

REVIEW AND REFLECT

Statistical Reasoning

To be an educated person today is to be able to apply simple statistical principles to everyday reasoning. One needn't remember complicated formulas to think more clearly and critically about data.

From this section's consideration of how we can organize, summarize, and make inferences from data—by constructing distributions and computing measures of central tendency, variation, and statistical significance—we derived five points to remember:

1. Doubt big, round, undocumented numbers.
2. When looking at statistical graphs in books and magazines and on television ads and news broadcasts, think critically: Always read the scale labels and note their range.
3. Always note which measure of central tendency is reported. Then, if it is a mean, consider whether a few atypical scores could be distorting it.
4. Don't be overly impressed by a few anecdotes. Generalizations based on only a few cases are unreliable.
5. Statistical significance indicates the *likelihood* that a result will occur by chance. It does not indicate the importance of the result.

CHECK YOURSELF: Consider a question posed by Christopher Jepson, David Krantz, and Richard Nisbett (1983) to University of Michigan introductory psychology students:

The registrar's office at the University of Michigan has found that usually about 100 students in Arts and Sciences have perfect marks at the end of their first term at the University. However, only about 10 to 15 students graduate with perfect marks. What do you think is the most likely explanation for the fact that there are more perfect marks after one term than at graduation?

ASK YOURSELF: Find a graph in a popular magazine ad. How has the advertiser used (or abused) statistics to make a point?

Answers to the Check Yourself questions can be found in the yellow appendix at the end of the book.

Frequently Asked Questions About Psychology

Preview: A scientific approach can restrain our flawed intuition while satisfying our curiosity about what predicts or causes behavior. But for many, the idea of applying science to human affairs raises concerns about how well experiments relate to life, whether they apply to all cultures and both genders, how experimenters treat human and animal subjects, and how psychologists' values influence their work and its applications.

We have seen how case studies, surveys, and naturalistic observations help us describe behavior. We have also noted that correlational studies assess the relationship between two factors, which indicates how well, knowing one thing, we can

predict another. We have examined the logic that underlies experiments, which use control conditions and random assignment of subjects to isolate the effects of an independent variable on a dependent variable. We have reflected on how a scientific approach, aided by statistics, can restrain biases.

You are now prepared to understand what lies ahead and to think critically about psychological matters. Yet, even knowing this much, you may still be approaching psychology with a mixture of curiosity and apprehension. So before we plunge in, let's confront some typical questions and concerns.

Can Laboratory Experiments Illuminate Everyday Life?

When you see or hear about psychological research, do you ever wonder whether people's behavior in the lab will predict their behavior in real life? For example, does detecting the blink of a faint red light in a dark room have anything useful to say about flying a plane at night? Does our tendency to remember best the first and last items in a list of unrelated words tell us anything about why we remember the names of certain people we meet at a party? After viewing a violent, sexually explicit film, does an aroused man's increased willingness to push buttons that he thinks will electrically shock a woman really say anything about whether violent pornography makes a man more likely to abuse a woman?

Before you answer, consider: The experimenter *intends* the laboratory environment to be a simplified reality—one in which important features of everyday life can be simulated and controlled. Just as an aeronautical wind tunnel enables an engineer to re-create atmospheric forces under controlled conditions, a laboratory experiment enables a psychologist to re-create psychological forces under controlled conditions.

People in the lab are not different creatures from their out-of-lab selves. For example, Cecilia Cheng (2001) observed that Hong Kong adults who flexibly coped with laboratory stresses also coped flexibly with stress in their marriages. In aggression studies, deciding whether to push a button that delivers a shock may not be the same as slapping someone in the face, but, the *principle* is the same. And the experiment's purpose, notes Douglas Mook (1983), is not to re-create the exact behaviors of everyday life but to test theoretical principles. *It is the resulting principles—not the specific findings—that help explain everyday behaviors.* When psychologists apply laboratory research on aggression to actual violence, they are applying theoretical *principles* of aggressive behavior, principles they have refined through many experiments. Similarly, it is the principles of the visual system, developed from experiments in artificial settings (such as looking at red lights in the dark), that we apply to more complex behaviors such as night flying. And many investigations show that principles derived in the laboratory *do* typically generalize to the everyday world (Anderson & others, 1999).

