

Chapter 2—Psychology’s Scientific Methods

Learning Goals

1. Explain what makes psychology a science.
2. Discuss the three types of research that are used in psychology.
3. Distinguish between descriptive statistics and inferential statistics.
4. Discuss some research challenges that involve ethics, bias, and information.

After studying Chapter 2, you will be able to:

- Discuss the difference between science and information that is not scientific.
- Describe the four ideals or attitudes characteristic of the scientific approach.
- Say why collaboration is important in the scientific research.
- Explain what the scientific method is and discuss its steps.
- Define and describe the relationship among theories, hypotheses, and operational definitions.
- Describe the difference between a sample and a population.
- Discuss the purpose of descriptive research methods in psychology, and describe four types of descriptive methods.
- Understand the difference between findings of correlational research and findings of experimental research.
- Interpret a correlation coefficient, because you will know what the correlation coefficient measures, what is the meaning of the number, and what is the meaning of the sign in the correlation coefficient.
- Describe the difference between descriptive statistics and inferential statistics.

CHAPTER 2: OUTLINE

- Psychology is a science; therefore, it relies on scientific research to study behaviors and mental processes. In comparison to personal observations and experiences, scientific research is systematic and usually requires collaboration among researchers. The scientific approach is characterized by four ideals: curiosity, skepticism, objectivity, and critical thinking. Embracing these ideals increases the likelihood that psychological research will result in reliable and objective scientific findings.
- Research in psychology is based on the scientific method and involves:
 1. Conceptualizing a problem. This step involves taking an issue that the researcher is curious or skeptical about and expressing it in terms of operational definitions and hypotheses.
 2. Collecting data. Based on the conceptualization of the problem, the researcher selects a research method that will be appropriate to explore the issue or test the proposed hypothesis or hypotheses. An important aspect of collecting data is selecting an appropriate sample that is representative of the population of interest. One of the options researchers have is to use a random sample, to increase the ability to generalize the results from the sample to the population. In psychology, generalizations often result from similar findings across a number of studies.

3. Analyzing the data. Based on what data was collected and how it was collected, the researcher will then proceed to analyze the data. Most research in psychology is analyzed using statistical procedures.
 4. Drawing conclusions. Based on the results of the analysis of the data, the researcher develops explanations for the findings. These explanations involve the extent to which the findings confirm the theories and hypotheses that the study was addressing.
- In the process of conceptualizing the problem, the researcher chooses the research method that better addresses the research topic. Psychologists rely on three basic types of research methods to perform their studies of behaviors and mental processes: descriptive, correlational, and experimental.
 - Descriptive methods involve systematic observations and recording of behaviors. The four types of descriptive methods discussed in Chapter 2 are observations, surveys and interviews, standardized tests, and case studies. Observations can take place in natural settings or in laboratories.
 - In naturalistic observation, the psychologist observes behavior in real-world settings and makes no attempt to manipulate or control the situation. However, many of the observations that take place in psychology occur in the laboratory, which gives the psychologist control over factors; for this reason, there are several drawbacks to this method, such as the unnatural behaviors that result from people knowing that they are being observed.
 - An interview involves asking people questions to find out about their experiences and attitudes. One problem of interviewing people is the concern of participants to tell the interviewer what they think is socially acceptable or desirable.
 - Surveys or questionnaires require subjects to read questions and mark their answers. Some psychologists observe behavior and mental processes by administering standardized tests. Standardized tests allow the researcher to measure some aspect of the participant's behaviors and/or mental processes and compare each individual's outcome to that of others who have also performed the same test.
 - The last descriptive method discussed in Chapter 2 is the case study, which provides an in-depth examination of a single individual, from which the results may not be easily generalized to other people.
 - The correlational method is basically a statistical procedure that allows the researcher to describe how strongly two or more events or characteristics are related. The correlation coefficient is a measure of the strength and direction of the relationship between the two factors. It is important to note that correlation does not equal causation but can allow us to make predictions.
 - Unlike the correlational method, the experimental method allows psychologists to determine the causes of behaviors and mental processes. In an experiment, one or more factors are manipulated and all other factors held constant. The factor that is manipulated is called the *independent variable*. The behavior or mental process that is observed and measured in the experiment is called the *dependent variable*. In general terms, the goal of an experiment is to determine the extent to which the independent variable influences and causes the dependent variable.
 - In experiments, researchers usually expose a number of participants to one level of the independent variable and others to another level. The group of participants whose experience is being manipulated is known as the *experimental group*, while the comparison group is called the *control group*.

- In experimental research, participants are randomly assigned to experimental and control groups. One concern involves the experimenter's own bias influencing the outcome of the research; this is called *experimenter bias*. However, research may also be influenced by *participant bias*, whereby the research participants have beliefs about how they are expected to behave and behave according to their expectations. The research participant bias is also referred to as the *placebo effect*.
- To control for these expectations, an experiment may be designed as a double-blind experiment, whereby neither the participant nor the experimenter knows in which condition is the participant.
- In order to analyze the data collected in systematic research, psychologists rely on statistics, which are mathematical methods. There are two basic categories of statistics: descriptive and inferential.
- Descriptive statistics are used to summarize the information acquired in the study. Two types of descriptive statistics are discussed in Chapter 2: (1) measures of central tendency, which are used to assess the general tendencies or the "average" behavior or mental process that was observed in the study, and (2) measures of variability, which inform us as to the differences in behaviors and mental processes inside the sample that was studied.
- Once you understand the three most common types of measures of central tendency, you will understand the importance of measures of variability. The first measure of central tendency is the mean. This is what we commonly associate with an "average" response.
- The mean is calculated by adding all the scores and then dividing that total by the number of scores or participants.
- The median is the score that stands right in the middle of the series of scores. The third measure of central tendency is the mode, which is the most typical score in the series of scores—in other words, the most typical behavior observed in the study.
- While these three measures of central tendency do give us a summary or idea of the behaviors and mental processes observed in the participants of the study, they do not include information about the individuals in the study and the differences between the participants. Here is where the measures of variability play a very important role in psychological research.
- The range and the standard deviation give information about the differences between the people that participated in the study. The range is the distance between the highest and the lowest score. The standard deviation is a measure of, on average, how different individuals are from the mean or average behavior. The higher the standard deviation, the more difference was there between the mean score and the scores of individuals. In other words, the higher the standard deviation, the less descriptive or representative is the mean of the behaviors and mental processes of the individual participants.
- Inferential statistics are used to analyze the data collected in the study to test the hypotheses that guided the study. A hypothesis explains the expected relationship between the manipulated independent variable and the dependent variable.
- Inferential statistics inform the researcher regarding the extent to which the relationship between the independent variable and the dependent variable is real and significant or is due to chance.
- Psychologists only report an effect as significant if the inferential statistics indicate that the odds of the results being due to chance is equal or less than 5 out 100, or .05 statistical significance.

- Ethics and values are of great concern to psychologists. Values influence the types of questions psychological research poses. The American Psychological Association has developed a code of ethics for researchers that calls for researchers to provide subjects with informed consent, confidentiality, debriefing, the careful use of deception, and protection from physical and mental harm.
- Current controversies surround the values of psychology and use of animals in research. In recent years, psychologists have shown increasing interest in and sensitivity toward gender, cultural, and ethnic bias in psychological research.
- Learning to read journals can be of benefit regardless of one's career choice.
- Journal articles are often written with technical language and specialized terms since they are usually intended to be read by professionals in the field. Learning to be a wise consumer of information about psychology is very important. When reading information presented in the media, one needs to pay attention to overgeneralization based on a small sample and the acknowledgment that one study should not be taken as the final answer on a problem.

Building Blocks of Chapter 2

Clarifying some of the tricky points in Chapter 2 and In Your Own Words

To respond to the questions and exercises presented in the "In Your Own Words" section, please write your thoughts, perspectives, and reactions on a separate piece of paper.

