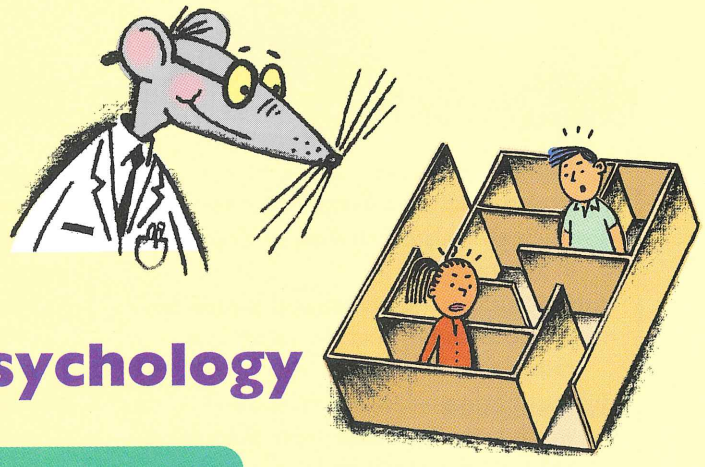
CHAPTER 2



Research in Psychology

In this chapter, you will learn about:

- the scientific method in psychology
- conducting research
- ethical issues

Swiss psychologist Jean Piaget's pioneering work on the development of children's thinking and reasoning began with his observations of his own children. However, his observations were different from those of other parents. When he started to notice things that were different from what he had been taught, he made notes. He observed other children. He developed a theory. He tested it. He published it and invited other psychologists to repeat his experiments and add their own observations. In other words, he used the "scientific method."

In designing research, psychologists choose from a number of methods—such as naturalistic observation, case studies, surveys, and experiments. They gather data using various methods. They process it to make comparisons and draw conclusions.

Psychologists must also consider the ethical aspects of their research. Is it okay for psychologists to deceive people to gather information? Is it wrong to use animals in experiments? Ethical guidelines help psychologists address these and other similar issues.

The Scientific Method

Science is an approach to gaining knowledge—a method of inquiry using certain rules and procedures to answer questions about nature. In science, any statement made about nature must be supported by experimental evidence. The behavioral science of psychology focuses its questions on human mental processes and behavior.

Scientists develop their theories based on objective observations and by conducting research to determine if those theories are true. A **theory** is a statement of underlying principles about some aspect of nature, such as the theory of universal gravitation—the idea that all objects attract one another.

Scientific knowledge is valid and believable only to the extent that the observations are objective and the rules and principles of the scientific method have been followed.

What Are Paradigms?

Scientists work within a given paradigm. A **paradigm** is a particular way of looking at the world. For example, some scientists work from the belief that understanding how each part of the brain works will lead to an understanding of the mind. Others work from the belief that interaction among the parts of the brain is an important factor in how thought and behavior arise.

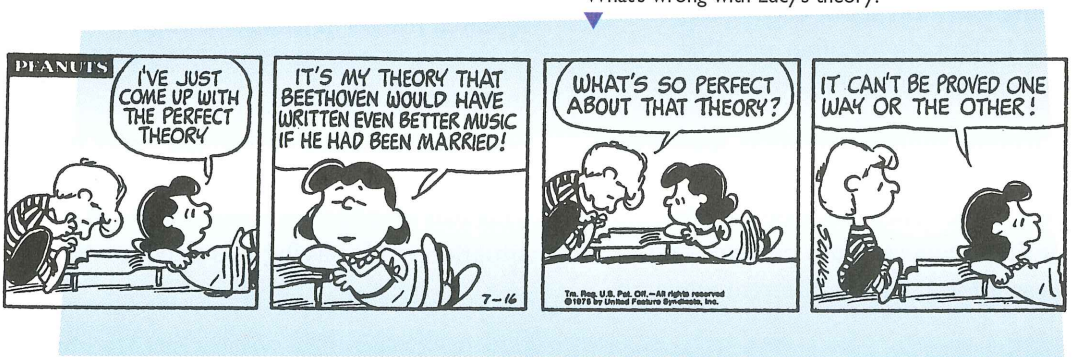
Where Do Theories Come From?

Theories are generated by looking at a large set of observations and finding common principles among them. This process is called **inductive thinking**—reasoning from particular instances to general principles.

Theories can rarely, if ever, be *proven* true because one can't reasonably test every possible situation. Even a simple statement such as "crows are black" can't be proven to be true unless one looks at every crow that ever lived and ever will live.

While you can't prove a theory true, you can prove it false by finding observations that don't fit the theory or that contradict it. Karl Popper, a philosopher of science, says that a theory must be able to be tested against observations that could prove it false in order to be a good theory. In the cartoon shown here, Lucy demonstrates why.

What's wrong with Lucy's theory?



How Are Theories Used?

Once scientists have a theory about how the world operates, they can apply those principles to individual people, objects, or circumstances. For example, if a theory says that phobias are caused by earlier traumas, a psychologist could attempt to identify the trauma that produced a client's fear of snakes. This is called **deductive thinking**—thinking from the general to the particular.