The point to remember: As psychologists, our concerns lie less with particular behaviors than with the general principles that help explain many behaviors.

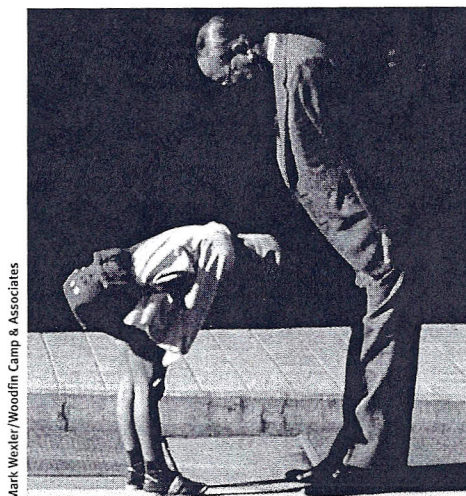
Does Behavior Depend on One's Culture?

If culture shapes behavior, what can psychological studies done in one culture, often with white North Americans, really tell us about people in general? As we will see time and again, **culture**—shared ideas and behaviors that one generation passes on to the next—matters. Our culture influences our standards of promptness and frankness, our attitudes toward premarital sex and varying body shapes, our tendencies to be casual or formal, and much, much more. Being aware of such differences, we can restrain our assumptions that others will think and act as we

■ **culture** the enduring behaviors, ideas, attitudes, and traditions shared by a large group of people and transmitted from one generation to the next.

A cultured greeting

Because culture shapes people's understanding of social behavior, actions that seem ordinary to us may seem quite odd to visitors from far away. Yet underlying these differences are powerful similarities. Schoolchildren everywhere greet their teachers with respect, although not necessarily with the formality of this young Japanese schoolchild.



Mark Wester/Woodfin Camp & Associates

"All people are the same; only their habits differ."

Confucius 551–479 B.C.

do. Given the growing mixing and clashing of cultures, our need for such awareness is urgent.

Our shared biological heritage does, however, unite us as a universal human family. The same underlying processes guide people everywhere:

- People diagnosed with dyslexia, a reading disorder, exhibit the same brain malfunction whether they are Italian, French, or British (Paulesu & others, 2001).
- Variation in languages—spoken and gestured—may impede communication across cultures, yet all languages share deep principles of

grammar, and people from opposite hemispheres can communicate with a smile or a frown.

- People in different cultures do vary in feelings of loneliness, but across cultures shyness, low self-esteem, and being unmarried magnify loneliness (Jones & others, 1985; Rokach & others, 2002).
- Most Japanese prefer their fish raw and most North Americans prefer theirs cooked, but the same principles of hunger and taste influence all of us when we sit down to a meal. We are each in certain respects like all others, like some others, and like no other. Studying people of all races and cultures helps us discern our similarities and our differences, our human kinship and our diversity.

The point to remember: Even when specific attitudes and behaviors vary across cultures, as they often do, the underlying processes are much the same.

Does Behavior Vary with Gender?

At your birth, friends and family immediately wondered which of the two human types you were: male or female. Given how important our gender is to our identity and to others' perceptions of us, do we need a different psychology for women and for men?

You will see throughout this book that gender issues permeate psychology. Researchers report gender differences in what we dream, in how we express and detect emotions, and in our risk for alcoholism, depression, and eating disorders. Not only is studying such differences interesting, it is also potentially beneficial. For example, many researchers believe that women carry on conversations more readily to build relationships; men usually talk to give information and advice (Tannen, 1990). Knowing this difference can help us prevent conflicts and misunderstandings in everyday relationships.