Exploring Psychology as a Science

Science is not defined by the subject matter it studies, but by how it studies it. The four ideals or attitudes that are central to the scientific approach are: curiosity, skepticism, objectivity, and critical thinking. Science is essentially a collaborative effort because in order for a science to progress researchers must share information. The scientific method is an approach that can be used to discover accurate information and includes conceptualizing a problem, collecting data, analyzing the data, and drawing conclusions. A theory is a broad idea or set of closely related ideas that attempt to explain certain observations. To test theories, researchers develop hypotheses, which are specific predictions arrived at logically from theory that can be tested in research. An operational definition consists of an objective description of how a research variable is going to be observed and measured. A psychologist studying a group of subjects will want to be able to draw conclusions that will apply to a large group of people. A sample is a subset of the population. For the generalization to be accurate, the sample should be representative of the population. One of the ways in which researchers can make the sample more typical of the population is by using a random sample, a procedure that gives every member of the population equal chance of being a part of the sample.

Helpful Hint #1

The scientific method has four major steps to it, which fall in logical order: conceptualizing the problem, collecting the data, analyzing the data, and drawing conclusions. For example, let's say you observe that your roommates seem very cranky in the mornings before they have a cup of coffee. You are curious about this and wonder exactly what is going on to improve their moods. You decide you will conduct a scientific study. Before you can go any further you need to become educated on your topic. You study what others have found in their scientific studies about coffee and improved moods. Now you are in a position to state your hypothesis, which is an educated guess. Perhaps, your hypothesis would be "two cups of coffee in the a.m. improves one's mood for the day." The goal of your study is to either support your hypothesis or disprove it.

The next step would be to design your study, which means you account for every detail. You decide what a “cup of coffee” means (5 ounces or 10 ounces?) Is the coffee black or are cream and sugar added? How fast is the coffee consumed, and on and on. This is an important aspect referred to as “defining the parameters” of your study. At this point you are now prepared to collect the data. Perhaps when you defined the parameters of your study you decided you would give a pre- and a post-test: a short questionnaire before the participant had any coffee, and the same questionnaire after the participant had some coffee. In this step, you are administering the questionnaires and gathering the responses.

After you have collected your data, you can now analyze it. This is where statistics come in. In this step you are proving or disproving your hypothesis with the data you collected. Statistics are mathematical formulations that make sense of information for us.

Finally, the last step is to draw conclusions about your study and to share the results. Perhaps you found that two cups of coffee in the morning did not significantly improve people’s moods. In your study you may discuss this. Most importantly, you share your findings with other researchers and practitioners in the field. This sharing helps the field grow and further our understanding of behaviors and mental processes.

In Your Own Words

Please write your thoughts, perspectives, and reactions on a separate piece of paper.

- ✓ A friend of yours is talking with you about psychology. She claims that psychology is not a real science, at least not like biology. What’s your reasoned response to her?

Types of Psychological Research

Psychologists use three basic types of research methods: *descriptive*, *correlational*, and *experimental*. *Descriptive methods* have the purpose of observing and recording behavior and include observation, surveys and interviews, standardized tests, and case studies. *Naturalistic observation* means observing behaviors in real-world settings. However, much psychological research is conducted in a *laboratory*, a controlled setting that removes many complex real-world factors. Laboratory research has some drawbacks: participants are likely to know they are being studied; the laboratory setting is unnatural; and participants in university laboratory research are unlikely to represent diverse cultural backgrounds.

In an *interview*, a person is asked face-to-face questions about experiences and attitudes. A shortcoming of interviews occurs where participants are not willing to disclose socially unfavorable information about them. In a *survey*, the respondents read the questions and mark their answers on paper. Tests used to measure an aspect of a person’s psychology and compare the individual’s score with the scores of others are referred to as *standardized* tests. An in-depth look at a single individual is called a *case study*.

The goal of *correlational research* is to describe how strongly two or more events or characteristics are related. Remember that, just because two events may be correlated, it does not prove that one event causes the other. The *number* in the *correlation coefficient* indicates the strength of the relationship between the two factors, and the *sign* indicates the direction of the relationship. A *positive* sign in the correlation coefficient indicates that the two factors vary in the same direction, and a *negative* sign indicates that the factors vary in opposite directions.

A technique that does allow psychologists to determine the causes of behavior is called *experimental research*. In conducting an experiment, the researcher manipulates one variable to see the *effect* on behavior. The *independent* variable is the manipulated factor. The *dependent* variable is the factor that is measured in an experiment and changes as the independent variable is manipulated.

Helpful Hint #2

Sometimes this is a tricky area for students. A good rule of thumb is to remember the saying “the dependent variable is DEPENDENT on the independent variable.” We can control the independent variable; the dependent variable is what we are studying. In our coffee/mood study the independent variable could be how much coffee we had each participant drink (1 cup, 2 cups, etc.); the dependent variable would be the change in their mood.

Subjects, whose experience is manipulated by the experimenter, are called the *experimental group*, while those who act as a comparison group are the *control group*. Subjects are assigned to groups by *random assignment*, which means that assignments are made by chance. Experimenter bias may occur in an experiment if the experimenter’s own expectations influence the outcome of the research. Research participants have beliefs about how they should behave; this is known as *research participant bias*. To control for the influence of expectations, *double-blind* experiments are used in which neither experimenter nor participant is aware of which participants are in which groups.

In Your Own Words

Please write your thoughts, perspectives, and reactions on a separate piece of paper.

- ✓ *One of the best ways to learn is by “doing.” Explore the challenges of naturalistic observation by sitting at one of your favorite spots and systematically observing specific behaviors of others in that real-world setting. Based on your experience, list the advantages and disadvantages of this research method.*

- ✓ *How would you operationally define love?*

- ✓ *What is the difference between findings based on an experiment and findings from a correlational study?*

Analyzing and Interpreting Data

Statistics are mathematical methods used to report data. There are two basic categories of statistics: descriptive and inferential statistics are used to summarize the data in meaningful ways, while descriptive statistics are used to draw conclusions about the data that has been collected, such as indicating whether there is sufficient support for the proposed hypothesis. One type of descriptive statistics uses the measures of central tendency. The mean is calculated by adding all the scores and dividing that total by the number of scores or participants. The median is the score that stands right in the middle of the ordered distribution of scores; unlike the mean, this measure of central tendency is not affected by extreme scores. The mode is the most typical score in the set of data. While the measures of central tendency provide summary information about the behaviors observed in the study, the measures of variability describe how much the scores in a sample are different from one another. The range is the distance between the highest and the lowest scores, and the standard deviation measures how much each scores varies on the average around the mean of the sample. This statistic informs the researcher of how close the participants were to the mean or typical behavior observed.

Inferential statistics, which are statistical methods used to draw conclusions about the data, rely on a probability assessment referred to as the level of statistical significance. A 5 out of 100, or .05 level, of statistical significance is considered the minimum level of probability to conclude that the effect of the independent variable on the dependent variable is real and significant.

In Your Own Words

Please write your thoughts, perspectives, and reactions on a separate piece of paper.

- ✓ *Imagine that you are trying to explain some of the important concepts learned in this chapter*

to a person who does not understand your language. Using drawings, describe the concepts independent variable, dependent variable, experimental group, and control group.

- ✓ *To better understand the information that we get from the measures of central tendency, administer the following brief survey to 10 of your acquaintances and calculate/determine the mean, the median, and the mode for each of the questions. Question #1: What is your age? Question #2: How many close friends do you have? What kind of conclusions can you draw from the measures of central tendency for each of these questions? How informative would it be to also assess measures of variability on the answers to these questions?*

Facing Up to Research Challenges

Three key reasons for studying the importance of ethics and values in psychological research are (1) we are active members of society in the age of information and technology; (2) we may participate in psychological research, so we need to know about our rights; and (3) students may themselves become researchers. The APA has developed ethical guidelines for psychologists. One guideline requires telling subjects about their participation and any potential risks. Researchers are responsible for keeping all the data gathered on individuals completely confidential and when possible completely anonymous. Informing participants of the purpose and methods used in a study when the study is completed is called informed consent. Subjects must not be harmed and must be debriefed as soon as possible in cases of deception. Regarding values, some psychologists believe that psychology should be value-free and morally neutral. For too long, the female experience was subsumed under the male experience; this illustrates gender bias. The use of an ethnic label in a way that makes a group seem more homogeneous than it is in actuality is called ethnic gloss.

