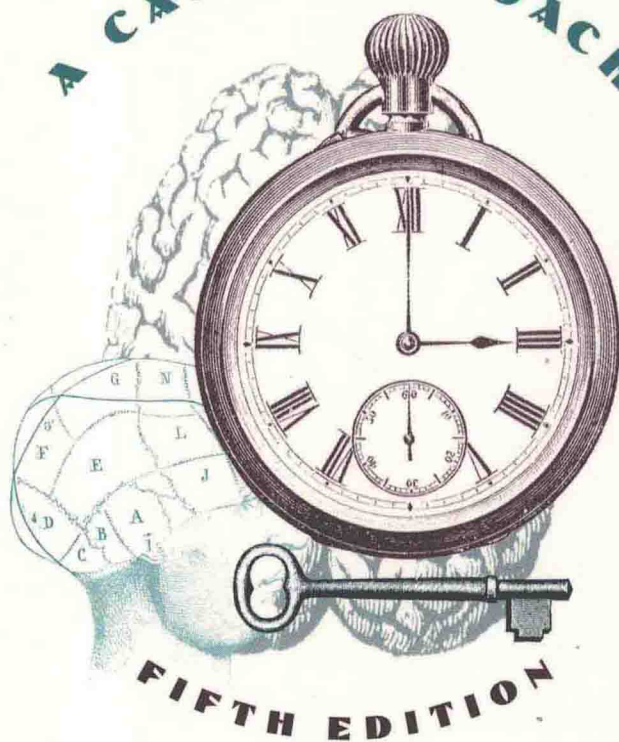


EXPERIMENTAL PSYCHOLOGY

A CASE APPROACH



FIFTH EDITION

ROBERT L. SOLSO
HOMER H. JOHNSON

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EXPERIMENTAL PSYCHOLOGY: A Case Approach, Fifth Edition

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To the Instructor

We are pleased to present this fifth edition of *Experimental Psychology: A Case Approach*. Experimental psychologists have covered a lot of territory during the past century when psychology became a formal discipline, and the many changes have necessitated changes in books and professional articles. This edition of *Experimental Psychology* reflects the current status of the major themes in psychology and shows how experiments are conducted as we approach the close of the 20th century.

Originally we wrote this book to identify the basic principles of experimental design as practiced by experimental psychologists. Too often the teaching of experimental psychology involves lengthy discussions of theoretical statistics, the philosophy of science, or a concentration on a highly specialized area of research. So after several years of experimenting with how to best present the material for a first course in experimental psychology, we have developed a method by which the student studies actual case examples in psychology and then generalizes the ideas from those examples to the principles of experimental design. The approach is “bottom-up,” in the argot of cognitive psychology, in that we emphasize actual experiments from which principles are derived. Although this approach builds from the basic to the more abstract, it is our intention to give both aspects of experimental psychology due attention. Both examples *and* principles are important in the study of experimental psychology. It is our purpose to teach both.

The pedagogical method in this book uses actual experiments to help the student learn how design principles are applied in research. In this edition of *Experimental Psychology* the student will read, critique, or analyze some 75 cases or experiments that exemplify various design principles and problems. In addition to understanding design, the student will become comfortable with the research literature and learn much of the content material of psychology.

This edition is based on the feedback and suggestions of numerous instructors who used the first editions in a wide variety of courses, ranging from introductory psychology through graduate psychology, as well as courses in other disciplines.

Their recommended improvements, as well as our class testing, have strengthened the text considerably.

Using examples in the teaching of disciplines such as experimental psychology has been a traditional means of instruction and is still widely practiced—whether the subject is high-energy physics, carpentry, accounting, computer programming, psychotherapy, creative writing, or cellular biology. But in courses involving experimental design in the behavioral sciences (or, more plainly stated, “how to do research in . . .”) the common practice is to meander through a series of philosophical/theoretical issues that, while important to any scholar’s education, make little or no effort to establish a link between the principles and the real world of research. We believe this link is essential to the development of critical thought and the practice of research, and hope that this book will help you establish that link as you teach experimental design.

We wrote the book from a tutorial standpoint: as if we were a private tutor instructing a student as he or she was reading the material. First we present a principle or a problem in experimental design. Then we show how the principle or problem has been dealt with in the psychological literature. We provide annotated reviews of actual articles, much as a master teacher might do if he or she sat down with a student and critically read an article with him or her. Based on the comments we have received from students and instructors alike, this technique is remarkably successful. We hope this edition will be even more useful and instructive in that sense than the previous editions.