Nevertheless, it's important to remember that psychologically as well as biologically, women and men are overwhelmingly similar. Whether female or male, we learn to walk at about the same age. We experience the same sensations of light and sound. We feel the same pangs of hunger, desire, and fear. We exhibit similar overall intelligence and well-being. We also tend to exhibit and perceive the very behaviors our culture expects of males and females.

So, gender matters. Biology determines our sex, and then culture further bends the genders. But viewing life through the lens of gender can exaggerate differences.

Why Do Psychologists Study Animals?

Many psychologists study animals because they find them fascinating. They want to understand how different species learn, think, and behave. Psychologists also study animals to learn about people, by doing experiments that are permissible only with animals. Rats, critics say, are not long-tailed people. Yet human physiology resembles that of many other animals. Animal experiments have therefore led to treatments for human diseases—insulin for diabetes, vaccines to prevent polio and rabies, transplants to replace defective organs.

Likewise, the same processes by which humans see, exhibit emotion, and become obese are present in rats and monkeys. To discover more about the basics of human learning, researchers even study sea slugs. To understand how a combustion engine works, you would do better to study the engine of a lawn mower than that of a Mercedes. Like Mercedes engines, humans are complex. But it is precisely the simplicity of the sea slug's nervous system that makes it so revealing of the neural mechanisms of learning.

"Rats are very similar to humans except that they are not stupid enough to purchase lottery tickets."

Dave Barry, July 2, 2002

Is It Ethical to Experiment on Animals?

If we share important similarities with other animals, then should we not respect them? "We cannot defend our scientific work with animals on the basis of the similarities between them and ourselves and then defend it morally on the basis of differences," noted Roger Ulrich (1991). The animal protection movement protests the use of animals in psychological, biological, and medical research. Researchers remind us that the world's 30 million mammals used each year in research are but a fraction of 1 percent of the billions of animals killed annually for food (which means the average person eats 20 animals a year). While researchers each year conduct experiments on some 200,000 dogs and cats cared for under humane regulations, humane animal shelters are forced to kill 50 times that many (Goodwin & Morrison, 1999).

Mobilization for Animals, a network of animal protection organizations, has nevertheless been concerned. It has declared that animals used in psychological experiments are shocked "until they lose the ability to even scream in pain, . . . [are] deprived of food and water to suffer and die slowly from hunger and thirst, . . . [are] put in total isolation chambers until they are driven insane or even die from despair and terror," and are made "the victims of extreme pain and stress, inflicted upon them out of idle curiosity." However, when psychologists Caroline Coile and Neal Miller (1984) analyzed every animal research article published in the American Psychological Association's journals during the preceding five years, they found no study in which any of these allegations was true. Even when researchers used shock, it was usually of a mild intensity, one that humans can easily endure on their fingers. Only 7 percent of psychology's studies involved animals, 95 percent of which were rats, mice, rabbits, or birds. About 10 percent of these animal studies involved electric shock (Coile & Miller, 1984; Gallup & Suarez, 1985). In British psychology departments, where animal use dropped by two-thirds in the dozen years after 1977, electric shock had been used in only 4 percent of animal studies. All involved rats (Thomas & Blackman, 1991).

Animal protection organizations, such as Psychologists for the Ethical Treatment of Animals, advocate naturalistic observation of animals rather than laboratory manipulation. However, many researchers say this is not the morality of good versus evil but of compassion (for animals) versus compassion (for people). How many of us would have attacked Pasteur's experiments with rabies, which caused some dogs to suffer but led to a vaccine that spared millions of people, and dogs, from agonizing death? And would we really wish to have deprived ourselves of the animal research

"I believe that to prevent, cripple, or needlessly complicate the research that can relieve animal and human suffering is profoundly inhuman, cruel, and immoral."

Psychologist Neal Miller (1983)

"Please do not forget those of us who suffer from incurable diseases or disabilities who hope for a cure through research that requires the use of animals."

Psychologist Dennis Feeney (1987)

"The righteous know the needs of their animals."

Proverbs 12:10

"The greatness of a nation can be judged by the way its animals are treated."