Many times, when psychological research is reported by the media, it is sensationalistic and dramatic. A wise consumer of psychological information recognizes that most research focuses on groups, not individuals. The wise consumer also is aware of the effect that sample size has on generalizing the results of a study to a larger population. In addition, it is important to note that one study is not the final authority on the issue.

In Your Own Words

Please write your thoughts, perspectives, and reactions on a separate piece of paper.

- ✓ *If you were a participant in a psychological research, what ethical concerns would you have? Describe the procedures that should take place in the study to guarantee your rights as a research participant.*

Correcting the Incorrect

Carefully read each statement. Determine if the statement is correct or incorrect. If the statement is incorrect, make the necessary changes to correct it. Then check the answer key at the end of the chapter for the correct statement and page reference in the textbook.

1. Personal experience is objective, systematic, and testable.
2. Science is defined by what it investigates.
3. The four attitudes central to the scientific approach are skepticism, subjectivity, curiosity, and critical thinking.
4. Science is an individual effort.
5. An ideal definition is one that defines the concept precisely and in terms of observable events that can be measured.
6. The first step of the scientific method is collecting research information.
7. A hypothesis is a broad idea or set of closely related ideas that attempts to explain certain observations.
8. Essentially, the scientific method is a process of developing and testing theories.

9. Psychologists use research methods to collect data.
10. Random assignment is done when every member of the population has an equal chance of being selected to the sample.
11. The sample is the entire group of participants about which the researcher wants to draw conclusions.
12. The sample should be representative of the population.
13. In psychology, generalizations can be achieved only if the sample studied is random.
14. Descriptive research methods use carefully regulated procedures in which one or more factors are manipulated while other factors are held constant.
15. A naturalistic observation has the drawback that participants know they are being studied and may act unnaturally.
16. In an interview, the participant reads the questions and answers them on paper.
17. In a survey, an individual's score is compared to the scores of a large group of similar people to determine how the individual responded relative to others.
18. A case study consists of asking in-depth questions to a number of individuals that share the same problem or psychological characteristic.
19. In the laboratory, many of the complex factors of the real world are removed.
20. If a psychologist is conducting naturalistic observation, she is attempting to manipulate the behavior of the subjects.
21. Correlation equals causation.
22. A positive correlation indicates that the relationship between the two factors being studied is a good relationship.
23. The sign in the correlation coefficient is an indicator of the strength of the relationship between the two factors being studied.
24. If a psychologist is interested in determining behavior's causes, experimental research is the most appropriate method.
25. The dependent variable is the factor that is manipulated in an experiment.
26. The experimental group acts like a comparison group.
27. When using random sampling, the researcher assigns participants to experimental and control groups by chance.
28. Experiments should have experimental bias since it can improve the results.
29. A placebo effect occurs when the participant's expectations and not the experimental treatment produce a desired outcome.
30. In the double-blind experiment, the participant and the researcher both know which participants are in the experimental and placebo control groups.
31. The median is the measure of central tendency that is the score that occurs most often in the set of data.
32. The standard deviation is a measure of central tendency.
33. Descriptive statistics are used to draw conclusions about the data, such as indicating whether there is support for the proposed hypothesis.
34. The .10, or "10 out of 100," level of statistical significance is considered the minimum level of probability that scientists accept for concluding that there is significant support for the proposed hypothesis.
35. When the study is about to begin, the researcher informs the participants about the purpose and methods used in the study; this is called *debriefing*.
36. About 25% of the APA members use animals in their research.
37. The media tend to focus on sensationalistic and dramatic psychological findings.
38. As you read psychological information in the media, you should see how the research affects you as an individual.

39. One study is usually enough research on a particular topic or issue.
40. Sample size is not important to know when reading media reports of psychological information.

Practice Test 1

1. Of the following, which best describes the role that mass media play in psychological research?
 - a. Mass media tend to sensationalize psychological research.
 - b. Mass media tend to accurately report most psychological research.
 - c. Through its influence, mass media determine what type of research is funded.
 - d. Mass media have had a profound effect on making us more knowledgeable about science and psychology.
2. _____ involves objective, systematic, and testable research.
 - a. Philosophy
 - b. The placebo effect
 - c. Science
 - d. Experimenter bias
3. Juan is engaged in a process to discover accurate information. He has followed several steps: conceptualizing a problem, collecting data, analyzing data, and drawing conclusions. Juan is using
 - a. an operational definition of the dependent variable.
 - b. a standardized test.
 - c. the scientific method.
 - d. a double-blind experiment.
4. What is the first step of the scientific method?
 - a. draw conclusions
 - b. analyze the data
 - c. collect data
 - d. conceptualize a problem
5. You have received feedback on your research proposal from your psychology professor. She has written, "You need to state your definitions more precisely and in terms of observable events that can be measured." What is she talking about?
 - a. She is referring to including more references in your study.
 - b. Her feedback is in regard to operational definitions.
 - c. She is suggesting that readers will not understand what you mean by the placebo effect.
 - d. You need to spell out in greater detail what statistical techniques you are proposing to use to analyze your data.
6. _____ are specific predictions that can be tested to determine their accuracy and are derived logically from theories.
 - a. Correlations
 - b. Experiments
 - c. Observations
 - d. Hypotheses

7. The use of statistical procedures allows researchers to
 - a. conceptualize the problem.
 - b. collect data.
 - c. analyze the data.
 - d. develop hypotheses.

8. A _____ is selected from the population.
 - a. sample
 - b. placebo
 - c. dependent variable
 - d. theory

9. Each of the following is a drawback of laboratory research, except
 - a. participants know they are being studied.
 - b. the laboratory setting might produce unnatural behavior.
 - c. the participants are not likely to represent diverse cultural groups.
 - d. laboratory settings do not permit control over complex real-world factors.

10. What is the main disadvantage of laboratory observation?
 - a. The researcher cannot control the situation.
 - b. The setting is too unpredictable.
 - c. Subjects may not behave naturally because they know they are being observed.
 - d. The variables cannot be defined in operational terms.

11. Ali and Michael are conducting a study in which they sit in the student center lobby and take notes on different students' hand gestures as they speak. What type of research method are they using?
 - a. case study
 - b. correlational study
 - c. naturalistic observation
 - d. experimental research

12. Caleb recently was asked by a researcher questions about his attitudes toward politics. Caleb participated in a(n) _____. He later admitted that he gave answers that he thought were what the researcher wanted to hear, which illustrates _____.
 - a. questionnaire; the placebo effect
 - b. interview; his desire to offer the answers he thought the researcher wanted to hear.
 - c. experiment; experimenter bias
 - d. experiment; informed consent

13. A research method typically used by clinical psychologists with unique individuals is called a(n)
 - a. interview.
 - b. random sample.
 - c. experiment.
 - d. case study.

14. Participants' tendency to respond in a way that is intended to create a good impression, rather than to provide true information, is one of the problems with
 - a. experiments.
 - b. correlational studies.
 - c. surveys.
 - d. naturalistic observations.

15. Standardized tests
 - a. give every member of the population an equal chance to be tested.
 - b. are used only by clinical psychologists.
 - c. provide information about individual differences among people.
 - d. involve making careful observations of people in real-world settings.

16. What is the main advantage of using standardized tests?
 - a. They have very good external validity.
 - b. They can determine cause and effect.
 - c. They provide information about individual differences.
 - d. They contain no biases.

17. The strength of the relationship between two or more events can be determined by
 - a. experimental research.
 - b. case study.
 - c. physiological research.
 - d. correlational research.

18. The research method that measures how much one characteristic is associated with another is known as
 - a. classic experimentation.
 - b. naturalistic observation.
 - c. correlational strategy.
 - d. standardized tests.

