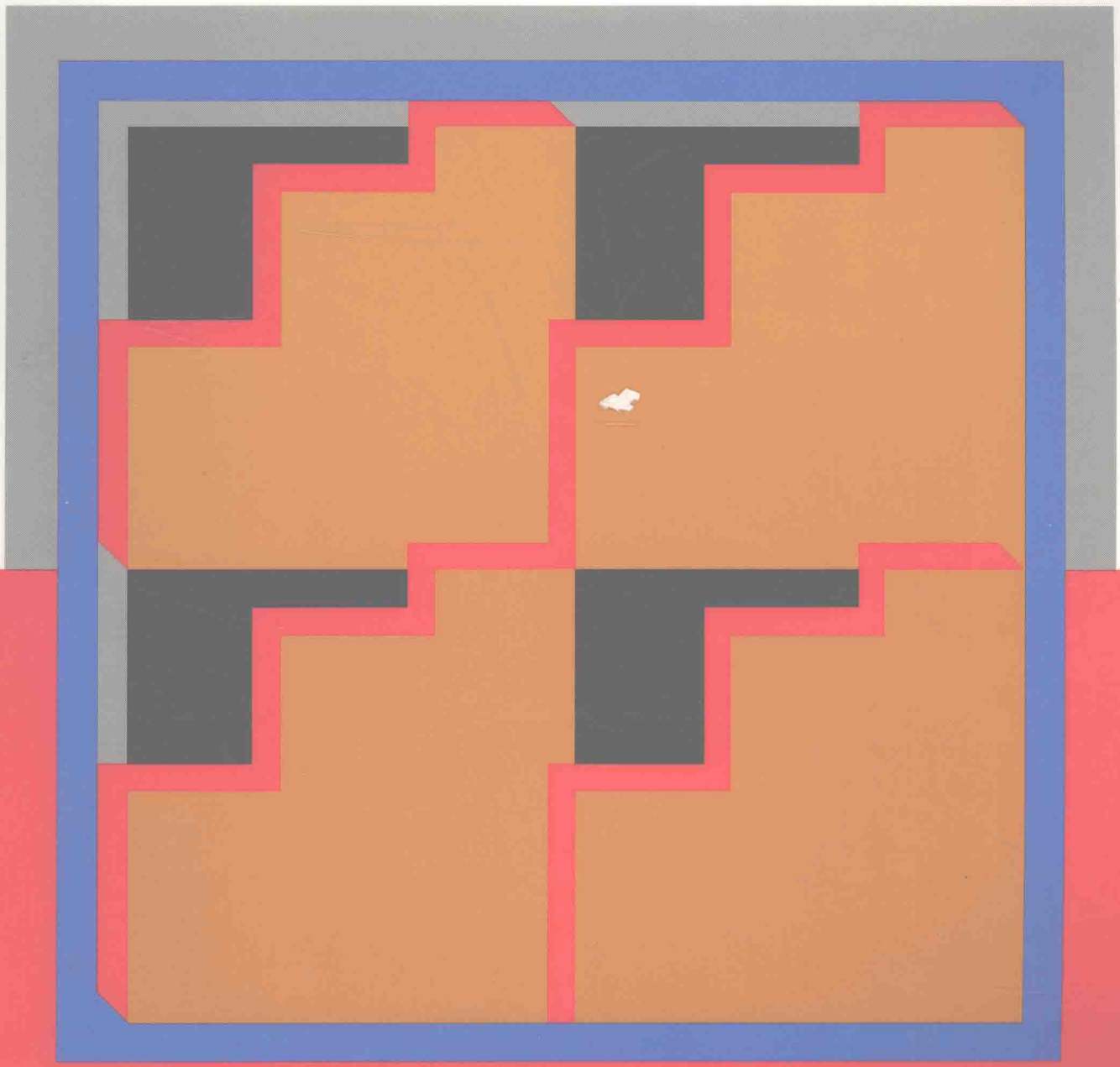
A PRACTICAL INTRODUCTION TO

RESEARCH METHODS IN PSYCHOLOGY

EUGENE B. ZECHMEISTER
JOHN J. SHAUGHNESSY



A PRACTICAL INTRODUCTION TO

RESEARCH METHODS IN PSYCHOLOGY

EUGENE B. ZECHMEISTER
Loyola University of Chicago

JOHN J. SHAUGHNESSY
Hope College

McGRAW-HILL, INC.