Mahatma Gandhi, 1869–1948

that led to effective methods of training children with mental disorders; of understanding aging; of relieving fears and depression; of controlling obesity, alcoholism, and stress-related pain and disease?

Out of this heated debate, two issues emerge. The basic one is whether it is right to place the well-being of humans above that of animals. In experiments on stress and cancer, is it right that mice get tumors in hopes that people might not? Should some monkeys be exposed to an HIV-like virus in the search for an AIDS vaccine? Is our use of other animals as natural as the behavior of carnivorous hawks, cats, and whales? (Animals themselves do not assign rights to other animals lower on the food chain.) Defenders of research on animals argue that anyone who has eaten a hamburger, worn leather shoes, tolerated hunting and fishing, or supported the extermination of crop-destroying or plague-carrying pests has already agreed that, yes, it is sometimes permissible to sacrifice animals for the sake of human well-being.

Scott Plous (1993) notes that our compassion for animals varies, as does our compassion for people, based on their perceived similarity to us. As Chapter 18 explains, we feel more attraction, give more help, and act less aggressively toward similar others. Likewise, we value animals according to their perceived kinship with us. Thus, primates and companion pets get top priority. (Western people raise or trap mink and foxes for their fur, but not dogs or cats.) Other mammals occupy the second rung on the privilege ladder, followed by birds, fish, and reptiles on the third rung, with insects at the bottom. In deciding which animals have rights, we each draw our own cut-off line somewhere across the animal kingdom.

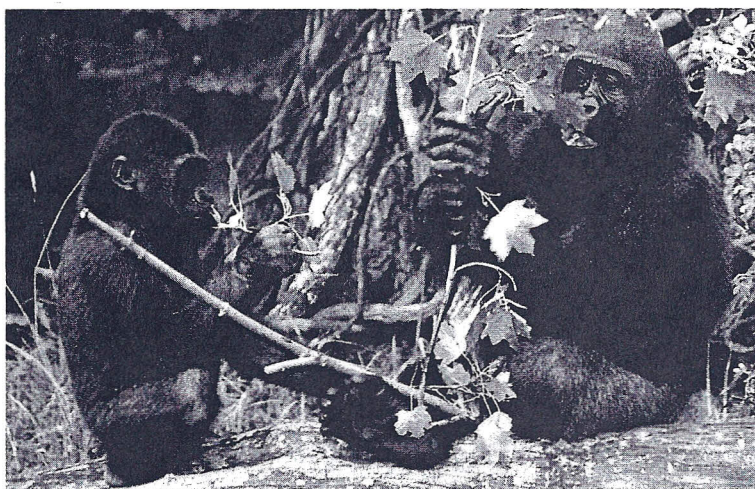
If we give human life first priority, the second issue is the priority given the well-being of the animals in research. What safeguards should protect animals? Most researchers today feel ethically obligated to enhance the well-being of captive animals and protect them from needless suffering. In one survey of animal researchers, 98 percent or more supported government regulations protecting primates, dogs, and cats, and 74 percent supported regulations providing for the humane care of rats and mice (Plous & Herzog, 2000). Many professional associations and funding agencies now have guidelines for the humane use of animals. For example, British Psychological Society guidelines now call for housing animals under reasonably natural living conditions, with companions for social animals (Lea, 2000). Humane care also leads to more effective science, because pain and stress would distort the animals' behavior during experiments.

Animals have themselves benefitted from animal research. One Ohio team of research psychologists measured stress hormone levels in samples of millions of dogs brought each year to animal shelters, and studied methods of handling and stroking them that reduced stress and eased their transition to adoptive homes (Tuber & others, 1999). Thanks to animal behavior studies, formerly idle Bronx Zoo animals are now staving off listless boredom by working for their supper as would their counterparts in the wild (Stewart, 2002). Studies have helped improve animal care and management not only in laboratories, shelters, and zoos but also in their natural habitats. By revealing our behavioral kinship with animals and the remarkable intelligence of some animals, experiments have also led to an increase in our empathy for them. At its best, a psychology concerned for humans and sensitive to animals serves the welfare of both.