19. A researcher finds a strong positive correlation between work stress and high blood pressure. Based on this finding, which of the following statements is true?
 - a. Work stress causes high blood pressure.
 - b. High blood pressure causes people to perceive high levels of work stress.
 - c. High blood pressure has nothing to do with stress.
 - d. The higher the stress at work, the higher the blood pressure.

20. Which of the following research strategies allows for most control and precision?
 - a. correlational
 - b. naturalistic observation
 - c. experimental
 - d. interview

21. In a correlation coefficient, the _____ is the indicator of the direction of the relationship.
 - a. number
 - b. sign
 - c. level of statistical significance
 - d. statistic

22. The _____ is the score that falls exactly in the middle of the distribution of scores after they have been arranged from highest to lowest.
- mean
 - mode
 - median
 - range

Practice Test 2

- If you conduct research in which you manipulate a variable while holding others constant and randomly assign participants to groups, what research method are you using?
 - case study
 - interview
 - correlational research
 - experimental research
- An experiment is being conducted to determine the effects of different teaching methods on student performance. The independent variable is _____, while the dependent variable is _____.
 - different teaching methods; number of students taking the test
 - student performance; grades on a test
 - different teaching methods; student performance
 - student performance; different teaching methods
- In an experiment, the _____ is the “cause” and the _____ is the “effect.”
 - dependent; independent
 - independent; dependent
 - control; dependent
 - dependent; experimental
- In an experiment testing the effect of amphetamine on learning in rats, the amphetamine is the
 - dependent variable.
 - experimental variable.
 - independent variable.
 - extraneous variable.
- Manipulated factor is to _____ as measured factor is to _____.
 - experimental group; independent variable
 - control group; independent variable
 - dependent variable; experimental group
 - independent variable; dependent variable
- Experiments with people involve a comparison between at least two groups: a group that receives the special treatment and a group that receives a placebo or neutral treatment. This latter group is called the
 - control group.
 - representative sample.
 - experimental group.
 - random sample.

7. Which of the following statements about psychological research methods is correct?
 - a. Only clinical psychologists are allowed to conduct experiments.
 - b. It would be inappropriate to combine observation and the correlational method.
 - c. Experiments usually involve standardized tests.
 - d. Correlational studies cannot be used to arrive at cause-and-effect conclusions..

8. If you were a psychologist concerned about reducing gender bias in psychological inquiry, you would be least concerned about which of the following?
 - a. gender stereotypes
 - b. exaggeration of gender differences
 - c. gender of consumers of psychological research
 - d. selection of research topics

9. Which of the following statements is NOT TRUE about the life and career of May Whiton Calkins?
 - a. This psychologist worked with William James.
 - b. Calkins became a faculty member at Wellesley, a women's college, in 1887.
 - c. In the 1890s Calkins established an experimental psychology program at Wellesley.
 - d. Unfortunately, Calkins was never recognized or achieved any recognition among her peers during her lifetime.

10. Which of the following statements is TRUE about science?
 - a. Science is defined by what it investigates.
 - b. Science is defined by how it investigates.
 - c. Collaboration is not essential to the progress of science.
 - d. Objectivity is not necessary in science.

11. Which of the following is NOT one of the ideals central to the scientific approach?
 - a. objectivity
 - b. curiosity
 - c. critical thinking
 - d. sensitivity

12. Which of the following is NOT one of the ways in which scientists collaborate?
 - a. doing presentations in conferences
 - b. submitting their work for peer review and serving as peer reviewers themselves
 - c. avoiding replicating studies identical or similar to those that others have already done
 - d. publishing in professional journals

13. Which of the following is NOT one of the basic steps of the scientific method?
 - a. publishing in a professional journal
 - b. collecting data
 - c. analyzing data
 - d. drawing conclusions

14. The theory of _____ says that by expressing pent-up emotions, a person can eliminate the emotions and the physical symptoms of stress associated with the experience of the emotions.
 - a. the scientific method
 - b. statistics
 - c. random sampling
 - d. catharsis

15. In Pennebaker's study of catharsis, the operational definition of "health" was
- if the participant got a cold or flu during the week following the study.
 - the number of times the participants had been seriously ill before attending college (and thus, before participating in the study).
 - the number of times the participants visited the health center at the university.
 - the physical condition of the participants at the time of participating in the study.
16. In scientific studies, generalizations can be made only if the _____ is representative of the _____.
- sample; random sample
 - random sample; sample
 - population; sample
 - sample; population
17. _____ is the extent to which a scientific research yields a consistent, reproducible result.
- Generalizability
 - Reliability
 - Objectivity
 - Randomness
18. Which of the following is NOT one of the basic types of research in psychology?
- correlational
 - descriptive
 - experimental
 - philosophical
19. A _____ is characterized by the unobtrusive observation of behaviors in real-world settings, such as parks, streets, and day care centers.
- naturalistic observation
 - laboratory observation
 - correlational study
 - survey
20. The _____ is a measure of central tendency that is calculated by adding all the scores and dividing that total by the number of scores or participants.
- mode
 - median
 - mean
 - range
21. The mode is the
- score right in the middle of the distribution of scores.
 - "average" score as we commonly know it.
 - most common score.
 - difference between the highest and the lowest score.

Practice Test 3

1. When Mary Calkins and other female psychologists questioned the extent to which the theories proposed by male psychologists, which were tested with male participants, would apply to females, they were exercising the _____ ideal, which is central to the scientific approach.
 - a. curiosity
 - b. skepticism
 - c. objectivity
 - d. critical thinking
2. In 1896 Mary Calkins did an experiment to find out whether people remember numbers better if they are linked with vivid colors. In this experiment, the independent variable was the
 - a. type of color linked to the numbers.
 - b. participants.
 - c. amount of numbers remembered.
 - d. memory of the participants.
3. Michelle Russo is a cognitive psychologist who is curious about the effects of caffeine on memory. Her operational definition of caffeine is “ounces of caffeine,” and memory is “number of details recalled after reading an essay.” Of the following research methods, which would be most appropriate for this research question?
 - a. interview
 - b. case study
 - c. naturalistic observation
 - d. experiment
4. If the correlation coefficient of the relationship between class attendance and final grade in a class is $+0.75$, that means that
 - a. there is no relationship between going to class and the final grade.
 - b. going to class makes people get better grades.
 - c. the lower the class attendance, the lower the final grade in the class.
 - d. the less people attend class, the higher the final grade in the class.
5. According to Pennebaker’s study of emotions and catharsis, which of the following activities would you recommend to a person who is grieving the loss of a loved one?
 - a. The person should seek the assistance of a clinical psychologist.
 - b. The person should try to ignore the negative thoughts and focus on positive thoughts.
 - c. The person should write down what he/she is feeling and describe what he/she feels has been lost.
 - d. The person should exercise while listening to motivational tapes.
6. Which of the following would be an appropriate sample if a researcher intends to generalize the results of the study to “all males”?
 - a. a sample of 100 members of the Knights of Columbus
 - b. a sample of 100 male freshman psychology students
 - c. a sample of 100 males, 50 from a university in Russia and 50 from a university in the U.S.
 - d. a sample of 100 American males who have been randomly selected from the draft registry

7. Why is it that surveys in magazines do not have good generalizability?
- Magazines can use random sampling.
 - People who choose to buy the magazine and choose to send in their answers may have characteristics that are particular to and different from the characteristics of those who do not complete the survey.
 - Surveys in magazines are poorly constructed and are about topics that cannot be generalized.
 - Magazine articles are silly and meaningless.
8. Serena went to a clinical psychologist and was diagnosed with depression. She then decided to get a second opinion, and the second clinical psychologist also diagnosed her with depression. Serena can conclude that the diagnosis of depression is
- changeable.
 - cathartic.
 - reliable.
 - correlated.
9. All the following are applications of Pennebaker's work on emotions, EXCEPT
- you should write about the most emotional trauma(s) in your life.
 - you should just write and not worry about spelling or grammar.
 - write when you feel like writing.
 - do not plan to share your writing with others.
10. What is the main difference between naturalistic observation and experiments?
- In naturalistic observation, the researcher manipulates the environment to see what happens and then describe it.
 - In experimental methods, the researcher tried to be as unobtrusive as possible.
 - In naturalistic observation, the independent variable cannot be manipulated.
 - In experimental methods, the researcher actively manipulates the environment of the participant.
11. Which of the following is a valid criticism of standardized tests?
- They cannot be used to compare people.
 - They may be biased and favor people from some cultures.
 - They do not measure appropriately the performance of an individual.
 - They are used to compare people, and this is not good.
12. An internet company in Virginia has the highest rate of success in its business sector, and most observers attribute this to the CEO of the organization. Which of the following would be the best research method to study the CEO and the success of this organization?
- correlational
 - a laboratory experiment
 - case study
 - naturalistic observation
13. Which of the following would be consistent with a $-.68$ correlation coefficient?
- The colder it is outside, the less people go outside.
 - The more hours I study, the better my grade is on the test.
 - The lower the ice cream sales, the lower the number of assaults reported at the police station.
 - The number of books a person owns has no relationship with how knowledgeable he or she is.