Part One of this edition, which deals with the basic principles of experimental design, has been expanded and is more inclusive. Also, while we have long advocated the view that experimental psychology is a laboratory science, in this edition we have expanded the view expressed in previous editions that a researcher needs to be prepared to ply his or her trade in a variety of settings, inside or outside the laboratory. In addition, we have expanded the section on ethics in experimental research to reflect changes in that area over the past few years. We have included the most recent version of the ethical standards as adopted by the American Psychological Association. We have also split the previous Chapter 2 on the anatomy of experimental design into two separate chapters and reorganized sections of other chapters so they progress more logically. We continue to stress the use of computers in library research and trust that the material we have presented will be helpful to your students in using electronic data banks. We also discuss the development of research ideas. In both Part One and Part Two we are mindful of the role psychological research plays in shaping thinking in society in general, and, as such, we have included examples (on gender differences, for example) that address these issues. We believe that such examples of “controversial” research in an introductory book on experimental psychology are entirely appropriate.

In Part Two we have added or deleted several articles. The scope of articles in Part Two was carefully selected to sample the major areas of psychology, including industrial and practical issues, cognitive psychology, social psychology, animal and ethological studies, practical problems, cross-cultural studies, psychotherapy, single-subject designs, educational psychology, behavioral modification, child psychol-

ogy, and so on. We have found that by using this format students learn a great deal about the different fields of psychology in addition to learning about the vast diversity of experimental designs and techniques currently being employed in the behavioral sciences. In this edition the case analysis notes for the case studies in Part Two appear on (or near) the same page as the referenced section. Thus, the student does not have to flip back and forth between the case analysis and the article. Some professors have told us that Part Two of the book is the primary reason they select the book for class use. (Curiously, about the same number have told us they select the book for the contents of the first section!)

Finally, in Appendixes A and B we have responded to frequent requests to include a section on basic statistics. This section is modest, but allows the book to be used in a much wider range of courses where basic statistics is necessary. It also allows instructors to demonstrate the computational procedures for a large number of the statistical tests demonstrated in this book.

It would be inappropriate for us to tell the instructor how to use the text; however, we would like to note briefly how we have used these materials with students having only a minimal knowledge of psychology. Our procedure was to make short daily reading assignments and to discuss this material during the next class session. Some professors have told us that the material works well in large classes in which they cannot provide personal tutoring. Chapter 1 is introductory material and was usually handled in one or two class sessions. Chapter 2 is expanded for discussion in four or five class sessions. Students could usually understand the first three sections of this chapter without much help from the instructor, but some students needed help with the later sections. Chapter 3 usually required about four class sessions. With Chapter 4 we discussed four control-problem examples at length in class to ensure that the students understood the design and procedures involved.

We handled the design critiques in Chapter 5 in two ways. In one approach we had students redesign the experiments outside of class and then we asked a few students to present their designs in class. Then the rest of the class commented on and criticized the new design. Our other approach was similar to the first, except that we put the students in groups of three or four and had the groups present their new designs. This generated considerable discussion and debate.

In the class discussion of Chapter 6, we started by emphasizing the problems that could arise if a biased assignment of subjects occurred. We found that emphasizing the problem generated more appreciation of possible solutions. The procedure for teaching Chapter 6 was similar to that for Chapter 4.

The exercise at the end of Chapter 7 asks the students to develop a series of questions that they can use to critique experiments with respect to their design. Having students do this as a homework assignment and comparing their lists in class worked quite well.

Chapter 8 promises to create a lively class discussion on the ethics of experimental research. Although the examples are intended to illustrate clearly different ethical principles, there are, in many cases, other sides to the issues that will make for interesting debates. Chapter 9 explains the practical matters of using the library and developing research ideas. Chapter 10 provides a model experimental write-up,

which we suggest students use in trying their hand at preparing a similar paper, using a hypothetical experiment and hypothetical results.

Part Two of the book contains 16 reprinted articles. We selected these articles to illustrate the design problems presented in Part One. We have also identified some “special issues” of experimental design that are embodied in some of the articles. These issues include control problems in field-based experiments, small n experiments, research with animals, clinical research, and so on. The articles are arranged in four groups with different types of experiments in each group. In general, the articles in each group are ordered from least complex to most complex. Some instructors may choose to assign the articles in the sequence presented, while others may select only those articles that reflect the nature of the course. We hope we have presented a bountiful smorgasbord that will satisfy the most selective diet.

For beginning psychology students, it is important to discuss some of the experiments thoroughly, even to the point of reading them aloud in class and discussing them point by point. Reading the psychological literature is a new and somewhat anxiety-provoking experience for most students. A thorough discussion of a few articles seems to relieve much of this anxiety and acquaint the student with the design and technique in a specific content area. We have also included a new section on “poster sessions” because an increasing number of students, both at the graduate and undergraduate levels, are using this format to present their work. We have also left several chapters for the student to analyze. This can be done individually or in groups and makes for good class discussion.