Is It Ethical to Experiment on People?

If the image of animals or people receiving supposed electric shocks troubles you, you may find it a relief that most psychological research involves no such stress. Blinking lights, flashing words, and pleasant social interactions are the rule.

Occasionally, though, researchers do temporarily stress or deceive people, but only when they believe it is essential to a justifiable end, such as understanding and



D. Shapiro, © Wildlife Conservation Society

Animal research benefiting animals

Thanks partly to research on the benefits of novelty, control, and stimulation, these Bronx Zoo gorillas are enjoying improved quality of life.

controlling violent behavior or studying mood swings. Such experiments wouldn't work if the participants knew all there was to know about the experiment beforehand. Either the procedures would be ineffective or the participants, wanting to be helpful, might try to confirm the researchers' predictions.

Ethical principles developed by the American Psychological Association (1992) and the British Psychological Society (1993) urge investigators to (1) obtain the informed consent of potential participants, (2) protect them from harm and discomfort, (3) treat information about individual participants confidentially, and (4) fully explain the research afterward. Moreover, most universities today screen research proposals through an ethics committee that safeguards the well-being of every participant.

Much research, however, occurs outside of university laboratories, in places where there may be no ethics committees. For example, retail stores routinely survey people, photograph their purchasing behavior, track their buying patterns, and test the effectiveness of advertising. Curiously, such research attracts less attention than the scientific research done to advance human understanding.

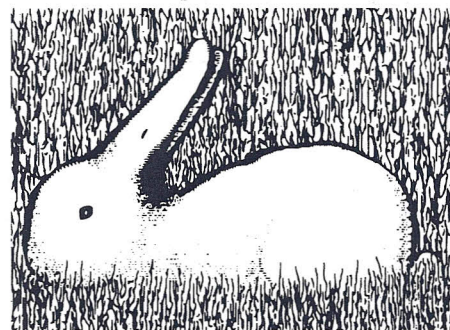
Is Psychology Free of Value Judgments?

Psychology is definitely not value-free. Values affect what we study, how we study it, and how we interpret results. Consider: Researchers' values influence their choice of research topics—whether to study worker productivity or worker morale, sex discrimination or gender differences, conformity or independence. Values can even color “the facts.” Our preconceptions can bias our observations and interpretations; sometimes we see what we want or expect to see (**FIGURE 1.13**). Even the words we use to describe a phenomenon can reflect our values. Labeling the sex acts we do not practice as “perversions” or as “sexual variations” conveys a value judgment. The same holds true in everyday speech, when one person’s “rigidity” is another’s “consistency,” or one person’s “faith” is another’s “fanaticism.” Our labeling someone as “firm” or “stubborn,” “careful” or “picky,” “discreet” or “secretive” reveals our feelings. Both in and out of psychology, labels describe and labels evaluate.

Popular applications of psychology also contain hidden values. If you defer to “professional” guidance about how to live—how to raise children, how to achieve self-fulfillment, what to do with sexual feelings, how to get ahead at work—you are accepting value-laden advice. A science of behavior and mental processes can certainly help us reach our goals, but it cannot decide what those goals should be. (See *Thinking Critically About the Death Penalty* on pages 52–53.)

FIGURE 1.13**What do you see?**

People interpret ambiguous information to fit their preconceptions. Did you see a duck or a rabbit? Before showing some friends this image, ask them if they can see the duck lying on its back (or the bunny in the grass). (From Shepard, 1990.)



© Roger Shepard

“It is doubtless impossible to approach any human problem with a mind free from bias.”