14. Dr. Redding did an experiment in which he interrupted people who were sleeping to ask them if they were dreaming. Some people would be awakened 1 hour after falling asleep, others after 3 hours, and others were not awakened until 8 hours had passed, which is considered a normal night of sleep. In this experiment, which was the independent variable?
- dreaming
 - the participants
 - the time at which the participants were awakened
 - the participants who were not awakened until 8 hours had passed
15. Dr. Wright did an experiment in which some people were placed in a nice-smelling room; others were placed in a foul-smelling room and still others placed in a room with no particular odor. Once the participants were in the room for 10 minutes, the researcher measured their mood with a questionnaire. In this experiment, which was the dependent variable?
- the mood
 - the odor
 - the room that smelled foul
 - the 10 minutes
16. In a correlation coefficient the _____ is an indicator of the strength of the relationship between the two factors being studied.
- number
 - sign
 - level of statistical significance
 - statistic
17. Which of the following is NOT one of the drawbacks of doing psychological research in laboratories?
- Participants may act unnaturally.
 - University samples, which are most likely to be used in laboratory experiments, may not be representative of the population of interest.
 - The researcher has great control over factors that are irrelevant to the independent variable(s) of interest.
 - Some aspects of psychology are difficult or even unethical to study in laboratories.
18. In political elections, which measure of central tendency would be more consistent with the method of determining who is elected?
- mean
 - median
 - mode
 - standard deviation
19. The statistic that measures how closely the scores are clustered around the mean is the
- mean.
 - range.
 - standard deviation.
 - mode.

20. _____ statistics are the mathematical methods used to draw conclusions and test hypotheses.
- Descriptive
 - Inferential
 - Psychological
 - Mathematical

Connections

Take advantage of all the other study tools available for this chapter!

| NAME OF CLIP | DESCRIPTION | KEY CONCEPTS AND IDEAS |
|--|-----------------------------|--|
| | | Exploring Psychology as a Science |
| | | Go to interactivity “Samples and Populations” to participate in an exercise that compares the costs and benefits of random samples vs. convenience samples. |
| Samples and Populations | In-Psych – Chapter 2 | Types of Research |
| | | See video clip “Cultural Variations in Nonverbal Behavior” to see how naturalistic observation has been used to study nonverbal behaviors across cultures. |
| *Cultural Variations in Nonverbal Behavior | Discovery – videos | Go to interactivity “Self-Report Bias in Surveys” to learn more about the challenges of using self-reports in psychological research. |
| Self-Report Bias in Surveys | Discovery – interactivities | Go to interactivity “Correlational Research” for an overview of correlational research and to engage in a correlational study. Learn more about the meaning of correlations from your own results. |
| Correlational Research | In-Psych – Chapter 2 | Analyzing and Interpreting Data |
| | | In the interactivity “Independent and Dependent Variables” you get to be a track coach. Your task is to use the experimental method to find the most effective performance tips. In the process, learn more about the process of manipulating independent variables and measuring dependent variables. |
| Independent and Dependent Variables | In-Psych – Chapter 2 | Facing Up to Research Challenges |

Online Learning Center (www.mhhe.com/Santrockp7u)

- Interact and make learning fun!
 - **Interactive Exercises**
 - Correlational Research
 - Independent & Dependent Variables
 - Reliability, Validity, & Variability
 - Samples & Populations
- Brush up on the Key Terms for this chapter by first reviewing the electronic **Glossary** (in English or Spanish) and then testing your retention using the **Flashcard** feature.

- “Notes”—This feature allows you to use the website as you would your text, inserting your own study notes and highlighting areas of particular importance.

In Your Text

- Found throughout each chapter, the **Review and Sharpen Your Thinking** feature breaks the text into logical chunks, allowing you to process, review, and reflect thoughtfully on the information that you’ve just read. When going back to *study* the chapter, try reading the feature *before* the section of text to which it relates. In doing so, you will be able to focus your attention on important concepts *as* you encounter them. In this chapter, this feature can be found on the following pages: pp. 47, 59, 62, and 71.

Practice Quizzes

- Test your knowledge of the scientific method by taking the different practice quizzes found on your text’s **Online Learning Center** and on the **In-Psych Plus CD-ROM** packaged with your text.

ANSWER KEY

In Your Own Words

- ✓ A friend of yours is talking with you about psychology. She claims that psychology is not a real science, at least not like biology. What’s is your reasoned response to her?
This answer should include the definition of psychology: the science of behavior and mental processes. The student may also make reference to the attitudes associated with the scientific approach in psychology: objectivity, curiosity, skepticism, and critical thinking. Illustrations of how psychologists creatively use research methods to test hypotheses and create theories should help the student make the point that psychology is a rigorous science not to be confused with uninformed and potentially biased opinions.
- ✓ How would you operationally define love?
An operational definition is a precise description of the phenomenon to be studied in terms of how it is going to be observed and measured. In this question the phenomenon to be operationalized is love, a concept subject to many operationalizations, even when it has be “narrowed down” to the context of romantic relationships. Love may be operationalized in various measurable ways, from observable behaviors such as gestures of affection (which gestures?) to mental processes, such as how often does a person think about the other person, what do they think about?, how do they feel, specific emotions, and so on.
- ✓ Imagine that you are trying to explain some of the important concepts learned in this chapter to a person who does not understand your language. Using drawings, describe the concepts independent variable, dependent variable, experimental group, and control group.
In the question, the student is asked to be creative in visualizing in a graphic format these concepts. When “drawing” independent variable and experimental group, the student may make pictorial reference to the issues of control and manipulation. The dependent variable may be expressed in a way that makes reference to its dependence on the independent variable. The control group may be expressed by emphasizing that in this group the independent variable is absent or not manipulated, it is the base against which the experimental groups are compared. This exercise is all about thinking about the basic meaning of these concepts so as to avoid getting lost in long and complex definitions.
- ✓ One of the best ways to learn is by “doing.” Explore the challenges of naturalistic observation by sitting at one of your favorite spots and systematically observing specific behaviors of

others in that real-world setting. Based on your experience, list the advantages and disadvantages of this research method.

Naturalistic observation is a research method in which the investigator observes behaviors as they naturally occur and makes efforts to be as unobtrusive as possible. The student engaged in this activity will probably realize some of the challenges of this method, such as the difficulty of recording behaviors that may be distant, quick, and simultaneous (i.e., more than one person doing the behavior of interest at the same time). Also, the student may set out to observe a particular behavior and never get to observe it; for example, going to a coffee shop to observe the people who order a “double mocha soy milk latte” and never having someone show up to make that order during the observation time. The main advantage of this method is that the observed behavior is genuine and naturally occurring.

- ✓ To better understand the information that we get from the measures of central tendency, administer the following brief survey to 10 of your acquaintances and calculate/determine the mean, the median, and the mode for each of the questions. Question #1: What is your age? Question #2: How many close friends do you have? What kind of conclusions can you draw from the measures of central tendency for each of these questions? How informative would it be to also assess measures of variability on the answers to these questions?