Imagine a psychological theory that says gender—whether an individual is male or female—affects behavior. Although the theory is too broad to be tested, it contains many smaller aspects about which questions can be asked, such as how gender affects shopping behavior, math ability, or job preferences.

Scientific Attitudes and Values

Most scientists share certain attitudes about their work. These include:

* Relying on careful observation.
* Quantifying results wherever possible.
* Relying on verification or duplication of results by other scientists.
* Recognizing that results are tentative and based on probability.
* Being skeptical about conclusions—that is, looking for other possible reasons to explain the observations.

Scientists value observation, questioning, logic, and simple explanations over more complex ones. Because people, including scientists, both perceive and process information in different ways, scientists rely on the careful steps required by the scientific method and on the duplication of their experiments by others to increase the objectivity of their results. When many scientists are able to repeat an experiment and get similar data, they are satisfied that the experiment is as objective as possible.

Bias in Research

At a party, you notice that a mother of four children, a famous concert violinist, a flashy blond in a sequined dress, and a millionaire are all in attendance. Which of those people would you most want to talk to? Which would you least want to talk to? What if all four descriptions applied to the same person?

Most of us have certain expectations or beliefs about people based on such things as the way they dress, the groups they belong to, or whether they are male or female. Depending on those biases, researchers might, without even realizing it, interpret the same behavior of two experiment participants in different ways.

Bias is generally defined as any condition or set of conditions that distorts data from what pure chance would have produced. Several types of bias can affect research results in different ways.

Intentional Bias

Some studies focus on a single factor in behavior, such as the effect of birth order. This bias emphasizes some aspects of a situation while paying less attention to

others. As long as an experimenter is open about his or her intent, people recognize that the conclusions drawn are meant to address only one aspect of a situation.

Experimenter Bias

The experimenter may hold a conscious or unconscious bias in terms of gender, ethnic or socioeconomic groups, or other personal traits. This can lead to error in the selection of participants, creation of tests, interpretation of observations, or in reaching conclusions. An experimenter's tone of voice or facial expression may be affected by bias, thus affecting a participant's own perceptions.

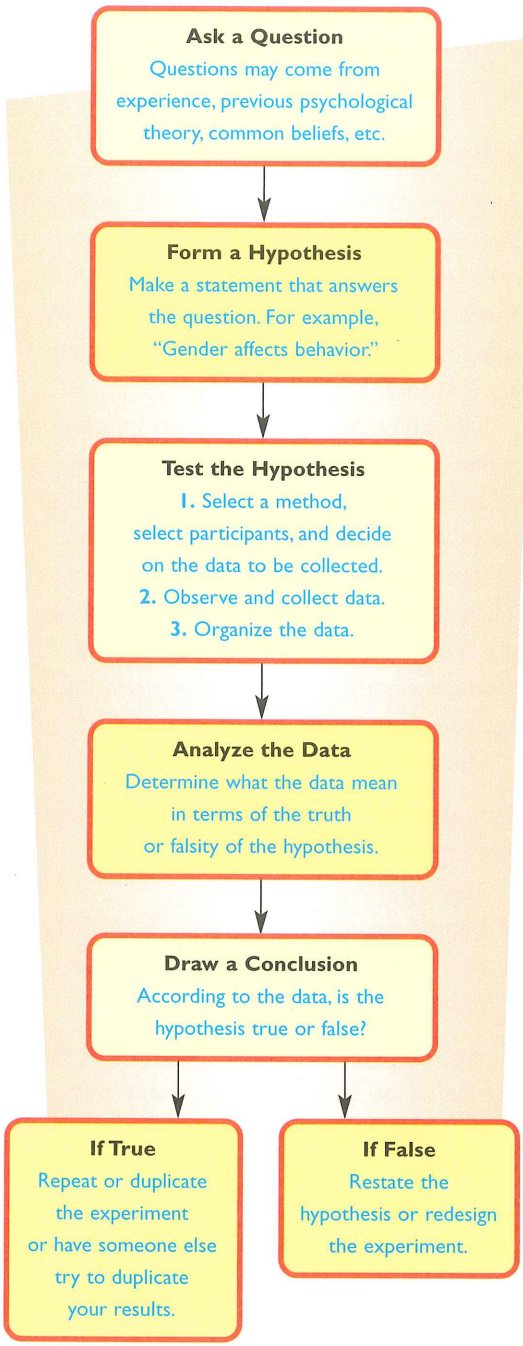
Participant Bias

If people know that they are part of an experiment, they may behave as they think they are expected to behave or may change their behavior so that the experimenter won't know how they really act. In medical experiments, participants may expect a medication to make them better and so they get better, even when they receive a pill with no active ingredients.

Ways researchers avoid bias include:

* Becoming as aware as possible of their own biases.
* Having other people review their work.
* Selecting methods that disguise the identities of the participants.
* Recognizing that subject bias might be affecting behavior.