Our goal in this book is to make psychological research more understandable, more interesting, and perhaps even exciting to the student. We invite ideas from instructors on how to best achieve these goals.

An Instructor’s Manual, with answers to questions and comments on the ethics section (Chapter 8), is available. The manual also contains test questions.

Finally, we would like to acknowledge the assistance of those who reviewed the book: Mary Anne Baker, Indiana University Southeast; W. Robert Batsell, Jr., Southern Methodist University; F. Samuel Bauer, Christopher Newport University; James R. Council, North Dakota State University; Michael Frank, Stockton State College; Paula Goolkasian, University of North Carolina, Charlotte; Maria S. McLean, Southwest Texas State University; and Theron Stimmel, Southwest Texas State University. Each read the entire manuscript and provided cogent remarks and valued advice. To all, we offer our sincere thanks.

Robert L. Solso
Homer H. Johnson

To the Student

You have chosen an excellent time to study experimental psychology. Exciting new developments are emerging in nearly every domain of the behavioral sciences, and a strong background in the methodology of experimental psychology will form a basis for understanding these new developments and provide you with the skills necessary for conducting research on your own.

This book examines the methods of experimental psychology. A great deal of the book is devoted to controlled psychological experiments and the collection of reliable data based on observations. We use a “case approach,” meaning that we illustrate each of the principles of experimental design with an example, or case, drawn from the professional literature in psychology. Study these cases carefully as they represent excellent examples of skillfully conducted experiments from every major area in psychology—including animal studies, child psychology, social psychology, cognitive psychology, applied psychology, and so on. We also emphasize ethics in experimental research and give some guidelines on how to best develop research ideas and write a research paper.

We believe that a powerful lesson can be learned by studying the techniques of experts. In addition to helping you learn proper experimental design, we hope the book will teach you a little about the various topics of psychology and inspire some of you to continue your studies and the work that some of us have started. We would be interested to hear your reaction to the material in this book and how it affects your study and work in the field. Good reading!

RLS
HHJ

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Basic Principles in Experimental Psychology

This book is divided into two distinct sections. Part One focuses on the basic principles of experimental psychology while Part Two analyzes actual experiments drawn from the psychological literature.

We begin with an introduction to scientific inquiry and methodology in psychology. Each major point is illustrated with an example from the experimental literature. In Part One we also discuss the fundamentals of research design as they apply to experimental psychology. A large portion of this material is devoted to the issue of experimental control, which is the means by which experimenters ensure the integrity of a psychological experiment.

Chapters 5 and 7 are called "Design Critiques" and offer brief descriptions of experiments that contain at least one conceptual or technical flaw. As you read these critiques, try to discover the error. Practice with these problems can strengthen your own ability to design experiments devoid of error.

Part One concludes with three important and practical chapters: "Ethics of Experimental Research," "The Psychological Literature: Reading for Understanding and as a Source for Research Ideas," and "Conducting Research and Writing a Research Paper." These chapters should guide you through the experimental process from the conceptualization of an experiment, to running an experiment, and finally to submitting a manuscript for publication.

Part One is intended to present, succinctly yet comprehensively, the rudiments of good experimental design and to show how to present research in a valid experimental paper. In Part Two we have selected for presentation actual experiments from the psychological literature. Each experimental case illustrates one or more specific design/experimental issues and, in most cases, is accompanied by our detailed analysis. (Several cases are without comment and await your remarks.) We suggest that you read these cases as you study the material in Part One to help enliven the textual material. Upon completion of Part One and Part Two you should be equipped to understand, analyze, and plan research in experimental psychology.

An Introduction to Scientific Inquiry

Man and science are two concave mirrors continually reflecting each other.

—Aleksandr Herzen

Periodically a journal of the American Psychological Society, called *Psychological Science*, is delivered to my office. Not long ago, a chemist friend saw the journal in my office and asked, “Isn’t that title an oxymoron? Do you believe that psychology is really a science?” My friend’s questions raise the issue: Are *psychology* and *science* incongruent terms?

It seems that psychology has lived in the shadow of “real” science for so long that many still believe it is in a prescientific period—a kind of alchemic stage in which everything from the mercurial nature of human behavior to weird social practices is investigated using arcane techniques. When I pointed out to my chemist friend that “science” is characterized by its method (i.e., the “scientific method”), not by its subject matter (e.g., chemistry, the brain, or demographic trends), the chemist argued that psychology was not a “true” science because it lacked a laboratory tradition in which technical instruments played a role in the search for scientific principles. “But that is a false impression,” I retorted. “From the very beginning (by which I meant the late 19th century), we have had laboratories, equipment, subjects, experimental techniques, statistical analysis of data, and so on, upon which reliable conclusions are based. And presently, experimental laboratories in psychology are equipped with a dazzling array of computers, physiological instruments, and

all sorts of scientific gadgets sure to impress the hardest of the hard among scientists.” “But still,” he responded, “you study weird, inconsistent, even berserk behavior.” “But, the more bizarre the subject,” I replied, “the greater the necessity to apply scientific methodology.”