The mean is calculated by adding all the scores, for example, adding the ages, and dividing them by the total number of observations, in this case, 10. The median is the number that is located right in the middle of the series of numbers that have been organized in an ascending order. The mode is the most typical score in the list of scores—in the case of age, the most common age in the group of people interviewed. The sample is short and simply representative of acquaintances of the researcher; therefore, the results cannot be generalized beyond that group. A correlation coefficient would tell us about the relationship between age and number of friends. If the correlation was negative it would suggest that the younger the person the more friends he or she has, if it was positive it would suggest that the older the person the more friends he or she has.

- ✓ What is the difference between findings based on an experiment and findings from a correlational study?

Correlational research points out patterns of relationships. It answers questions regarding the extent and direction of the relationship between two variables; however, it never is an indicator of cause-and-effect relationships. Only experiments can provide that type of evidence. In experiments in which extraneous variables are controlled and only the independent variable is allowed to influence the behaviors observed (i.e., dependent variable), the researcher concludes cause-and-effect relationships.

- ✓ If you were a participant in a psychological research, what ethical concerns would you have? Describe the procedures that should take place in the study to guarantee your rights as a research participant.

Participants should expect that each of the following procedures takes place: informed consent at the beginning of the study, with clear instructions regarding their ability to leave the study at any point; ethical procedures that include deception only if it is absolutely necessary for the purposes of the study and in no way harms the participants; debriefing at the end of the study, in which participants receive information about the real purpose of the study and contact information for the researcher in case they want more details about the study.

Correcting the Incorrect

1. Personal experience is subjective, not always systematic, and can be difficult to test scientifically.
2. Science is defined by *how* it studies (i.e., the scientific method) not by what it studies.
3. The four attitudes central to the scientific approach are skepticism, *objectivity*, curiosity, and critical thinking. (p. 40)

4. Science is a *collaborative* effort. (p. 42)
5. An *operational definition* is one that defines the concept precisely and in terms of observable events that can be measured. (p. 44)
6. The first step of the scientific method is *conceptualizing the problem*. (p. 42)
7. A *theory* is a broad idea or set of closely related ideas that attempts to explain certain observations. (p. 42)
8. Essentially, the scientific method is a process of developing and testing theories. (p. 43)
9. Psychologists use research methods to collect data. (p. 45)
10. Random *sampling* is done when every member of the population has an equal chance of being selected to the sample. (p. 45)
11. The *population* is the entire group of participants about which the researcher wants to draw conclusions. (p. 45)
12. The sample should be representative of the population. (p. 45)
13. In psychology, generalizations can be achieved if the sample studied is random, *but generalizations may also come from similar results across various studies on the same issue*. (p. 46)
14. *Experimental* methods use carefully regulated procedures in which one or more factors are manipulated while other factors are held constant. (p. 56)
15. A *laboratory* observation has the drawback that participants know they are being studied and may act unnatural. (p. 49)
16. In a *survey* or *questionnaire*, the participant reads the questions and answers them on paper. (p. 51)
17. In a *standardized test*, an individual's score is compared to the scores of a large group of similar people to determine how the individual responded relative to others. (p. 51)
18. A case study consists of asking in-depth questions to *one individual*. (p. 52)
19. In the laboratory, many of the complex factors of the real world are removed. (p. 49)
20. If a psychologist is conducting naturalistic observation, she *is not* attempting to manipulate the behavior of the subjects. (p. 50)
21. Correlation *does not* equal causation. (p. 55)
22. A positive correlation indicates that the relationship between the two factors being studied *is one in which the factors vary in the same direction, but this has nothing to do with the relationship being good or bad*. (p. 54)
23. The *number* in the correlation coefficient is an indicator of the strength of the relationship between the two factors being studied. (p. 53)
24. If a psychologist is interested in determining behavior's causes, experimental research is the most appropriate method. (p. 56)
25. The *independent* variable is the factor that is manipulated in an experiment. (p. 56)
26. The *control* group acts like a comparison group. (p. 56)
27. When using random *assignment*, the researcher assigns participants to experimental and control groups by chance. (p. 56)
28. Experiments should *avoid* experimental bias since it can skew the results. (p. 57)
29. A placebo effect occurs when the participant's expectations and not the experimental treatment produces a desired outcome. (p. 58)
30. In the double-blind experiment, the participant and the researcher both *do not* know which participants are in the experimental and placebo control groups. (p. 58)
31. The *mode*, a measure of central tendency, is the score that occurs most often in the set of data. (p. 60)
32. The standard deviation is a measure of *variability*. (p. 61)

33. *Inferential* statistics are used to draw conclusions about the data, such as indicating whether there is support for the proposed hypothesis. (p. 61)
34. The .05, or “5 out of 100,” level of statistical significance is considered the minimum level of probability scientists accept for concluding that there is significant support for the proposed hypothesis. (p. 62)
35. When the study is about to begin, the researcher informs the participants about the purpose and methods used in the study; this is called *informed consent*. (p. 64)
36. About 5% of the APA members use animals in their research. (p. 66)
37. The media tend to focus on sensationalistic and dramatic psychological findings. (p. 69)
38. As you read psychological information in the media, it is important to see how the research affects you as an individual, *keeping in mind that the study was done on groups*. (p. 69)
39. One study is usually *not enough* research on a particular topic or issue. (p. 70)
40. Sample size *is* important to know when reading media reports of psychological information. (p. 70)

Practice Test 1

1. a. CORRECT; the mass media tend to report only the sensational and the dramatic
b. reports in the media tend to be too brief and leave out important details
c. deciding what research is funded is not the role of the mass media
d. actually, the mass media have made us less knowledgeable
p. 69
2. a. no, philosophy does not involve the systematic research required from a science (see Chapter 1).
b. the placebo effect refers to changes in behavior that are due to expectations
c. YES; science involves objective and systematic research.
d. experimenter bias occurs when the experimenter has expectations that influence the outcome of the research
p. 41
3. a. operational definitions are a part of the scientific method but do not have these steps described
b. a standardized test may be used to collect data but is not relevant to the other steps
c. YES, THAT'S CORRECT; these steps describe the scientific method
d. a double-blind experiment may be used by the experimenter to control for expectations during the data-collection step
p. 42
4. a. drawing conclusions is the last step
b. no; this is third step
c. no; collecting data is the second step
d. RIGHT; the first step in the scientific method is to conceptualize a problem
p. 42
5. a. the comment is not related at all to the references used in the study
b. RIGHT; your teacher is asking you to develop the operational definitions for the concepts in your research proposal
c. the placebo effect in not being addressed in the feedback from the professor
d. the comment is really the definition of an operational definition and does not relate to statistical techniques
p. 44

6. a. correlations are statistical assessments, not predictions
 b. experiments are research methods, not predictions
 c. observations are part of the process of collecting data and are not predictions
 d. TRUE; a hypothesis is a specific assumption or prediction that can be tested
 p. 43
7. a. statistical procedures are not involved in conceptualizing research problems
 b. collecting data is accomplished through research methods
 c. THAT'S RIGHT; statistical methods help psychologists understand the meaning of data
 d. hypotheses are developed in the process of conceptualizing the problem, and thus before the data is analyzed with statistics
 p. 46
8. a. YES; a sample is a subset of the population
 b. a placebo is an inert treatment that has no real effect
 c. the dependent variable is the variable that is being measured
 d. a theory is a set of interrelated ideas
 p. 45
9. a. this is a drawback; participants will know they are being studied
 b. this is a drawback; being in a laboratory can cause participants to behave unnaturally
 c. this is a drawback
 d. CORRECT; the laboratory does in fact permit control over factors
 p. 49
10. a. the researcher can control the situation in laboratory observation
 b. since the researcher can control the laboratory observation, the setting is predictable
 c. THAT'S RIGHT; subjects may change their behavior if they think they are being watched
 d. operationally defined variables are necessary in laboratory observation
 p. 49
11. a. no; a case study involves an in-depth examination of one person
 b. no; a correlational study examines the relationships of two or more events or characteristics
 c. YES; this is the method by which behavior is observed in real-world settings
 d. no; experimental research consists of the manipulation of variables and groups of subjects
 p. 50
12. a. a questionnaire consists of the participant writing down responses; the placebo effect refers to the participant's expectations affecting the research
 b. THAT'S RIGHT; an interview involves the person being asked questions; some people may give only socially desirable or acceptable answers
 c. an experiment involves the manipulation of variables; experimenter bias refers to the experimenter holding expectations that influence the outcome of the study
 d. an experiment involves the manipulation of variables; informed consent is an ethical guideline that requires researchers to inform their research participants
 p. 51
13. a. no; an interview is a face-to-face method whereby the participant is asked questions
 b. no; a random sample is a sample that is selected from the population at random
 c. no; an experiment involves the manipulation of variables and subject groups
 d. YES; a case study is an in-depth look at a single individual
 p. 52