New York St. Louis San Francisco Auckland Bogotá Caracas
Lisbon London Madrid Mexico Milan Montreal New Delhi
Paris San Juan Singapore Sydney Tokyo Toronto

A PRACTICAL INTRODUCTION TO
RESEARCH METHODS IN PSYCHOLOGY

1 2 3 4 5 6 7 8 9 0 MAL MAL 9 0 9 8 7 6 5 4 3 2 1

ISBN 0-07-056485-X

The editor was Renee Shively Leonard;
the production supervisor was Denise L. Puryear.
Malloy Lithography, Inc., was printer and binder.

PREFACE

This book was prepared with a twofold purpose. First, it is intended to act as a companion to our textbook, Research Methods in Psychology (Shaughnessy & Zechmeister, 1990, 2nd ed.). Students in our research methods classes often ask us for "real" examples of the concepts and methods presented in our textbook and lectures, as well as for additional practice applying the research tools given to them. This book provides students with concrete examples of what to them are often abstract ideas, and gives students the kinds of practical experiences that aid understanding of research methods. There is much information contained herein, however, and some instructors may find it reasonable to use the book without an accompanying research methods text. The present text also could be used as part of a laboratory class or in a statistics class that emphasizes relationships between research methods and data analysis. Thus, a second purpose in preparing this book has been to provide instructors with a "stand alone" introduction to research methods in psychology, one that emphasizes the active nature of this topic. When not using the book as a companion text, however, the instructor may want to develop certain topics more fully.

Throughout, we have focused on the "working" aspects of understanding and doing psychological research. Each unit contains a rather lengthy overview of a research methods topic with a list of key concepts and their definitions. This is followed by brief descriptions of published research in psychology with related questions, problems, and exercises. The research examples are real, as are the problems and issues we ask students to consider. Students are asked, in other words, to recognize how concepts are applied in actual research situations. Complete references to published articles are provided should students wish to consult the actual articles for more information about a topic or for ideas that might form the basis of their own research projects. Exercises and problems are based both on key methodological concepts (e.g., identifying a confounding) and on principles of data analysis (e.g., performing and reporting a *t* test). The goal is to help students develop a working vocabulary along with the necessary skills for doing research in psychology.

In order to complete the problems and exercises related to data analysis, students will need to have been introduced previously to the use of statistics in psychology or, minimally, they need to be taking a statistics course concurrently. Statistical problems can be done successfully using information found in Appendix A (Statistical Methods) of the Shaughnessy and Zechmeister (1990) text; however, students may find it useful to have available a statistics book for consultation.

At the end of each unit are several sets of review questions (e.g., multiple choice, matching, or true-false) that test knowledge of the material found in the unit. A complete set of answers to all questions, problems, exercises, and review tests is found at

the end of the book. For users of the Shaughnessy and Zechmeister (1990) textbook, we have identified relevant page numbers with the key concepts and test answers to aid students' further review.

Students using this material in our classrooms tell us that they find it challenging. Most importantly, they also report that they are much more confident about their knowledge of research methods in psychology when they have completed the exercises and problems. This increased competence and confidence has been our main objective for this book.

ACKNOWLEDGMENTS

In order to make this a "practical" introduction to research methods in psychology we have gone directly to the psychology literature for our examples. Readers will see that in each unit we have included brief summaries of published articles. These summaries are generally paraphrased versions of the original text, and thus we owe a debt of gratitude to the authors and publishers of these works. If this book proves interesting to students it is largely due to the interesting research carried out by the investigators whose work we have liberally cited.

We have included with each article summary a complete citation identifying the author(s), source, and specific volume and pagination of the published work. We wish to thank the many authors who consented to have their work summarized in these pages. We also requested permission to paraphrase the original works from the various journal or book publishers. All replied to our request. Several asked that we formally acknowledge them as publishers. Thus, we want to acknowledge specifically the permission given by the following publishers.