Presently, the experimental investigation of thought and behavior by psychologists follows the basic principles of scientific inquiry prescribed in other more traditional fields of science. While the things psychologists study (thought and behavior) distinguish psychology from other scientific fields, the method of inquiry is similar.

CAN THOSE WHO STUDY THE TRANSCENDENTAL THOUGHTS OF PEOPLE IMMERSED IN HOT TUBS BE CALLED SCIENTISTS?

Experimental psychologists study subjects such as the interpersonal relations between people of different status, the predatory behavior of the barn owl, the eye movements of newborn children, personality traits, the etiology of schizophrenia, brain patterns of people solving logic problems, and the transcendental thoughts of people immersed in hot tubs. These topics, and many more, are legitimate issues a psychologist could examine using the experimental method.

The lay person frequently ponders these and other topics using speculation, subjective arguments, and phenomenological proofs. These nonscientific interpretations, although sometimes interesting, frequently lead to invalid conclusions.

But it is possible to examine these topics scientifically, by which we mean that they may be subjected to analysis that follows a prescribed, logical method of investigation in which the conclusions are reliable and valid. To do this, experimentation and rational analysis—tools of investigation that are less susceptible to subjective interpretation or idiosyncratic bias—are designed to yield valid conclusions about a wide range of behavior and thoughts. Someone interested in the thoughts of a person sitting in a hot tub is not necessarily committed to using kooky, nonscientific techniques to study that phenomenon. Indeed, the kookier the subject matter, the more rigorous psychologists must be in their application of experimental techniques.

WHAT IS SCIENCE?

If undergraduate students are asked, “What is **science**?” many answer by giving examples of science: Science is physics, chemistry, biology, and so on. This definition suggests that science is a generic term describing specific subject areas. For example, college students are required to take a number of “science courses,” and these courses usually are drawn from physics, chemistry, astronomy, botany,

“ARE YOU A STUDENT?”

Experimental psychologists study a wide range of phenomena—from the physiological components of emotion, to the eating behavior of people in fast-food restaurants, to poetry learning—but few avenues of research are more interesting to college students than the study of interpersonal relations. How these relations are established in opening conversations has been the focus of research conducted by Kleinke, Meeker, and Staneski (1986), and Cunningham (1988). In one survey Kleinke et al. had subjects rate opening lines such as, “Isn’t it cold? Let’s make some body heat.”; “Are you a student?”; and “I’m sort of shy, but I’d like to get to know you.” These lines were conceptualized to represent three different types of social advances: cute-flippant, innocuous, and direct. Overall, respondents agreed that cute-flippant opening lines were the least desirable.

With these normative data, Cunningham (1988) field-tested the opening lines by having researchers approach members of the opposite sex and begin a conversation in a singles bar with different types of social advances. In general, women reacted negatively to the cute-flippant lines and were positive to direct or innocuous opening lines. The reaction of men was ambiguous. Perhaps female initiated conversation, no matter how innocuous or cute, is perceived by men as a come-on. The research illustrates that even the vagaries of social mingling may be analyzed experimentally.

biology, and the like. While some casual support for this definition can be found, it is less than specific and does not appear to be adequate. If you ask why chemistry is a science but history is not, or why physics is a science but music is not, the definition of science becomes more complex and usually confusing. People usually argue that science deals with facts (yet, so does history), or that science deals with theories (so does music), or that it involves laboratory experiments (but what about astronomy or the classification of plants in botany, both of which are usually characterized as sciences and yet frequently do not engage in laboratory experiments).

The difficulty in finding an adequate definition of science is also shared by scientists. Many scientists specify the collection of facts, the use of experimentation as a method of “proof,” the use of theories as tentative explanations, and so on as prerequisites for a field to be labeled a science. But other definitions emphasize the ongoing or dynamic nature of science—the search for new “facts” and theories to replace the old, much as some of Einstein’s theories replaced those of Newton. James Conant (1951) expressed this quality of science when he defined science as “an interconnected series of concepts and conceptual schemes that have developed as a result of experimentation and observation and are fruitful of further experimentation and observation.” We can see this dynamic process when a scientist, through observation and experimentation, attempts to ascertain what is related to what, or