14. a. no, this is usually not a problem in an experiment
b. no, this tendency is unrelated to correlational studies
c. YES, this is one of the problems of surveys
d. incorrect
p. 51
15. a. this option describes a random sample
b. standardized tests are used by several different types of psychologists
c. CORRECT; these tests provide information about individual differences
d. standardized tests are not given in real-world settings
p. 51
16. a. this may be true, but it is not the main advantage
b. only experimentation can determine cause and effect
c. THAT'S RIGHT; standardized tests give information about individual differences
d. standardized tests can be biased against certain groups of people
p. 52
17. a. experimental research consists of manipulation of variables and subject groups
b. case studies provide an in-depth look at an individual
c. physiological research studies the biological basis of behavior
d. TRUE; correlational research examines relationships
p. 53
18. a. the experiment determines cause-and-effect relationships
b. no, since naturalistic observation does not attempt to control variables
c. YES, THAT'S RIGHT; correlational research attempts to determine the relationship between variables
d. this is incorrect
p. 53
19. a. no; correlation does not indicate causation
b. no; correlation does not indicate causation
c. incorrect; while we cannot say that one causes the other, the correlation does indicate that there is a relationship
d. YES; a positive correlation indicates that these two factors vary in the same direction, even if we don't know which causes which or if there are other factors that could be contributing to this relationship
p. 54
20. a. correlational research only determines relationships among variables and it is usually used when the researcher cannot control the factors of interest
b. this method by definition does not have any control over the factors influencing the observations
c. RIGHT; experimental research can determine cause and effect between events because it controls factors and manipulates precisely the variables of interest
d. no; in an interview, the researcher chooses which questions to ask but does not seek to control every aspect of the procedure
p. 56

21. a. no; the numbers of the correlation coefficient range from -1 to $+1$, and the farther away the number from 0, the stronger is the relationship between the two factors
b. YES; the sign is the indicator of the direction of the relationship; if the sign is positive, the factors vary in the same direction, and if the sign is negative the factors vary in opposite directions
c. no; the level of significance is a measure relevant to inferential statistics and is not used in correlations
d. no; the correlation coefficient is a statistic, but placing the concept “statistic” at that point in the sentence does not make sense

p. 53

22. a. no
b. no
c. YES
d. no

p. 60

Practice Test 2

1. a. a case study consists of an in-depth analysis of a single individual
b. an interview is a face-to-face questioning of another person
c. in correlational research, we examine the relationship between two or more events
d. CORRECT; the experiment can help psychologists determine the causes of behavior

p. 56

2. a. partially correct; the different teaching methods are the independent variable, but the dependent variable is not the number of students the taking test, which is irrelevant
b. partially correct; student performance is not the independent variable, but student performance could be measured by grades on a test
c. TOTALLY CORRECT; the different teaching methods are being manipulated (cause), and student performance is the dependent variable (effect) (it is being measured)
d. no; they are backward

p. 56

3. a. no; the dependent variable is being measured to detect change that the manipulation of the independent variable might have caused
b. CORRECT; the cause is the independent variable and the effect is the dependent variable
c. no; the control group acts as a comparison; the dependent variable is the effect that is being measured because of changes to it due to manipulation
d. no; the dependent variable is being measured to detect change that the manipulation of the independent variable might have caused; the experimental group is the group that receives the manipulation

p. 56

4. a. no; the dependent variable is learning
b. no
c. YES; the amphetamine is the “cause” that is being manipulated
d. no

p. 56

5. a. the experimental group receives the manipulation; the measured factor is the dependent variable
 b. the control group acts as a comparison group; the measured factor is the dependent variable
 c. the manipulated factor is the independent variable; the experimental group receives the manipulation
 d. THAT'S RIGHT; the experimenter manipulates the independent variable and determines what, if any, changes occurred in the dependent variable
 p. 56
6. a. RIGHT; this is the control group
 b. the sample that is selected from the population should be a representative sample
 c. the experimental group receives the special treatment
 d. both groups make up the random sample
 p. 56
7. a. psychologists from all specializations conduct experiments
 b. combining methods is something that is often done and is appropriate when required
 c. experiments involve the independent variable and the dependent variable
 d. correct, correlations do not indicate causation.
 p. 55
8. a. no; this is a very important issue
 b. gender differences are often exaggerated
 c. YEAH; this is the least important
 d. research topics often reflect a male bias
 p. 67
9. a. this is true; while it took time and negotiations, Calkins did work with James at Harvard
 b. this is true; Wellesley, like Smith, where she studied, were both schools committed to the higher education of women
 c. this is true; after working with William James, Calkins established this program at Wellesley.
 d. CORRECT ANSWER; Calkins's career lasted nearly 40 years and she was recognized by her peers by becoming the first female president of the American Psychological Association
 p. 40
10. a. no; philosophers may address the same issues, but they are not subject to the scientific methods that define a science
 b. YES; the way the information is collected, in other words, the methods used, are what define and distinguish a science from other approaches
 c. incorrect; collaboration is very important in the development of a science
 d. incorrect; objectivity is one of the four ideals that are central to the scientific approach
 p. 40
11. a. this is central to a science
 b. this is central to a science
 c. this is central to a science
 d. RIGHT ANSWER; while sensitivity may be considered a valuable characteristic in a person, it is not one of the attitudes central to the scientific approach; to a certain extent, sensitivity could be construed as bias, and this tendency goes against the ideal of objectivity
 p. 40

12. a. this is one of the best ways to collaborate, by sharing information and taking advantage of the feedback that they may receive during the conference
b. this is also one of the main ways in which scientists collaborate
c. RIGHT ANSWER; avoiding replicating the studies of others is not in the spirit of collaboration; . when scientists replicate the studies of others they add very important information that can serve to support or disprove the hypotheses and theories proposed by others
d. this is also a common form of collaboration; however, publishing in a prestigious journal requires a lot of work on the part of the scientist
p. 42
13. a. CORRECT; while this is an important activity that contributes to scientific collaboration, it is not an essential step of the scientific method
b. this is the second step of the scientific method
c. this is the third step of the scientific method
d. this is the fourth and last step of the scientific method
p. 42
14. a. this is not a theory but a general approach to scientific investigations
b. while there are theories of statistics, this is a conceptual theory not a mathematical theory
c. this is not a theory but a procedure of sample selection
d. YES; the theory of catharsis, originally created by Freud, was further developed by Pennebaker.
p. 44
15. a. incorrect; this would not have been a good idea, since a week's period is too brief
b. incorrect; only assessing their health before the study would not have been useful in determining if the catharsis had any effect on health
c. CORRECT; the researchers asked for the number of times the participants visited the health center before, during, and after they participated in the study
d. incorrect; the physical condition at the time of the study may have influenced their performance in the study but would not have been informative regarding the longer term effects of catharsis on health
p. 45
16. a. no
b. no
c. incorrect; the population is larger than the sample; therefore, the statement does not make sense
d. CORRECT; in almost all scientific studies, the scientist cannot study the complete population of interest and therefore must select a sample; in order to generalize the findings to the population, however, the sample must be representative
p. 45
17. a. no; generalizability is the extent to which the results of one study with a sample can be generalized to the population
b. CORRECT
c. no; objectivity is one of the four ideal approaches to science
d. no; randomness refers to the extent to which an event is due to chance
p. 47