The following summaries were used with permission of the author and Sage Publications, Inc.: (Unit 2) Latané, B., & Bidwell, L. D. (1977). Sex and affiliation in college cafeterias. Personality and Social Psychology Bulletin, 3, 571-574. Copyright 1977; (Unit 2) Crusco, A. H., & Wetzel, C. G. (1984). The Midas touch: The effects of interpersonal touch on restaurant tipping. Personality and Social Psychology Bulletin, 10, 512-517. Copyright 1984; (Unit 3) Simpson, J. A., Campbell, B., & Berscheid, E. (1986). The association between romantic love and marriage: Kephart (1967) revisited. Personality and Social Psychology Bulletin, 12, 363-372. Copyright 1986; (Unit 8) Horton, S.V. (1987). Reduction of disruptive mealtime behavior by facial screening. Behavior Modification, 11, 53-64. Copyright 1987; and, (Unit 9) Levitt, L., & Levanthal, G. (1986). Litter reduction: How effective is the New York State Bottle Bill? Environment and Behavior, 18, 467-479. Copyright 1986. Permission was granted by the author and John Wiley & Sons, Inc., to summarize: (Unit 1) Skowronski, J. J., & Thompson, C. P. (1990). Reconstructing the dates of personal events: Gender differences in accuracy. Applied Cognitive Psychology, 4, 371-381. Copyright 1990. The following article was used with permission of the author and the Psychonomic Society, Inc.: (Unit 1) Cunningham, J., Dollinger, S. J., Satz, M., & Rotter, N. (1991). Personality correlates of prejudice against AIDS victims. Bulletin of

the Psychonomic Society, 29, 165-167. Copyright 1991. Permission was given by the author and Cambridge University Press to summarize: (Unit 1) Krumhansl, C. L., & Jusczyk, P. W. (1990). Infants' perception of phrase structure in music. Psychological Science, 1, 70-73. Copyright 1990.

Finally, we wish to thank the American Psychological Association for permission to reprint the ethical principles governing research with human and animal subjects. Complete citations and formal acknowledgment appear in Unit 10.

When we were asked to prepare a "camera-ready" version of the text for this book we knew only one strategy: approach Kathy Adamski, departmental assistant in psychology at Hope College, and ask her to help us out once again. You are reading this only because she said yes to our request. Working under a tight schedule and with two above average compulsive research methodologists (and with one whose handwriting is barely able to be deciphered) she came through with flying colors. Thanks, Kathy.

We also want to thank Elizabeth J. Zechmeister for typing portions of the first draft and Kimberly L. Bundy for being the first student to use the book. Kim carefully read the text and worked through the many exercises. She helped us to see the book from a student's perspective and she alerted us to possible problems of interpretation that we tried to correct. Finally, we owe a debt of gratitude to Emil Posavac, Loyola University of Chicago, for providing a thoughtful review of the final manuscript.

NOTE TO STUDENT

This book comes with a promise and a warning. (No, the warning is not that learning about psychological research can be hazardous to your health.) The promise is that you will find the topics and problems presented in these pages interesting, challenging, frustrating, tedious, illuminating, and rewarding. We say that with a high degree of confidence because these are the adjectives that most researchers would use to describe psychological research. Our goal has been to reproduce in a textbook as much as we could the taste and feel for the research enterprise. Thus, we must also issue a warning. To the extent that we have been successful, you should experience all of the above. We believe that you will find learning about psychological research interesting; we hope you will find it as interesting as we find doing it (and writing about it). There is no more fascinating topic than that of human behavior and mental processes. But, as you will see, research is a challenging and sometimes even frustrating endeavor. And, yes, there are some tedious aspects also. Ask any detective how cases are solved and he or she will tell you that it is by legwork, by methodically following up leads, by spending time in blind alleys, by checking and rechecking evidence and alibis. These are some of the characteristics of the research process, too. But we believe the outcome is worth it. To illuminate some aspect of behavior or to fit one more piece in the complex puzzle of our existence is a rewarding affair. Good luck.

To

Kathy

E.B.Z.

To my mother and in memory of my father.

J.J.S.

To our students--those whom we meet personally in the classroom, as well as those whom we meet only in these pages.

E.B.Z. and J.J.S.

