conducted in many different contexts to produce results consistent with an explanation of behavior to support it.



Confirmation Bias: seeking only evidence that supports our beliefs and ignoring evidence that contradicts those beliefs

Testability is one of the reasons that many of Sigmund Freud's ideas have not had more influence

in current clinical and personality psychology theories—they are difficult to test using the scientific method. For example, Freud proposed that many of our personality traits are a product of a struggle between constructs of our minds (id, ego, and superego) that we do not have full conscious access to (Nairne, 2009). It is difficult to test this theory, because the constructs Freud proposed are difficult to connect to observable behaviors. Thus, it is difficult to systematically observe behaviors in a research study that would contradict the theory. We can, however, answer questions about other types of mental processes that are indicated by observable behaviors. For example, we can test the idea that anxiety causes sleeplessness. We can observe behaviors of sleeplessness in situations where people are placed in anxiety-provoking situations with anxiety verified by self-report. If anxious people are sleeping well, this contradicts our explanation of sleeplessness (i.e., anxiety) and

provides us with a good test of our explanation (although this particular result is unlikely to be found). As psychologists using the scientific method, it is important that we ask questions and test explanations about behavior that can be falsified by observations of those behaviors.

Why is falsifiability so important in psychological science? As indicated above, falsification of explanations of behavior advances psychological science much more than supporting explanations (Platt, 1964). Whenever researchers can show that an accepted explanation is not supported, it changes the direction of investigation in an area of research and moves psychological science forward in gaining new knowledge about behavior.

The canons of science provide a general “how to” guide for psychologists designing research studies, because they help us conduct good tests of our explanations of the causes of behaviors and further our understanding of why certain behaviors occur. The rest of this text describes more of the details of how psychologists apply these canons in designing and conducting research and walks you through the process of developing research studies of your own.

BASIC AND APPLIED RESEARCH

As you begin to consider the types of questions that can be answered in psychological research studies (a topic that will be covered more in Chapter 2), it is important to keep in mind the goals of two major categories of research: basic research and applied research.

The goal of basic research is to understand the most fundamental processes of behavior and how they operate. Research questions in basic research are typically about how a behavior works. How much information can we store in short-term memory? Who exhibits more symptoms of depression: men or women? Do we have implicit stereotypes that affect our social behavior?

Applied research is generally focused on answering questions related to solving real-world problems. What type of automated teller machine (ATM) is the easiest to use? Which treatments are best in helping people who are depressed? What type of work environment increases productivity of employees?


Typically, basic research provides fundamental knowledge of how behaviors operate that is useful to researchers conducting applied studies. For example, suppose that a researcher finds that people who report having insomnia also report symptoms of anxiety (a similar result was recently reported by Morphy, Dunn, Lewis, Boardman, & Croft, 2007). A conclusion from this study might be that anxiety and sleeplessness are related in some way (note that this does not mean that anxiety *causes* sleeplessness, only that they are related). This conclusion represents basic knowledge about the connection between emotional state and sleeplessness or insomnia. Researchers interested in the more applied question of how we help people with sleep problems may use this basic knowledge to test treatments for sleeplessness that focus on reducing anxiety to determine whether the relationship found in the above study is causal or not. The basic research in this case is vital for the development of applied studies that address a real-world problem (i.e., insomnia). Table 1.2 provides some additional examples of basic and applied research studies.

It is also important to remember that the applications of basic research may not be obvious when it is initially conducted. The utility of such research to real-world problems may not be revealed until much later when enough is known about an issue to apply the knowledge gained in the basic research studies. For example, early neuroscientists (e.g., Santiago Ramón y Cajal, as cited in Meyers, 2007) conducted basic research studies to understand how neurons function. The applications of this knowledge were not clear until much later when neuroscientists better understood how this neural functioning affected behavior. For example, we now know that some types of disorders (e.g., depression) are linked to neural functioning that is abnormal (e.g., higher levels of serotonin than are typical; Barlow & Durand, 2008), and drugs have been developed to alter the neural functioning to help individuals with such disorders. The understanding of the basic knowledge of neural functioning became useful in helping individuals with disorders long after this research had been completed. Thus, basic research is important to conduct, even if an application is not immediately clear.

Because applied research investigates realistic problems, applied researchers are often concerned with the **external validity** of their studies. This means that they attempt to observe behaviors that can be applied to real-life situations. This is important because these researchers want to be able to apply their results to a problem that applies to individuals who are not participants in their study (as well as to those individuals who were observed in the study). External validity is also a consideration in basic research but in some cases can be less important than it is in applied research.