The Scientific Approach to Research



Designing Research

Psychological research is not always done in labs. Nevertheless, it uses much of the same scientific method that other sciences employ in the laboratory. Let's define a few terms.

What Is a Hypothesis?

As Kelly moves through the halls between classes, she notices that most of the boys carry their books in one hand at about hip level. In contrast, girls seem to wrap both arms around their books and carry them against their chests or stomachs.

Kelly has taken the first step in scientific research. She has noticed a **correlation**—a relationship between two different things. Kelly says, "Boys carry their books in a different way from girls." Kelly has stated a **hypothesis**—a statement of something she believes to be true. A more formal hypothesis might be "There is a relationship between gender and book-carrying style."

Here are a few other hypotheses:

* Males are more aggressive than females.
* Practice improves performance on video games.
* People raised on a farm are less likely to engage in criminal behavior than those raised in a city.

Hypotheses are merely statements that can be tested by designing an experiment that may show them to be true or false. Once you have a hypothesis, the next step is to decide who or what you want to observe and under what conditions. Since Kelly can't observe all males and females, she will probably limit her experiment (and her hypothesis) to students at her high school.

Selecting Participants

When Kelly decides which students she will observe, she is selecting participants for her experiment. Here are **three** things to consider when choosing participants:

1. If Kelly wants to make a general statement about all students, then she must select participants that represent all students—students of the different ages, ethnic groups, and various physical characteristics that represent a cross-section of her school's population. Remember that conclusions can only apply to the population observed.
2. The greater the number of participants, the more meaningful the results are likely to be. By choosing a large number of students, Kelly may reduce the possibility that her observations occurred by chance.
3. Participants should be chosen in a way that avoids any bias. Kelly should randomly select students in the various groups to avoid errors such as selecting students she'd already seen who confirmed her hypothesis.

Variables

One of the key parts of designing any experiment is analyzing the variables. A **variable** is anything that can take on different values or qualities.

In Kelly's experiment, in addition to gender and book-carrying style, variables might include:

* How many books the person had to carry.
* How big or heavy the books were.
* Whether anything else was carried.
* Whether or not students walked alone.
* How crowded the halls were.

Dependent and Independent Variables

In an experiment, the behavior that you are observing is called the dependent variable. In Kelly's case, this is the book-carrying style of the student. Kelly's hypothesis says that this behavior *depends* on something else—the gender of the student.

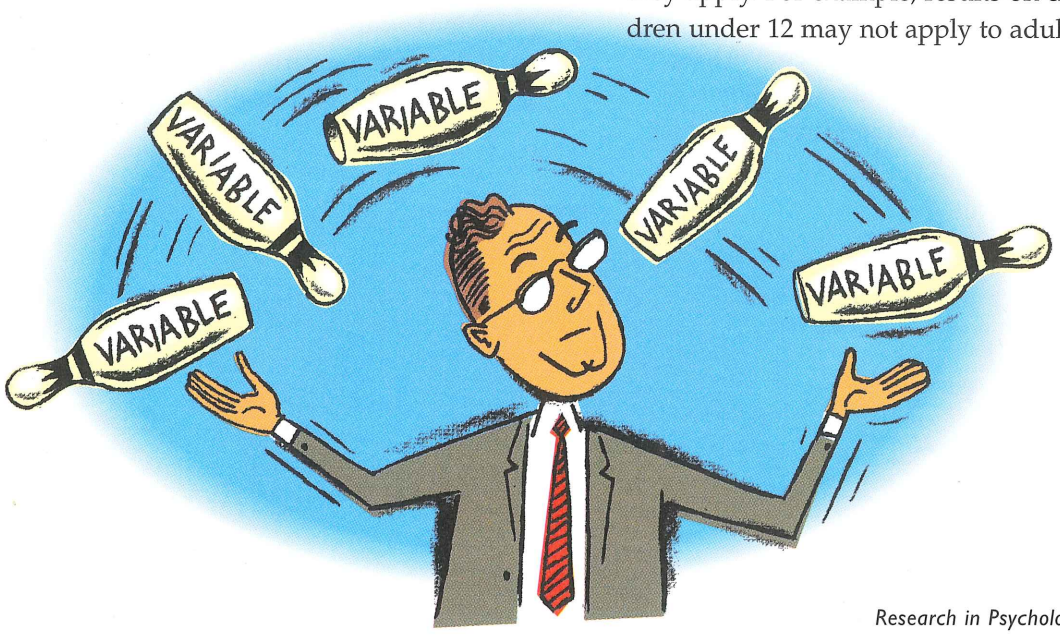
The factor being studied—and upon which the dependent variable depends—is the independent variable. In Kelly's case, it is gender. Gender is independent of book-carrying style. A boy is a boy no matter how he carries his books.