TABLE OF CONTENTS

UNIT 1. INTRODUCTION

I. OVERVIEW

The establishment in 1879 of a formal psychology laboratory in Leipzig, Germany under the direction of Wilhelm Wundt brought the application of the scientific method to problems of psychology. Wundt and his colleagues were interested in a variety of problems, including those of sensation, perception, and cognition (see Boring, 1950). One research method used by these early psychologists was to ask observers to describe their feelings and sensations as an event was experienced, a process called introspection. As it turns out, other psychologists later criticized the method of introspection, saying that it was too subjective.

As an approach to knowledge, the scientific method relies on empirical procedures rather than on intuition, and attempts to control (through manipulation, holding conditions constant, and balancing) those factors believed responsible for a phenomenon (Boring, 1954; Marx, 1963). Those factors that are systematically controlled in an attempt to determine their effect on behavior are called independent variables. The measures of behavior used to assess the effect (if any) of the independent variable are called dependent variables. It is important to recognize when levels of an independent variable have been manipulated and when the levels have been selected, as is the case for a subject variable, such as age or gender. Suppose an investigator seeks to determine whether listening to music interferes with learning textbook material. She might ask one group of students to study while music is played and ask another group to study without music. Presence or absence of music would be the levels of the independent variable and these levels are manipulated by the researcher. A suitable measure of learning would be needed to serve as the dependent variable. The number of correct answers on a 20-item fill-in-the-blank test covering the information in the textbook would be an example. If an investigator simply compared learning of textbook material between a group of males and a group of females, gender would be the independent variable. In this case, the levels of the independent variable (males and females) are selected rather than manipulated.

Scientists seek to report results in an unbiased and objective manner. Giving operational meaning to concepts helps to achieve this goal (see Marx, 1963). A psychologist might, for example, operationally define expertise based on the time an individual takes to complete a complex task--the shorter the completion time, the greater the expertise. Accuracy and precision of instruments are important to the scientific process, as are both the validity and the reliability of measures. Time to complete a task would be a valid measure of expertise if, in fact, expertise is being measured and not something else, such as previous familiarity with the task. Time would be a reliable measure if individuals' times when measured again on the same or a related task are consistent with their times on the first task.

How data are analyzed depends largely on the level of measurement used. Measurement scales are characterized as nominal, ordinal, interval, or ratio scales. The scales differ in the kind of information obtained. A nominal scale is achieved when events are categorized into two or more mutually exclusive categories. Classifying people according to the color of their eyes represents a nominal scale of measurement. An ordinal scale indicates relative importance of events in the form of greater than or less than. Students graduating from high school, for example, often are given a class rank to indicate relative academic position in their graduating class. Class rank is an example of an ordinal scale.

When we specify how far apart two events are on a given dimension we achieve an interval scale of measurement. That is, unlike an ordinal scale, we specify the intervals between events. If you find out that you graduated 10th in your class and a friend graduated 20th (an ordinal measure), you don't know how far apart you and your friend really were on the dimension that was being measured. You simply know your level of performance was greater than hers. However, if you scored 600 on the verbal section of the Scholastic Aptitude Test (SAT) and your friend scored 500, you know that your performance was 100 units above your friend's score. If someone else were found to score 550 you would be correct in saying that 550 is halfway between your score and your friend's score. SAT scores and other kinds of general aptitude measures are examples of an interval level of measurement. Note that though you know the distance your score is from your friend's score, and you even know about the ratio of scale intervals (e.g., a difference between two scores is half that observed between two other scores), there is something missing. That something is an absolute zero point. If you were to score zero on the verbal section of the SAT it would not mean you had zero verbal aptitude. An interval scale lacks a true zero and, therefore, it is not meaningful to express ratios of specific scale values. It is not meaningful, for example, to say that a person who scores 600 on the SAT verbal test has twice as much verbal aptitude as someone who scores 300. When all of the information found in an interval scale is present, as well as an absolute zero, a ratio scale of measurement is achieved. Physical scales measuring time and weight, for instance, typically are ratio scales. In these cases it is permissible to say that one score is twice as great as another score.