In turn, knowledge gained in applied studies can also help basic researchers refine their theories about how behavior works. Suppose in the above example regarding anxiety and insomnia, the applied studies showed that treatments reducing anxiety did not cure the symptoms of insomnia (similar results were reported by Morin, Belanger, & Fortier-Brochu, 2006). In this case, the basic researchers may use this knowledge to hypothesize that the link between anxiety and insomnia may not be a simple causal relationship and conduct further studies to better understand the causes of insomnia and how it is related to anxiety. In this way, the two types of research, basic and applied, interact with each other, showing that both types of research are critical to the field of psychology.

As you encounter descriptions of psychological research, you may find that not all research fits neatly into basic or applied categories. Some research can both answer fundamental questions about behavior and help solve a realistic problem. It may be better to think about research as primarily basic or applied. In other words, basic and applied descriptors may be end points in a continuum of types of research studies with each research study falling somewhere between these end points.



Basic Research: research conducted with the goal of understanding fundamental processes of phenomena

Applied Research: research conducted with the goal of solving everyday problems

External Validity: the degree to which the results of a study apply to individuals and realistic behaviors outside the study

Table 1.2 Basic and Applied Research Studies*Basic research*

- Researchers investigated participants' awareness of the effects of handheld objects on their ability to pass through an opening (such as a doorway). Participants held objects while viewing an opening and reported whether they could pass through the opening holding the objects (Wagman & Taylor, 2005).
- To investigate possible spatial-ability differences in male and female infants, a group of 5-month-olds completed a task to determine if they recognized objects that had been rotated from their original orientation (Moore & Johnson, 2008).
- Participants were randomly assigned to mixed-race groups, while their brain activity was recorded to investigate brain areas involved in in-group biases (Van Bavel, Packer, & Cunningham, 2008).

Applied research

- Researchers investigated how to increase volunteers for charitable organizations by presenting participants with information about the organizations to determine what type of information affects whether someone will volunteer (Boezeman & Ellemers, 2008).
- Two experiments were conducted to determine which emotional states contribute to people being willing to accept advice from others (Gino & Schweitzer, 2008).
- From self, peer, and supervisor ratings, researchers determined if managers with better work-life balances were less likely to advance in their careers (Lyness & Judiesch, 2008).

WHY SHOULD I CARE ABOUT RESEARCH IF I DON'T WANT TO DO RESEARCH IN MY CAREER?

Through my years of teaching psychology methods courses, this question often comes up by students taking these courses who don't think they want to conduct research after they graduate. Many students majoring in psychology are interested in working as a practitioner of psychology or may be completing a psychology minor that is related to another career they want to pursue (e.g., education, social work, etc.) and do not understand why research methods courses are part of their curriculum. In fact, the majority of individuals who hold a degree in psychology do not conduct research in their jobs. As mentioned earlier, the majority of individuals working in psychological areas are in the helping professions. However, much of what we know about effective treatments and counseling techniques comes from research in these areas. In addition, it is important that we as individuals understand how to interpret the vast amounts of information we take in each day through media sources.

To give you a recent example, in debates about global warming and the seriousness of the problem, many opponents of global warming solutions point out that there is disagreement among scientists about the subject. As a voter and a consumer, it is important that we

understand how research is conducted and that there will almost always be disagreement among researchers in an area, because no single study can fully answer a research question. In order to fully understand what answers the research provides on a question, we must consider the accumulation of data in many research studies. We must also understand that new knowledge is always gained and we must be flexible in our conclusions about an issue when new data suggest a different answer. Remember, there was a time when most humans believed the sun revolved around the earth. Scientific study revealed this idea to be false and over time humans adapted their beliefs to the new knowledge.

Understanding research methods can also help you better interpret research study results that are reported in the media. In almost all cases, media sources present concise and simplified reports of a research study and its results, leaving many questions about the quality of the study still to be answered. When one encounters reports of research in the media, some important questions should come to mind. Who were the research subjects? Was an appropriate sample tested? Was an appropriate method used to investigate the question? Were the results published in a high-quality source where other researchers were able to critique the work? How do the results correspond to past studies on this topic? The topics covered in this text and in your methods course will help you ask and answer these questions as you evaluate the reports you receive in the media to make decisions about your life.

Finally, the new knowledge you gain from your study of research methods may help you decide how to evaluate claims made by others in general. When you see an ad on television for a new miracle diet pill that the ad claims has helped people lose weight in studies, should you buy the pill? When your friends tell you that drinking energy drinks helps you study better and do better on exams, should you follow their advice? Hopefully, one of the things you will consider as you learn about research is to be skeptical about claims that seem too good to be true. As described earlier, a good researcher uses the data to decide what the best thing to do is rather than using unsubstantiated advice from others who just sound knowledgeable about a topic. Examples of how to evaluate claims and research reported in the media are given in the *Using Research* sections found at the end of some of the chapters in the text.