Simone De Beauvoir, *The Second Sex*, 1953

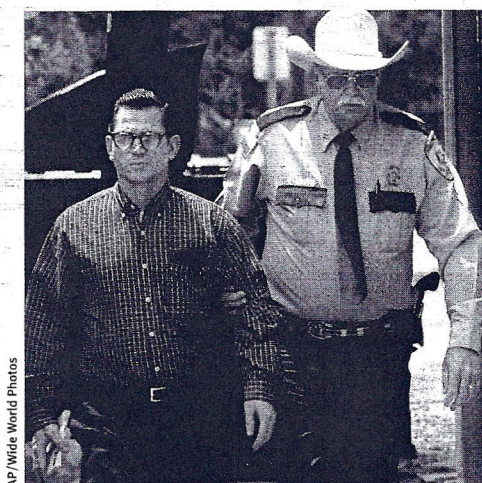
THE DEATH PENALTY—WHEN BELIEFS COLLIDE WITH PSYCHOLOGICAL SCIENCE

An influential modern viewpoint, ironically called *postmodernism*, questions scientific objectivity. Rather than mirroring the real world, say postmodernists, scientific concepts are socially constructed fictions. Like all knowledge, they reflect the culture that formed them. “Intelligence,” for instance, is a concept psychologists created and defined. Because personal values guide theory and research, “truth” is actually personal and subjective. (What behaviors shall we call “intelligent”?) In our quest for truth, we cannot help following our hunches, our biases, our cultural bent.

Psychological scientists agree that many important questions lie beyond the reach of science. And they agree that personal beliefs often shape perceptions. But they also believe that there is a real world out there, and that we advance truth by checking our hunches against it. Marie Curie did not just construct the concept of radium, she *discovered* radium. It really exists. In the social sciences, pure objectivity, like pure love, may be unattainable. Yet most would argue that it is better to humble ourselves before reliable evidence than to cling to untested presumptions.

Letting go of presumptions is just what the U.S. Supreme Court justices did after 1950. They considered pertinent social science evidence and decided to disallow five-member juries and to end school desegregation. These very decisions helped inspire hundreds more studies that researchers hoped would inform future judicial decisions. But more recently the Court has joined postmodernists in discounting social science research. In deciding whether the death penalty falls under the Constitution’s ban on “cruel and unusual punishment,” the Court wres-

tled with whether society defines execution as cruel and unusual, whether courts inflict the penalty arbitrarily, whether they apply it with racial bias, and whether execution deters crime more than all other available punishments. The social science answers to each of these questions, note psychologists Mark Costanzo (1997) and Craig Haney and Deana Logan (1994), could hardly be clearer. And yet, on two of these issues—the fairness of the death penalty and its effectiveness—the Court has disregarded social science research.



AP/Wide World Photos

Executing the childlike

When granted a stay of execution in November 2000, with three hours to spare, Johnny Paul Penry’s immediate concern was whether he would lose his promised last meal of a cheeseburger and fries. Penry, the son of an absent father who taunted him as retarded and a mother who abused and tormented him, has the mental ability of a 7-year-old. In 2002, he was again sentenced to death.

Is Psychology Potentially Dangerous?

If some people see psychology as merely common sense, others have a different concern—that it is becoming dangerously powerful. Is it an accident that astronomy is the oldest science and psychology the youngest? Exploring the external universe is one thing, but exploring our own inner universe seems even more dangerous and threatening. Might psychology be used to manipulate people?

Knowledge, like all power, can be used for good or evil. Nuclear power has been used to light up cities—and to demolish them. Persuasive power has been used to ed-

Is the Death Penalty Applied Fairly?

Should it be permissible to execute a person with mental retardation—someone having the mental age of a 7-year-old, as in the case of Johnny Paul Penry? Attitudes toward capital punishment tend to follow a nation's legal practice. The death penalty is therefore mostly favored by Americans and opposed by those in many other nations (as readers in Canada, Western Europe, Australia, New Zealand, and most of South America will recognize). Nevertheless, public opinion surveys show Americans are overwhelmingly opposed to executing people with mental retardation. Some justices have dismissed such surveys, preferring instead to trust state legislation and jury decisions as indicators of public attitudes. However, studies show that those eligible to serve as jurors in capital punishment cases—those who accept the death penalty—do not represent the greater population. Compared with people excluded by virtue of their qualms about capital punishment, those chosen as jurors are less likely to be minorities and women. They are also more

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"The state asks that the defendant, although a tadpole, be charged as a frog."

likely to believe the prosecution's arguments, and they are more conviction-prone.