Controlling Variables

If Kelly wanted to be sure that no other independent variable affected the way people carried their books, she'd have to make certain that every other variable mentioned above stayed the same at all times. That is called *controlling the variables.*

To carry that to extremes, Kelly would have to observe students only when students were walking alone and carrying the same number and weight of books, and when the halls had a certain density of students. Obviously that isn't reasonable. Since these variables may introduce some error into Kelly's data, she should acknowledge them when she draws her conclusions.

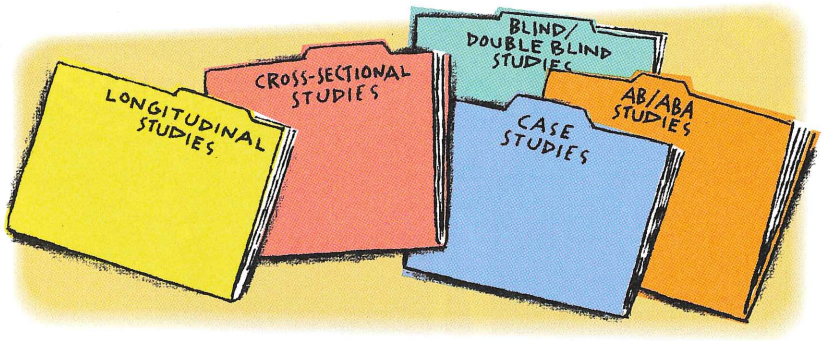
It's important for scientists to agree on the variables being measured and those being ignored to understand the conclusions a research study may reach. Many studies list the variables in the conclusion so that those reading the results will understand under what circumstances they apply. For example, results on children under 12 may not apply to adults.



Which Kind of Study?

Researchers may select from a number of different types of studies, including the following **five:**

1. **Longitudinal Studies.** When researchers want to know the long-term effects of some variable, they may do periodic tests on participants over a number of years. These longitudinal studies are particularly useful in studies of child development.
2. **Cross-sectional Studies.** Participants are chosen from a representative sample of the population—including people from a variety of ethnic, occupational, socioeconomic, and other groups. Researchers then form conclusions that may be applicable to the entire population.
3. **Case Studies.** Case studies are in-depth studies of one individual with the goal of finding out as much as possible about what factors have influenced his or her development and personality. Case studies are often used when working with a client's individual problems or to compare and understand individual differences.
4. **Blind/Double-Blind Studies.** To counter effects of experimenter and participant expectations and biases, some studies are done without the participants knowing the purpose of the study. That is called a blind study. Because the researcher's behavior may affect results, other studies are done with neither the participant nor the person administering the test knowing the purpose of the study. This is a double-blind study.
5. **AB/ABA Studies.** Before you can decide if a particular treatment changes behavior, you must know the normal behavior of a person. For example, if you're trying to reduce the number of tantrums a child throws, you need to know how many he or she normally throws in a period of time. That is condition A. After the treatment, the number of tantrums is condition B. If B is less than A, one might conclude that the treatment was effective. To make doubly sure, the researcher will go back to the original conditions, without the treatment, and see if the person reverts to condition A. This is called an ABA study.



Gathering Data

Consider these research topics:

* A sociocultural psychologist wants to know the opinions of various ethnic groups on effective ways of child rearing.
* A behavioral psychologist is curious about how babies respond to different sounds.
* A neurobiologist is concerned with which parts of the brain are most active during sleep.

Depending on the question being asked in psychological research, many different kinds of research methods might be used to gather data. The first of our examples might use a questionnaire, the second might manipulate sounds and observe and record a baby's behavior, and the third might make physiological measurements of brain activity. Each is gathering data, but in very different ways.

Self-Reporting Methods

In one form of data collection, the researcher simply asks the participants about their behaviors or experiences using surveys or interviews.

Surveys. Participants answer questions about the variable being tested. These questions may require simple yes-no answers, a ranking, or a more open-ended response. Often, surveys are sent to people to be filled out at their convenience. Surveys can gather information from many people on a wide variety of topics, such as opinions, behaviors, feelings, or beliefs. If the participants take the survey seriously, it can generate very accurate responses.

However, some people will not take the time to fill out and return surveys, so the sample size is reduced. Because the researcher doesn't speak directly to the participants, there is no way of knowing how the responder understood the questions. That could lead to misinterpretation of answers.

Interviews. Researchers may use the same questions they would in a survey but pose them to participants face to face. Interviews allow much more detailed answers to be obtained with respect to the variables being tested. Interviewers can be certain that participants interpret and understand the questions in the way they were written.

Interviews, however, are very time consuming, so some people aren't willing to participate. Interviewers may influence the participants' answers by their own behaviors or biases, or they may allow themselves to stray from the questions.

Behavioral Methods

Some research questions require that the actual physical behavior or thought processes of a person be observed. This can occur either in a laboratory situation or in a more natural setting.

Naturalistic Observation. Often, particularly in the early phases of research, psychologists simply observe the behavior of participants in their natural environments and record their behaviors. This

method, called naturalistic observation, is particularly useful with children or others who may act differently because they are being observed. When they are unaware of being watched, participants act naturally. Naturalistic observation also allows researchers to observe a variety of behaviors to decide what relationships may exist.