Hypotheses are tentative explanations of events. To be useful to the scientist, however, hypotheses must be testable (Marx, 1963). Hypotheses may not be testable for several reasons. The concepts to which they refer, for instance, may lack adequate definition. Hypotheses also are not testable if they are circular, that is, the event itself is used as an explanation of the event. An example of a circular hypothesis would be: People get depressed because they feel "down" most of the time. If depression is essentially feeling down then we have used depression to explain depression. Hypotheses are not testable if they appeal to ideas or forces outside the province of science ("The devil made me do it."). Although some of these hypotheses may be of value to theologians and philosophers, they cannot be evaluated scientifically. Hypotheses often

are derived from theories, which have the important functions of guiding research and organizing empirical knowledge (Marx, 1963).

More than anything else, scientists are skeptical. A skeptical attitude is not always found among nonscientists, who may rush to accept "new discoveries" and extraordinary claims. It is important to be skeptical about new evidence that is brought forth, even evidence provided by the scientific community. Consider, for example, the task confronting the psychologist interested in explaining human behavior. Behavior is very complex and many factors likely contribute to a particular psychological phenomenon. Some important factors may not even be known and others may be overlooked. Moreover, psychology (like science in general) is a human endeavor. Humans are fallible; they make mistakes. Human judgment is not always perfect. Is it any wonder, then, that a good scientist often wants to examine evidence carefully and to reproduce it again and again under a variety of circumstances before making a conclusion based on the evidence.

The goals of the scientific method are description, prediction, and understanding. Description involves defining, classifying, and categorizing events and their relationships. Observation is the principal basis of scientific description. Prediction is based on an analysis of the relationships between events. When two measures correlate we can predict the value of one measure by knowing the value of the other. A quantitative measure of our predictive ability is the correlation coefficient, which has both a direction (positive or negative) and a magnitude (0 to 1.00). Understanding is achieved when the causes of a phenomenon are discovered. A causal inference typically is permitted only when we have obtained evidence that two events covary, that a time-order relationship exists (i.e., the causal event comes before the event it causes), and that alternative explanations have been eliminated.

Eliminating alternative explanations (causes) for an event is particularly difficult. Although the experimental method is especially useful when seeking to understand psychological phenomena, it is easy to make mistakes. When two potentially effective independent variables covary such that the independent effect of each on behavior cannot be determined, we say that our research is confounded. Consider, for instance, an educational psychologist who seeks to find out why students make mistakes on mathematical word problems. She manipulates the kind of problem given to two different groups of students. If one group of students were older, more practiced, and in general more proficient at solving word problems than the other group, a confounding would exist. If a difference in problem solving performance between the two groups were obtained, we would not know whether it was caused by the differential abilities of the two groups or by the kind of word problem. The most common solution to this problem is to balance subject characteristics by randomly assigning subjects to conditions. Similarly, if the time given to the subjects to solve the word problems, or some other aspect of the procedure other than problem type, also differed between conditions, a

confounding would be present. It is necessary to control certain factors other than the independent variable by holding them constant between conditions, for instance, allowing both groups the same amount of time to work on the problem. A study that provides an unambiguous interpretation for the outcome, one that is free of confoundings, is said to have internal validity. If the results of a research study can be generalized to different populations, settings, and conditions, the findings are said to have external validity.

References

Boring, E. G. (1950). A history of experimental psychology. New York: Appleton-Century-Crofts.

Boring, E. G. (1954). The nature and history of experimental control. American Journal of Psychology, 67, 573-589.

Marx, M. H. (1963). The general nature of theory construction. In M. H. Marx (Ed.), Theories in contemporary psychology (pp. 4-46). New York: Macmillan.

II. KEY CONCEPTS

The following concepts are importantly related to the problems and exercises found in this unit. Use the information found in the **OVERVIEW**, as well as the definitions of the key concepts provided here, to complete the exercises in the following sections. [NOTE: Numbers in parentheses refer to pages in the second edition of Research Methods in Psychology by Shaughnessy and Zechmeister (1990), where these concepts are more fully defined.]