CHAPTER SUMMARY

Reconsider the questions from the beginning of the chapter:

- Why do psychologists use the scientific method? Psychologists use the scientific method because it provides the best way to gain new knowledge about behavior.
- How do psychologists use the scientific method? Psychologists use the scientific method to observe behaviors as they occur in everyday life and in situations researchers are interested in learning about.
- What are the canons of the scientific method? The canons are empiricism, determinism, parsimony, and testability.
- What is the difference between basic and applied research? Basic research is designed to answer fundamental questions about behavior. Applied research is designed to gain solutions to everyday problems.

- How does basic and applied research interact to increase our knowledge about behavior? Basic research advances our understanding of the causes of behavior. In applied research, these explanations are tested in everyday situations to inform researchers about the best solutions for everyday problems. Knowledge gained about these problems in applied research can then inform basic researchers about how explanations of behavior may need to be revised to explain behaviors that occur in everyday life.

THINKING ABOUT RESEARCH

A summary of a research study in psychology is given below. As you read the summary, think about the following questions:

1. What behaviors are the researchers observing?
2. How are the observations being recorded by the researchers?
3. Were the researchers able to identify a cause of behavior from this study?
4. Were the researchers able to answer their research questions with the observations they collected? How?
5. What results would have falsified the explanation of behavior the authors were testing?
6. Do you think this study qualifies as primarily basic or applied research? Why?
7. What are some examples of real-world behaviors that the results of this study might apply to?

Olson, K. R., Banaji, M. R., Dweck, C. S., & Spelke, E. S. (2006). Children's biased evaluations of lucky versus unlucky people and their social groups. *Psychological Science*, *17*, 845–846.

Purpose of the Study. The researchers were interested in how we develop views of other people in terms of how lucky they are. Do people view lucky individuals more positively than unlucky individuals, or do they prefer unlucky individuals because they feel bad for them? Olson, Banaji, Dweck, and Spelke (2006) examined this way of thinking by measuring children's preference for individuals portrayed as lucky or unlucky.

Method of the Study. Children between 5 and 7 years old participated in the study. A group of study participants listened to stories about other children. In these stories, the children performed an intentional action that was either positive (i.e., helpful) or negative (i.e., harmful) or were involved in an uncontrollable event that was either positive (i.e., something good happened to the child that he or she had no control over—the child was “lucky”) or negative (i.e., something bad happened to the child that he or she had no control over—the child was “unlucky”). After hearing the stories, the participants were asked to rate how much they liked the child in the story by choosing one of six different facial expressions (e.g., smiling face, frowning face) that matched how they felt about the child they heard about.

Results of the Study. Study participants preferred children who experienced positive events. This result was shown for both intentional actions (i.e., children who were intentionally good were preferred over children who were intentionally bad) and uncontrolled events (i.e., “lucky” children were preferred to “unlucky” children). Participants also preferred children who experienced uncontrolled negative events (i.e., “unlucky” children) as compared to children who performed an

intentional negative action. However, the difference in preference for intentional positive actions and uncontrolled positive events (i.e., “lucky” children) was less clear.

Conclusions of the Study. The authors concluded that children prefer lucky individuals as compared with unlucky individuals. This preference was present in children as young as 5 to 7 years old. According to the researchers, these results may help explain negative attitudes that are sometimes present for disadvantaged individuals.

COMMON PITFALLS AND HOW TO AVOID THEM

Problem: Assuming that psychology equals practice in a *helping* profession, ignoring or dismissing the scientific aspect of psychology.

Solution: Understand that science and practice are both important aspects of the field of psychology. In addition, although there is debate about this issue, many psychologists find it important that practitioners of psychology stay abreast of current research findings to ensure that they are using the most effective treatments.

Problem: Positive test bias—designing studies that provide supportive evidence of an explanation of behavior without including the possibility for contradictory evidence.

Solution: Carefully design studies to allow collection of data that can support or contradict explanations of behavior.

Problem: Misinterpretation of causation—study of cause and effect relationships requires manipulation (e.g., randomly assigning participants to different situations), but many people confuse reports of relationships with evidence of causation. In other words, correlation does not equal causation, but many people assume a link between two things means one caused the other.

Solution: Do not assume a reported relationship between factors is evidence that one factor causes another unless the study has been designed in such a way that other noncausal relationships can be ruled out.

Problem: Dismissing basic research—some people dismiss basic research as unimportant because it is not designed to solve a real-world problem.

Solution: View the “big picture” of knowledge in psychology to see how basic research informs applied research by providing fundamental knowledge of behavior that guides research questions and interpretation of results in applied studies. In addition, for a basic research study do not assume that because an application is not immediately evident the study is not valuable. Applications of basic research findings are often not clear until long after the basic research has been conducted.