However, observers may misinterpret the reasons for certain behaviors. Because researchers are more interested in "what goes with what" than simply "what happens," naturalistic observation is often limited in its results.

Laboratory Experiment. Participants may be brought into a laboratory setting and observed as they are exposed to different stimuli or engage in various tests. In the lab, the number of variables can be limited and controlled. Opportunities to interact with participants can clarify misunderstandings and assist in interpretation of data.

But participants' behavior in a laboratory setting may not reflect their behavior in a more natural setting. And because participants know that they are being observed, their behavior may change.

Field Study. Researchers may move their laboratory to a more naturalistic setting to improve the chances that participants will behave "normally."

Physiological Measurement

For some research, the physiological responses of participants must be measured. Many tools are now available to help psychologists understand body, mind, and behavior interactions well beyond the familiar factors of heart rate and blood pressure.

Galvanic Skin Response (GSR). With measuring devices attached to various parts of the skin, researchers can monitor very small changes in the electrical characteristics of the skin because of perspiration. This is interpreted as having some correlation to emotional arousal or anxiety.

Electromyograph (EMG). This records muscle tension related to psychological tension or stress.

Electroencephalograph (EEG). This records certain electrical characteristics of brain activity. It has, for example, been used in the study of dreams.

Positron Emission Tomography (PET). This brain imaging technique allows researchers to see what parts of the brain are active as a person is speaking, listening, or engaged in other mental activities. The device measures the amount of glucose present in various parts of the brain. More glucose is present in areas of higher brain activity.

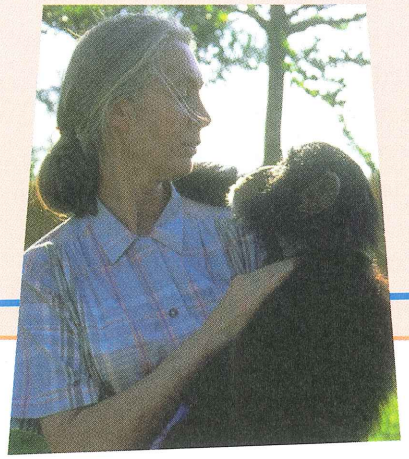
Functional Magnetic Resonance Imaging (FMRI). This also measures the activity in the brain but uses strong magnetic fields to determine which parts of the brain contain the highest blood oxygen—a sign of activity.

Because it's assumed that when a person lies, several of his or her physiological measurements will change, a lie detector includes GSR, EEG, and EMG devices.

Naturalistic Research

Jane Goodall conducted the longest field study of any animal species in its natural surroundings in her work with chimpanzees. In 1960, when she began her work in Kenya, it was unheard of for a single female to work in such rugged surroundings. Within a few years, Goodall became intimately familiar with the lives of the chimpanzees, spending her days trailing them through the forest and recording their habits.

Many of her techniques were considered "unscientific." She gave the chimps names, such as Fifi and Passion. In her first scientific article, all of her references to *he* or *she* were crossed out by the editors and replaced with *it* or *which.* She rebelled and won the battle in her insistence that chimpanzees were highly individualistic; that they not only reasoned but also felt emotion; and that they lived in highly complex societies. It came as a shock when Goodall discovered that chimpanzees use tools, because at the time it was assumed that only humans had the intelligence to do so.



Jane Goodall and one of the chimpanzees she studied. ▶

Processing Data

Data gathered in a psychological study may be processed and analyzed in several ways.

The Correlational Approach

Gathering information through surveys and interviews, by observation, and through physiological measurements yields interesting insights into human behavior and mental processes. Psychologists often find it interesting to study how two variables—different behaviors or processes—are correlated or related to one another. What, for example, is the relationship between school grades and the number of hours a student works outside of school?

Correlation Coefficient

The degree of relationship or correlation between two variables is expressed in a value called a correlation coefficient. The values of most correlation coefficients

vary between –1 and +1. A positive value means that as one variable increases, the other increases also. The closer the coefficient is to +1, the higher the correlation. A negative correlation means that as the incidence of one variable goes up, the other goes down.

Would you expect a correlation study of students' grades and how much they worked at jobs to show a positive or negative correlation? Why?

Correlation Doesn't Imply Causation

Suppose a study showed a much higher positive correlation between being a patient in a hospital and death rate than between being at home and death rate. In other words, more people die in hospitals than die at home. Does this mean that being in a hospital is likely to *cause* your death?

Think about it. Wouldn't someone who was seriously ill or who required surgery be more likely to be in a hospital than at home?

The fact that two things are highly correlated doesn't automatically mean that one causes the other. It simply means that as one changes, the other changes. It could mean that A causes B, B causes A, or some other factor causes both A and B.

In the 1950s and '60s, researchers looked for a correlation between the two variables of cigarette smoking and the incidence of lung cancer. They found a high positive correlation between smoking and lung cancer.