causal inference The identification of the cause or causes of a phenomenon, by establishing covariation of cause and effect, a time-order relationship with the cause preceding the effect, and the elimination of plausible alternative causes. (27)

confounding When the independent variable of interest systematically covaries with a second, unintended independent variable. (28)

control A key component of the scientific method whereby the effect of various factors possibly responsible for a phenomenon are isolated; three basic types of control are manipulation, holding conditions constant, and balancing. (9)

correlation A correlation exists when two different measures of the same people, events, or things vary together; the presence of a correlation makes it possible to predict values on one variable by knowing the values on the second variable. (25)

correlation coefficient A statistic that indicates how well two measures vary together; absolute size ranges from 0.0 (no correlation) to 1.00 (perfect correlation); direction of

covariation is indicated by the sign of the coefficient, a plus (+) indicating that both measures covary in the same direction and a minus (-) indicating that the variables vary in opposite directions. (25)

dependent variable Measures of behavior used by the researcher to assess the effect (if any) of the independent variables. (10)

empirical approach An approach to acquiring knowledge that emphasizes direct observation and experimentation as a way of answering questions. (7)

external validity The extent to which the results of a research study can be generalized to different populations, settings, and conditions. (28)

hypothesis A tentative explanation for a relationship or phenomenon. (19)

independent variable A factor that the researcher controls or manipulates in order to determine its effect on behavior. (9)

internal validity The degree to which differences in performance can be attributed unambiguously to the effect of an independent variable, as opposed to the effect of some other (uncontrolled) variable; an internally valid study is free of confoundings. (28)

introspection A method of doing research wherein observers are asked to describe their feelings and sensations when presented with various stimuli. (13)

measurement scale One of four levels of physical and psychological measurement: nominal (categorizing); ordinal (ranking); interval (specifying distance between stimuli); ratio (having an absolute zero point). (18)

operational definition A procedure whereby a concept is defined solely in terms of the operations used to produce and measure it. (15)

reliability A measure is reliable when it is consistent. (17)

scientific method An approach to knowledge that emphasizes empirical rather than intuitive processes, testable hypotheses, systematic and controlled observation of operationally defined phenomena, data collection using accurate and precise instrumentation, valid and reliable measures, and objective reporting of results; scientists tend to be critical and, most importantly, skeptical. (5)

subject variable The characteristics subjects bring with them to the laboratory, such as their gender; subject variables are often studied as independent variables in the natural groups design by selecting the levels of the subject variables. (9)

theory A logically organized set of propositions which serves to define events, to describe relationships among events, and to explain the occurrence of these events; scientific theories guide research and organize empirical knowledge. (20)

validity The "truthfulness" of a measure; a valid measure is one that measures what it claims to measure. (16)

III. EXAMPLE STUDIES

Read the following summaries of published research and attempt to answer the questions found at the end of each summary.

A. INFANTS LISTENING TO MOZART

Reference: Krumhansl, C. L., & Jusczyk, P. W. (1990). Infants' perception of phrase structure in music. Psychological Science, 1, 70-73.

Article Summary: Recent studies have demonstrated that human infants are more cognitively adept than had been thought previously. These cognitive abilities enable infants to discriminate among objects and events in their environment. For example, at a very early point in their development human infants must sort out important noises in their environment. For instance, they must learn to recognize speech. A study was done to find out whether 4 1/2-month-old infants were sensitive to disruptions in the natural structure of music. The infants listened to short selections of simple Mozart minuets that were either natural (pauses corresponded to the phrases in the music) or unnatural (pauses inserted into middle of phrases). A total of 24 4 1/2-month-old infants was tested. An infant sat on a parent's lap inside a three-sided test booth. In the middle of the booth was a green light and on each side was an audio speaker. An observer looked through a peephole in the center panel and recorded direction and duration of head turns. A test trial consisted of the child's attention first being drawn to the center light; then a red light above one of the speakers flashed. When the child turned toward the loudspeaker, one of the two kinds of music was played. The observer measured the length of time the child remained oriented to the speaker. Results revealed that children oriented significantly longer to the naturally segmented music than to the unnaturally organized music. The authors suggested that this finding provides evidence that young children are sensitive to certain natural segmental acoustic cues; these cues may be similar to those the child uses to organize human speech.

Questions:

1. What information in the article summary indicates that the major scientific goal of this study was understanding how children perceive acoustic information in their environment?

2. (a) What are the independent variable and the dependent variable in this study?
   (b) Identify the specific levels of the independent variable.
3. Were the levels of the independent variable manipulated or were they selected?
4. Identify at least two factors that were controlled by holding conditions constant.