The Court has accepted social science evidence that a 15-year-old is too immature emotionally and too vulnerable to peer pressure for the death penalty to be appropriate. Yet, without explanation, it ignored the very same body of evidence when it decided that a 16-year-old, and even someone with the mental ability of a 7-year-old, could be executed.

Does the Death Penalty Work—Does It Deter Crime?

The evidence is consistent: States with a death penalty do not have lower homicide rates. After instituting the death penalty, these states did not see their rates drop. And homicide has not risen in states that have abandoned the death penalty. A person committing a crime of passion doesn't pause to calculate the consequences (and, if she or he did, would likely consider life in a prison cell an ample deterrent). Yet the Court persists in its belief that "the death penalty undoubtedly is a significant deterrent."

Beliefs guide perceptions. And that, say psychological scientists responding to postmodernists, is why we *need* to think smarter—to restrain our hunches, our biases, and our cultural leanings by checking them against available evidence. Why not put our testable beliefs to the test? If they find support, so much the better for them. If they collide against a wall of observation, so much the worse for them. These ideals of skeptical scrutiny and humility fuel all scientific endeavor.

ucate people—and to deceive them. The power of mind-altering drugs has been used to restore sanity—and to destroy it.

Although psychology does indeed have the power to deceive, its purpose is to enlighten. Every day, psychologists are exploring ways to enhance learning, creativity, and compassion. Psychology also speaks to many of our world's great problems—war, overpopulation, prejudice, family dysfunction, crime—all of which involve attitudes and behaviors. And psychology speaks to our deepest longings—for nourishment, for love, for happiness. True, psychology cannot address all of life's great questions, but it speaks to some mighty important ones.

REVIEW AND REFLECT

Frequently Asked Questions About Psychology

Can Laboratory Experiments Illuminate Everyday Life?

By intentionally creating a controlled, artificial environment in the lab, researchers aim to test theoretical principles. These principles help us to understand, describe, explain, and predict everyday behaviors.

Does Behavior Depend on One's Culture?

Attitudes and behaviors do vary across cultures, but the principles that underlie them vary much less. Cross-cultural psychology explores both our cultural differences and the universal similarities that define our human kinship.

Does Behavior Vary with Gender?

Gender is a basic fact of life. Although gender differences tend to capture attention, it is important to remember our greater gender similarities.

Why Do Psychologists Study Animals?

Some psychologists study animals out of an interest in animal behavior. Others do so because knowledge of the physiological and psychological processes of animals gives them a better understanding of the similar processes operating in humans.

Is It Ethical to Experiment on Animals?

Only about 7 percent of all psychological experiments involve animals, and under ethical and legal guidelines these animals rarely experience pain. Nevertheless, animal rights groups raise an important issue: Even if it leads to the relief of human suffering, is an animal's temporary suffering justified?

Is It Ethical to Experiment on People?

Occasionally researchers temporarily stress or deceive people in order to learn something important. Professional ethical standards provide guidelines concerning the treatment of both human and animal participants.

Is Psychology Free of Value Judgments?

Psychology is not value-free. Psychologists' own values influence their choice of research topics, their theories and observations, their labels for behavior, and their professional advice.

Is Psychology Potentially Dangerous?

Knowledge is power that can be used for good or evil. Applications of psychology's principles have so far been overwhelmingly for the good. Psychology addresses some of humanity's greatest problems and deepest longings.

CHECK YOURSELF: How are human and animal research subjects protected?

ASK YOURSELF: Were any of these Frequently Asked Questions your questions? Do you have other questions or concerns about psychology?

Answers to the Check Yourself questions can be found in the yellow appendix at the end of the book.

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