Using this data, the government required the cigarette industry to put warning labels on cigarette packages. Naturally, the industry fought against this, pointing out that correlation did not prove causality—and correctly so. In fact, several scientists did studies indicating that some other psychological factor (such as anxiety) may cause some personality types both to smoke and to develop cancer.

Later medical studies have demonstrated that many of the chemicals in cigarettes do cause cancer in lab animals, so there is quite probably a causal effect. But the correlational study did not prove that. The requirement of warning labels may have been correct—but it was sought for the wrong reason.

Coincidence

Correlation coefficients can be calculated between any two variables, so one must be careful to look at the theory underlying the study. While it may be possible to show a high positive correlation between, say, the number of people entering the army in a given year and the number of bananas eaten by chimps in the nation's zoos, it would take a pretty strange theory to suggest any way that one causes the other. Such results would be simply a coincidence.

Predictions Based on Correlation

Recently, there have been many claims that the increased violence on television, in movies, and in video games is responsible for increased aggression in young people. If a correlational study does show that there is some positive relationship between a person's aggression and the amount of media violence to which he or she has been exposed, what does it mean?

Correlational studies can demonstrate a relationship but cannot prove the direction of that relationship. Are people more aggressive because they watch media violence, or are they more attracted to violent media because they are more aggressive? While it's possible to answer that question, it requires more than one study to do it.

People in the media, in politics, and in advertising often use correlational data to make claims or predictions. The next time you hear a claim based on a correlation, first ask yourself if the claim is justified.

Graphs and Statistical Analysis

Correlation coefficients are only one way to "crunch numbers" in psychological research. Depending on the method used to collect data, different types of values are generated. A few typical values include measurements of a physical characteristic such as pulse rate, test scores, the time it took someone to complete a task, or the number of times a certain behavior occurred in a given period.

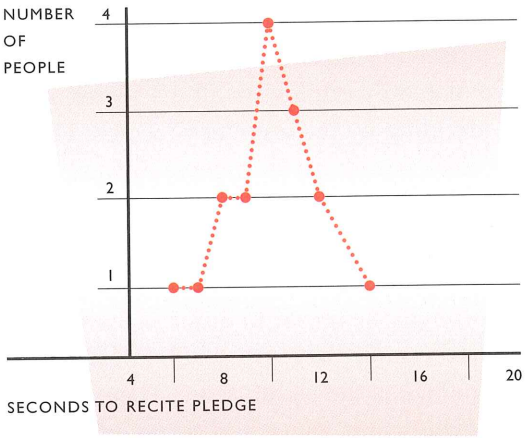
Depending on the hypothesis or question, these numbers would be manipulated in different ways.

Descriptive Statistics

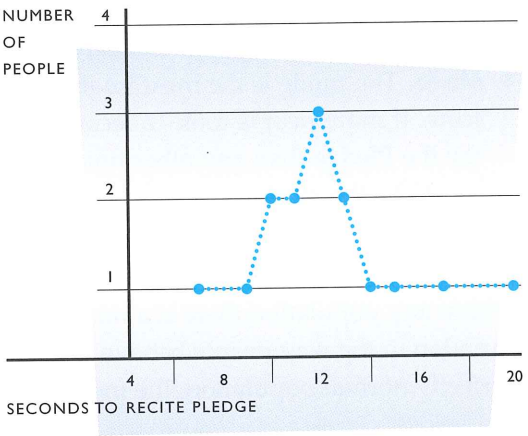
Suppose you are interested in the effect of marijuana on the time it takes a person to recite the Pledge of Allegiance. Your experimental design includes 15 people who have not smoked marijuana (the control group) and 15 who have smoked marijuana within the half-hour prior to the test (the experimental group). Participants are timed on how long it takes them to say the Pledge. For the sake of simplicity, let's say the test is done only once.

Now, you have 30 numbers—length of time for each of the 30 people in the study. What do you do with the numbers? One thing you could do is generate a graph like the ones shown below. These help you see any obvious tendencies in the data.

Results: Control Group



Results: Experimental Group



Measures of Central Tendency

The chart opposite shows the distribution of scores in the Pledge of Allegiance study. The tendency of more scores to occur around the middle of a set of numbers is typical of data in many types of studies and is called a central tendency. We might say that central tendency measures the typical score within a range of numbers. (Range is the numerical distance between the highest and lowest score.) This central tendency is measured in several ways. Let's first define them and then demonstrate how they're found.

* ***Mean.*** The **mean** is what you might normally call the average. Mean is calculated by adding up all the scores and dividing by the number of scores. The mean is perhaps the most useful and most often used measure of central tendency.
* ***Median.*** The **median** is the midpoint of the distribution of numbers. First, you arrange the scores in order. If there is an odd number of scores, such as 15, the median is the eighth score. There are seven scores above and seven below it. The median isn't as affected by extreme scores, such as might occur if one of the experimental group forgot where he or she was in the Pledge and started over.
* ***Mode.*** The **mode** is the most frequent score. If more people took 12 seconds to say the Pledge than any other time, that would be the mode.