18. a. no
b. no
c. no
d. CORRECT; while philosophers may address many of the same issues as do psychologists, they do not use the scientific method in the same manner

p. 47

19. a. CORRECT; notice that unobtrusive means that investigators try not exert any influence or effect on those that are being observed; instead, they try to blend into the situation
b. no; in laboratories the observations are obtrusive, since the participants do know that they are being observed and studied
c. no; data collected through naturalistic observation may be analyzed with the correlational statistical procedure, but the correlational method is not limited to the use of data collected in real-world settings or in unobtrusive manners
d. no; surveys may be collected in real-world settings, such as the mall, but they are obtrusive, since the participant does know that they are being studied

p. 50

20. a. no; this is the most common score
b. no; this is the score right in the middle of the distribution of scores
c. YES; this is what we commonly associate with an average score
d. no; this is a measure of variability, not of central tendency

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21. a. no; this is the median
b. no; this is the mean
c. YES; the mode is the most common or typical score.
d. no; this is the range

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Practice Test 3

1. a. no
b. YES; they were challenging what others took for granted, which was that the studies done by male researchers with male participants would apply to males and females
c. no
d. no

p. 41

2. a. YES; the type of color, vivid versus subtle, was the independent variable
b. no; the participants are neither the independent variable nor the dependent variable
c. no; this is the dependent variable
d. no; this is another way of expressing the dependent variable

p. 56

3. a. no; while with an interview the researcher may be able to ask participants about their caffeine intake and even give an essay to ask for details, the tendency for social desirability is likely to have an influence on the recollection of information
b. no; finding out information about caffeine intake and memory from one individual would not answer this researcher's general question about the effects of caffeine on memory
c. no; with this method the researcher would not be very likely to collect the information she needs to make any conclusions about caffeine and memory
d. YES; the experiment is the most appropriate method for this research question; in an experiment the researcher will be able to manipulate the amount of ounces of caffeine the

participants take, then have participants read the essay; then the researcher systematically measures the details the participants remember

p. 56

4. a. incorrect; a correlation coefficient of 0 means that there is no relationship
- b. incorrect; this statement suggests causation, which cannot be concluded from a correlation coefficient
- c. YES; the positive and strong correlation coefficient says that these two factors vary in the same direction; we could also say that the higher the attendance, the higher the final grade in the class
- d. incorrect; this statement is consistent with a negative correlation coefficient

p. 54

5. a. no; a person who is feeling bad as a result of the loss of a loved one does not necessarily need the help of a clinical psychologist, since it is normal to be upset and emotional under such circumstances
- b. no; this recommendation would not be consistent with Pennebaker's research on catharsis
- c. YES; Pennebaker found that when people write about their negative emotions they experience a type of catharsis that allows them to move on to a more positive experience
- d. no; this is similar to item b in that it does not address the research done by Pennebaker on catharsis

p. 44

6. a. no; this sample of adult males who are also Roman Catholic is not representative of all males
- b. no; while this would be the most common way to recruit participants for a study, this would not be a representative sample of all males
- c. no; while this option is better than option b because it integrates males from different cultures, it is still limited to males from universities in powerful countries
- d. YES; while this sample has only American males, the fact that it is randomly selected from a list that includes males older than 18 would allow the researchers to get participants of various ages and from all of the United States

p. 45

7. a. no; magazines are chosen by the reader and cannot use random sampling
- b. YES; generalizability to the people that did not complete the survey is compromised by the specific characteristics of those who did complete the survey
- c. no; surveys in magazines can be very good and about important topics, they are just not likely to get a representative sample, unless their population of interest is only the people that choose to answer the survey
- d. no; surveys in magazines can be very well constructed

p. 45

8. a. no; the observation that two clinical psychologists concluded the same diagnosis does not indicate that it is changeable or not
- b. no; catharsis may help depression, but it has nothing to do with the agreement in the diagnosis
- c. YES; reliability is the extent to which research (which is what clinical psychologists do when they interview a client) yields consistent, reproducible results
- d. no; a case study cannot be correlated with another study; correlations require many observations

p. 47

9. a. YES; this is the correct answer because you should write about what bothers you now and not focus on larger traumas that may be in the past
b. no; this is one of the recommendations; you want to focus on getting the emotions out and not on the details of how it reads
c. no; this is one of the recommendations, since you should not feel forced to explore your emotions
d. no; this is one of the recommendations, since people might inhibit their expression if they are thinking that others will read their work

p. 48

10. a. no; naturalistic observation does not manipulate the environment
b. no; experimental methods are obtrusive
c. no; there is no independent variable to be manipulated in naturalistic observation
d. YES; experimental methods are characterized by this manipulation of the environment in which the observations take place

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11. a. no; standardized tests are designed for the purpose of comparing people
b. YES; unfortunately, if a test is standardized based on scores of individuals from one culture, the standardization may not apply to people from another culture
c. no; standardized tests do measure appropriately the performance of an individual
d. no; comparing people in psychological factors is a valid research endeavor

p. 52

12. a. no; the question does not mention correlation of any two variables
b. no; studying a real organization would not be very effective in a laboratory
c. YES; a case study of the CEO would be very informative on psychological issues of leadership in organizations
d. no; unless the researcher becomes an employee and is able to participate in meetings at high levels in the organization in order to observe the CEO, this would not be the best method

p. 52

13. a. CORRECT; $-.68$ is a strong negative correlation between cold, which goes up, and people going outside, which goes down. Notice that the item does not make reference to measuring of temperature. Change the item to mean the same, but instead of using "cold" use the corresponding description of temperature, "lower temperature," and see how the correlation coefficient changes.
b. no; this is a positive correlation
c. no; this is a positive correlation
d. no; this presents no correlation

p. 53

14. a. no; this is the dependent variable
b. no; the participants are not a variable
c. YES; the time lapse is the independent variable
d. no; this is not a variable, but rather a control group

p. 56

15. a. CORRECT; this is what the researchers measured and wanted to see if the independent variable of odor would influence
b. no; this is the independent variable
c. no; this is one of the experimental conditions
d. no; this is part of the procedure and may be considered an independent variable if the researcher also varied the time spent in the room before measuring the mood
p. 56
16. a. YES; the numbers of the correlation coefficient range from -1 to $+1$, and the farther away the number from 0, the stronger the relationship between the two factors
b. no; the sign is the indicator of the direction of the relationship
c. no; the level of significance is a measure relevant to inferential statistics and is not used in correlations
d. no; the correlation coefficient is a statistic, but placing the concept “statistic” at that point in the sentence does not make sense
p. 53
17. a. this is one of the main problems with laboratory studies: participants, when they know they are being observed and studied, may modify their behaviors and act “unnaturally”
b. this has been a longstanding criticism of research depending on university samples, which may not be as culturally diverse as the population of interest
c. CORRECT; this is not a drawback, this is the main asset of laboratory research
d. laboratories cannot be used to study all the issues of interest in psychology, because many aspects of psychology cannot and should not be controlled
p. 49
18. a. no; in elections we don’t average votes
b. no; this measure would be irrelevant
c. YES; the mode is the score that occurs most often in a set of data; each time a person votes for candidate A this can be considered a score for A and the same for candidate B, etc.; the score that occurs more often (A, B, or C) determines who wins
d. no; this is irrelevant
p. 60
19. a. no; this is a measure of central tendency, and the statement is asking about a measure of variability
b. no; while this is a measure of variability, it does not assess the extent to which the scores vary from the mean
c. YES; the standard deviation does measure how much on the average scores vary around the mean
d. no; this is a measure of central tendency
p. 61
20. a. no; descriptive statistics are not used to test hypotheses, just to summarize the data
b. YES; these types of statistics are used to draw inferences and test if the proposed hypotheses are supported by the data collected
c. no; while there are some statistical procedures that are almost exclusively used by psychologists, “psychological statistics” is not the same as inferential statistics
d. no; “mathematical statistics” is a redundant and incorrect concept because statistics *are* mathematics
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