B. PROFILES OF THE EXTREMELY TALENTED

Reference: Colangelo, N., & Kerr, B. A. (1990). Extreme academic talent: Profiles of perfect scorers. Journal of Educational Psychology, 82, 404-409.

Article Summary: Psychologists have long shown an interest in extremely gifted and creative individuals. One way to identify academically talented individuals is through their performance on standardized tests. In this particular study, the authors examined the "characteristics of students who scored perfectly on at least one subtest of the American College Testing Assessment Program (English, Mathematics, Social Studies, or Natural Sciences)." The sample consisted of perfect scorers from a population of 729,606 high school juniors and seniors who took the test in 1985-1986. "Of this group, 5,615 students received perfect scores on at least one scale; 701 received perfect scores on two scales; 384 scored perfectly on three scales and 3 students scored perfectly on all four scales." Perfect scores were most often obtained in Mathematics (3,265) and least often in Social Studies (577). Girls scored perfectly in English at more than a 2:1 ratio relative to boys. On the other hand, boys scored perfectly on the Mathematics subtest at more than a 3:1 ratio compared to girls. "All ethnic minority groups except Asians were underrepresented among perfect scorers." Because so few students scored perfectly on more than one subtest, talent often can be said to be quite specific. Moreover, many perfect scorers in one area tended to be quite average in another area. These results support a model of giftedness that emphasizes multiple intelligences as opposed to a model that emphasizes a global or general intelligence factor. A troublesome (to the researchers) finding was that when asked about possible future careers, most perfect scorers expressed interest in more vocational or applied areas (e.g., engineering, medicine) than in pure areas (e.g., English, mathematics, history). This suggests that relatively few of these talented individuals will seek careers in strictly academic areas where they might use their talents to teach future students.

Questions:

1. What information in the article summary would suggest that a major scientific goal of this study was description of events and their relationships?
2. What is the operational definition of "giftedness" in this study?
3. What evidence might be gathered to support the validity of a perfect score on the ACT subtest in mathematics as a measure of giftedness in mathematics?
4. What evidence would be required to demonstrate the reliability of the ACT test scores as a measure of giftedness?

C. WHO HAS A BETTER MEMORY OF EVENTS AND WHEN THEY OCCUR--WOMEN OR MEN?

Reference: Skowronski, J. J., & Thompson, C. P. (1990). Reconstructing the dates of personal events: Gender differences in accuracy. Applied Cognitive Psychology, 4, 371-381.

Article Summary: According to the authors of this study, a commonly held stereotype is that women are more concerned with (and attentive to) dates of past events than are men. This stereotype may imply that in general women are better than men at reconstructing the dates of past events. To test this implication, the results of four studies investigating memory for past events were analyzed for gender differences. In all the studies subjects were asked to keep a diary for about 3 months. They were instructed to write down each day a short description of one unique personal event. At the end of the 3-month period, subjects' memory of the events and their ability to date the events were assessed. The list of personal events was read aloud to subjects in a random order. Each subject indicated on a 7-point scale how well the event was remembered (1 = not at all to 7 = perfectly). For events that were remembered, the subject attempted to identify the exact date and day of the week on which the event occurred. Memory for dates was measured using the median error made in estimating the dates for each subject. The means of these error scores for males and females were compared in each of the four studies. In three studies, female mean errors were less than male mean errors. Two of these differences were statistically significant. For the fourth comparison there was a slight and nonsignificant difference in favor of the males. Overall, the investigators viewed the data as suggesting that women are slightly better at reconstructing dates than are men. It is not clear whether this finding occurred because women are better able than men to organize temporal events or because of some artifact of the record keeping process (e.g., women may have written more detailed, and hence more memorable, descriptions in their diaries).

Questions:

1. Have the major scientific goals of this study description, prediction, and understanding been met in this study?
2. (a) What are the independent variable and the dependent variable in this study? (b) Identify the specific levels of the independent variable in this study.
3. Were the levels of the independent variable manipulated or were they selected? Explain.
4. Evidence supporting a causal inference is obtained by establishing covariation of cause and effect, a time-order relationship with cause preceding effect, and the elimination of plausible alternative causes. In this study, (a) what specific evidence is provided regarding a causal relationship? (b) What evidence is not provided?