Measures of Variation

Within any population there is a normal variation in the way people behave. In a perfectly normal population, the mean, median, and mode of a set of scores will be the same. The scores for this population, when plotted on a graph, produce the familiar bell curve. Notice that the graph of the control group (page 29) takes this form.

A measure of how far a set of test scores strays from normal distribution is called **standard deviation.** Researchers are really asking, "Could this set of data have occurred by chance?" Standard deviation gives one indication of that probability. If it is unlikely that the scores of the experimental group occurred by chance, then the independent variable may have affected them. What are the dependent and independent variables in the marijuana/Pledge of Allegiance study?

Ethical Issues

To help students understand the effects of prejudice, teachers in some schools have had their students participate in an experiment. For one day, all of the students who happen to be wearing a certain color are to be considered "inferior." Other students are encouraged to ignore them or to treat them in ways that express a prejudice against them. While many students agree that this experiment really helped them understand how damaging prejudice can be, possible problems with such an experiment include:

* Students who are not normally prejudiced becoming upset by having to act that way.
* Students who are treated badly suffering lasting effects, even though it was "pretend."

Pledge of Allegiance Study

Scores (In seconds)

Control group 7, 10, 8, 12, 9, 10, 8, 10, 11, 14, 6, 9, 10, 12, 11

Experimental group 13, 9, 12, 14, 10, 13, 20, 11, 12, 7, 10, 12, 11, 17, 15

Mean

Sum of control group scores = 147

Sum of experimental group scores = 186

The mean for the control group is 147/15 = 9.8.

The experimental group mean is 186/15 = 12.4.

Median

Control group scores in order: 6, 7, 8, 8, 9, 9, 10, 10, 10, 10, 11, 11, 12, 12, 14

The median, middle (eighth), score of this range = 10.

Experimental group scores in order: 7, 9, 10, 10, 11, 11, 12, 12, 12, 13, 13, 14, 15, 17, 20

The eighth score in this range (the median) = 12.

Mode

The most common score (mode) in the control group = 10.

The most common score in the experimental group = 12.

Observations

1. The mean, median, and mode for the control group are about the same (9.8, 10, 10).
   The same is true for the experimental group, but the values are higher.
2. Notice that a score of 30 instead of 20 in the experimental group would have changed the mean to 13, but would not have changed the median and mode.

Risk/Benefit Assessment

Some psychological experiments encourage people to behave in ways that are not comfortable for them, or that subject them to conditions that may affect their emotions. Researchers argue that such experiments are necessary to learn more about behavior. Others say that the risks are too great for the benefits they produce. Who is correct?

Here, the value of increased knowledge conflicts with the value of protecting individual rights. If the knowledge might lead to something that would save or improve many lives, it might be worth the risk. But if a study is done merely to advance the career of a particular scientist, it is doubtful that the risk is justified. This comparison is known as risk/benefit assessment. It's important to assess the value of any experiment involving humans or animals.

What other ethical concerns do psychologists face when designing experiments?

Ethical Concerns

The American Psychological Association (APA) has developed an extensive policy statement related to ethics in research. Here are a few of the issues in that statement:

* ***Moral and Ethical Responsibility.*** It is the responsibility of the researcher to weigh the potential benefits of the study against the fair and humane treatment of the participants. The APA states that *the participants' welfare is of greater importance than society's gain.*

* ***Harm Avoidance.*** Harm may refer to physical harm as well as to psychological or emotional harm. For example, studies on perception of pain or on the effect of drugs must be done with the full, informed consent of the participants. Participants should be debriefed after the study to reduce any stress and to determine if there are any lasting psychological or emotional effects. Any such effects must be treated.
* ***Fairness and Deception.*** Suppose that a person is promised a fee for participating in a study. After the study is completed, the person is told that actually the fee was promised to influence his or her motivation in the study. In another study, people are rewarded for correct answers and punished for incorrect answers. But they were not told that to be "correct" they must use the words *I* or *we*. These are examples of deception.
* ***Confidentiality.*** If the results of a study are published, researchers should take great care to disguise the identities of participants. If data are entered into a computer or other record that may be seen by outsiders, participants' names should be changed or coded. This prevents private information from becoming public. Double-blind studies help to avoid breaches of confidentiality.
* ***Animal Research.*** This is a very controversial topic in ethics. Are researchers justified in performing experiments on animals to advance knowledge?

Should Animals Be Used in Research?

Many medical and psychological studies have been done using animals. Scientists argue that the benefits gained from animal research far outweigh the rights of animals. Opponents argue that animals have rights that cannot be traded away for the benefit of people. What do you think?