USING RESEARCH

The number one cause of death in Americans today is heart disease, which can be caused by high cholesterol (Centers for Disease Control and Prevention, 2011). Many ads for fish oil supplements

suggest that taking the supplements can reduce the risk of heart disease. Should you start taking fish oil supplements to prevent heart disease? Consider the following as you decide:

- The ads also indicate that the U.S. Food and Drug Administration (FDA) has not evaluated those claims. That means that there may not be research showing benefits for the supplements or the research may have been conducted only by the companies selling the supplements. Why should we be skeptical of research only conducted by the company selling the product?
- A recent study indicated that for men who had suffered a heart attack, taking fish oil supplements was associated with their chance of having another heart attack and/or dying suddenly. Should this result affect your decision to take fish oil supplements? Why or why not?
- The National Institutes for Health (2011) suggest that fish oil is effective for lowering triglycerides, an element of maintaining good cholesterol. What other questions are important to ask before using this information to decide about taking fish oil supplements?

TEST YOURSELF

Match each canon of science below with its correct definition.

1. Determinism (a) The scientific method can be used to test descriptions and explanations of the world that can be contradicted by observations.
2. Empiricism (b) The scientific method is used to examine phenomena that have an identifiable cause.
3. Testability (c) An assumption of science is that simpler explanations are more likely than complex explanations to be correct.
4. Parsimony (d) Knowledge is gained in science by systematically observing the phenomenon being studied.
5. Freud hypothesized that many of our personality traits are controlled by an unconscious conflict between aspects of ourselves—the id, ego, and superego—that we are not consciously aware of (Nairne, 2009). Using what you know about the scientific method, explain why this hypothesis is difficult to support with observations of behavior.
6. Explain how parsimony is helpful in psychological studies.
7. For each reference listed below, decide whether the study is primarily basic or applied.
 - (a) Drews, F., Pasupathu, M., & Strayer, D. (2008). Passenger and cell phone conversations in simulated driving. *Journal of Experimental Psychology: Applied*, 14, 392–400.
 - (b) Roediger, H. L., III, & Geraci, L. (2007). Aging and the misinformation effect: A neuropsychological analysis. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 33, 321–334.
 - (c) Bratcher, N. A., Farmer-Dougan, V., Dougan, J. D., Heidenreich, B. A., & Garris, P. A. (2005). The role of dopamine in reinforcement: Changes in reinforcement sensitivity induced by

D-sub-1-type, D-sub-2-type, and nonselective dopamine receptor agonists. *Journal of the Experimental Analysis of Behavior*, 84, 371–399.

- (d) Declercq, F., Vanheule, S., Markey, S., & Willemsen, J. (2007). Posttraumatic distress in security guards and the various effects of social support. *Journal of Clinical Psychology*, 63, 1239–1246.
 - (e) West, R. (2007). The influence of strategic monitoring on the neural correlates of prospective memory. *Memory & Cognition*, 35, 1034–1046.
 - (f) McClernon, C. K., McCauley, M. E., O'Connor, P. E., & Warm, J. S. (2011). Stress training improves performance during a stressful flight. *Human Factors*, 53, 207–218.
 - (g) Weaver, J. R., & Bosson, J. K. (2011). I feel like I know you: Sharing negative attitudes of others promotes feelings of familiarity. *Personality and Social Psychology Bulletin*, 37, 481–491.
 - (h) Blanchette, I., & Leese, J. (2011). The effect of negative emotion on deductive reasoning: Examining the contribution of physiological arousal. *Experimental Psychology*, 58, 235–246.
8. I believe that the best way to study for exams is to reread my notes three times from start to finish, because last semester I did that and I got an A on my psychology exam. I believe this despite the fact that I have tried this method before and have never received an A on a psychology exam. I am falling prey to the _____.
9. The scientific method relies on which way of knowing information about the world?
10. If I am concerned about whether the behavior exhibited in my research study maps on to the everyday behaviors of individuals, I am considering the _____ of my study.

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Answers: (1) b, (2) d, (3) a, (4) c, (5) If we do not have conscious awareness of the conflict (if it is unconscious), then it would be difficult to support the existence of this conflict through direct observations of behavior. In other words, it is difficult to falsify this theory by directly observing behavior, (6) Parsimony (assuming that simple explanations are more likely to be correct) is useful in psychological studies because this assumption makes it easier to test explanations of behavior. It is easier to devise a study that can falsify a simple explanation than to devise a study to falsify a more complex explanation, (7a) applied, (7b) basic, (7c) basic, (7d) applied, (7e) basic, (7f) applied, (7g) basic, (7h) basic, (8) confirmation bias, (9) observation, (10) external validity.