THE ISSUES

Animal research has been a major contributor to our knowledge of basic learning processes; of motivational systems such as hunger, thirst, and reproduction; of modes of adaptation to change; and of the characteristics of disease. Scientists argue that alternatives such as computer simulations and experimentation on tissue cultures cannot give them the kind of information they get from experiments with living animals. The American Psychological Association has a policy for the care and use of animals in research, encouraging humane treatment and the use of animals only when no other alternative is available.

Groups such as People for the Ethical Treatment of Animals (PETA) argue that there is a difference between animal welfare addressed by APA and animal rights. They claim that animals are not ours to use. PETA lists a number of alternatives that it insists can be used in place of animal experimentation, such as computer simulation and human tissue cultures. They claim that because animals are not the same species as humans, tests on human tissue cultures yield more accurate predictions. Acknowledging that animal rights are limited, PETA does say that each case should be decided on an individual basis "wisely and mercifully."

Do you think that animals should be used in research?

THE PROCESS

1. **Restate the issues.** In your own words, state the nature of the disagreement.
2. **Provide evidence.** From your own experience and from the information above, list the evidence *for* animals being used in research.
3. **Give opposing arguments.** From your own experience and from the information above, list the evidence *against* animals being used in research.
4. **Look for more information.** What else would you like to know before you decide? Make a list of your questions. Research issues of *animal research* on the Internet, in the psychology section of the library, or in the index of psychology books. Check out the APA and PETA web sites.
5. **Evaluate the information.** Make a chart with two columns:

Animals Used in Research	
For	Against

Record the arguments in each column and rank each column of arguments in importance from 1 to 5, with 1 as the most important.

6. **Draw conclusions.** Write one paragraph supporting your answer to the question "Should animals be used in research?" Be sure to state reasons, not just an opinion.

Checklist

How to Evaluate Research

Locate the report of a psychological study on behavior on the Internet, in the popular press, or in a psychology book. Evaluate the study by asking the following questions. You may find that you have to conduct additional research to complete this checklist.

Hypothesis

- ✓ Is the hypothesis clearly worded?
- ✓ Is the question worth the time and effort to study?

Selection of Participants

- ✓ Do participants represent the population being studied?
- ✓ Was the test population selected randomly?
- ✓ Is the sample size large enough to rule out chance?

Identification and Control of Variables

- ✓ Have all potential variables been identified?
- ✓ Have variables other than the dependent and independent variable been controlled or accounted for in the conclusion?

Methodology

- ✓ Has an appropriate method been chosen to test the hypothesis?
- ✓ Have the rules and principles of scientific research been applied to the experimental design?

Observations and Data Collection

- ✓ Has every effort been made to keep observations objective?
- ✓ Have the data been organized and processed in an appropriate manner?

Analysis of Bias

- ✓ Have potential areas of bias on the part of the experimenters and participants been identified and accounted for?
- ✓ Have the researchers avoided bias in reporting, processing, and presenting their data?

Ethical Concerns

- ✓ Have researchers followed the code of ethical conduct in terms of research design, confidentiality, deception, and appropriate concerns for test participants?

Conclusions

- ✓ Have conclusions been limited to the population studied?
- ✓ Have other researchers duplicated the experiment?
- ✓ Have alternative explanations been explored?

Chapter 2 Wrap-up

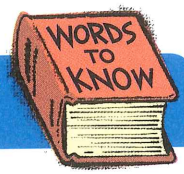
RESEARCH IN PSYCHOLOGY

Psychologists use the scientific method when designing ways to study human behavior. Researchers generate a question or hypothesis, select participants, identify variables, decide on dependent and independent variables while controlling others, and design their experiments using the rules and procedures of the scientific method. They collect data from the experiments and draw conclusions from the results.

Scientists are concerned with how people are alike, how people are different, and how individual differences affect behavior. They may choose to use surveys, interviews, naturalistic observation, laboratory experiments, field studies, or other methods to explore their questions. Once gathered, data are processed using statistics, and a conclusion is reached regarding the hypothesis.

Psychological researchers are sensitive to the need for ethical standards in their research. They make sure that they assess the risks and benefits of research, avoid harm to participants, avoid deception, and maintain confidentiality. Research on animals follows similar guidelines.

Psychology



bias—any condition or set of conditions that distorts data from what pure chance would have produced. *p. 20*

correlation—relationship between two variables. *p. 22*

deductive thinking—reasoning from a general principle to particular instances. *p. 20*

hypothesis—statement of something a researcher believes to be true—an "educated guess." *p. 22*

inductive thinking—reasoning from particular instances to a general principle. *p. 19*

mean—measure of central tendency calculated by dividing the sum of the scores by the number of scores. *p. 30*

median—middle value in a set of data that have been listed in order. *p. 30*

mode—most common value among a set of data. *p. 30*

paradigm—worldview or set of beliefs about the world in which a scientist works. *p. 19*

standard deviation—measure of how far from normal distribution a set of data falls. *p. 30*

theory—statement of underlying principles used to explain and predict some aspect of nature. *p. 19*

variable—anything that can take on different values or qualities. *p. 22*