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# **EXPERIMENTAL METHODS IN PSYCHOLOGY**

**GUSTAV LEVINE  
STANLEY PARKINSON**

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Stanley Parkinson  
*Arizona State University*



1994

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# **EXPERIMENTAL METHODS IN PSYCHOLOGY**

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## Preface

This text's unique contributions are found in two features. First, there is a detailed discussion of the process of theorizing that is coupled with a close examination of psychological constructs. This focus is evident in reading through some of the chapter headings: "The Problems Encountered in Theorizing about Internal Events"; "Changes in the Construct of Iconic Memory Over 30 Years of Research"; "A Close Look at the Methods and Logic Used in Evaluating a Theory of Short-Term Memory Search"; "Testing Theories when Internal Events Can Be Monitored or Manipulated." Thus, the reader of this text is offered an opportunity to see how psychologists think about, develop, and modify their theories, and the part played by research in changing explanations for behavior.

The second unusual focus in this text is an overt analysis of the logic of drawing conclusions from research. It is common for psychologists to be self-conscious in their reasoning. But it is uncommon to see an analysis of the logic that they use to draw conclusions. For example, chapter 7 closely examines the commonly encountered logical error of affirming the consequent, an error frequently made when predicted results are interpreted as confirmation of a theory. Conditions promoting the error, and conditions that avoid it, are described in both chapters 7 and 13. Other logical problems that are commonly encountered are also examined.

There are probably more chapters here than can be comfortably

completed in one semester. The purpose was to offer options to the instructor. The “excess” chapters are in the latter half of the textbook, where there are choices among particular areas in psychology. The instructor using this text can teach a broad-based course including material on research methods in experimental, social, and clinical psychology, or a course that is exclusively focused on experimental psychology.

Whatever the final decision about which chapters to use, it is recommended that the first seven chapters be included. Chapter 13 is also highly recommended. Whereas chapter 7 describes the logic most commonly encountered in experimental psychology, chapter 13 describes a different form of logic that is more common to the area of social psychology. Neither form of logic is exclusively used in either subdiscipline, so it is helpful to understand both approaches regardless of a reader’s major area of interest. A close examination of the two different approaches, and the problems they each pose, serves to increase understanding of the entire research enterprise.

Chapter 5 is a relatively complete summary of the material typically presented in an introductory statistics class, with an emphasis on what the students need to know for a course on experimental methods. The chapter includes an appendix that offers the formulas for commonly used statistical tests, and illustrates their use. This material was deliberately kept separate from the chapter itself, in order not to distract from the chapter’s discussion of the logical relationship between statistics and the research enterprise.

Whereas all of the later chapters (beginning with chapter 7) integrate psychological content and experimental methods, the initial chapters focus more exclusively on methods and associated terminology. In chapters 1 through 4, only simple examples with single independent variables are described, so as not to distract from the information on research technique. After the summary of the more elementary statistical concepts in chapter 5, chapter 6 presents a discussion of designs with multiple independent variables. It defines and illustrates blocking variables and moderator variables, and offers an extensive discussion of tests of interactions. Chapter 6 also describes the ways in which additional independent variables can sometimes affect the estimate of variability, and the consequences this can have for statistical significance. Such topics are only occasionally covered in introductory statistics classes. They were included in this methods text because of the insights they contribute to the discussion of multifactor designs.

The two authors have enjoyed teaching experimental methods. The special pleasure this course provides is the opportunity to

broaden the ways in which students think, to offer new templates that will help in their later approaches to problems in very different areas of concern. It is for this reason that the text emphasizes ways of thinking. Although this suggests that the specific content covered is secondary, we took special care in its selection. We wanted the students to have contact with questions that were initially intuitively interesting, that had been made more interesting by their research histories, and that involved clever solutions to the problems encountered in the quest for understanding. We have increased our own level of understanding through the writing of this text, so we have high hopes for its readers.

*Gustav Levine*  
*Stanley Parkinson*

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# **CHAPTER 1**

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## **Introduction: The Function of Research Methods**

People were gathering information, and successfully using much of this information, long before science came along. The survival of the species is evidence that humans are capable of obtaining useful information without invoking the scientific method. Yet we are all familiar with incorrect information that was believed for long periods of time by intelligent people. For example, there was the belief in bloodletting to reduce fever (which weakened the patients and sometimes killed them), and there was the use of boiling oil to cauterize battlefield wounds when soldiers or sailors lost limbs (which created a toxic reaction from the burnt tissue, increasing the death rate). Remedial procedures sometimes appear reasonable, and are reported by observers to be effective, yet are in fact useless, or even harmful. It must be concluded that there are circumstances where experience and observation can be misleading, and that prior beliefs, or other factors, can affect what is observed or remembered (Nisbett & Ross, 1980). Some of the observational circumstances that are most vulnerable to such errors have been identified. Ways of rearranging the collection of observations to avoid these errors have been developed. These better arrangements for making (and interpreting) observations constitute the largest part of what is meant by research methods. In fact, an informal definition of science might be that science is a series of techniques to help people avoid fooling themselves.



The special arrangements for collecting observations that are integral to research procedures are detailed throughout this text, but an example is useful at this point. There is an interesting accidental experiment that occurred naturally and resulted in the abandonment of the use of boiling oil for cauterization. Boiling oil cauterization was used during the 15th and 16th centuries, having been recommended by Giovanni Divego (1460–1520) in his classic text on surgical procedures. During military battles army and navy surgeons always had boiling oil handy, which they would apply after amputating a mangled arm or leg. Civilian surgeons followed the same procedures when accidents produced similar injuries.

The 16th century French army physician Ambroise Paré ran out of oil during a battle. The result was two groups of wounded men, one group receiving the burning oil cauterization, and another group, otherwise similarly wounded and similarly treated, who did not have the burning oil applied after the amputation procedure. Contrary to expectations, the surgeon found far more survivors, and better healing, among the noncauterized group, and reported this finding to his colleagues. Paré was something of a nay-sayer, and so was probably happy to be able to show that an established treatment was incorrect. If this dissident physician were simply to claim that in his experience cauterization was an undesirable treatment, his colleagues would have ignored him. As discussed in the following section, it was the form of the evidence that caused the profession to treat the new information seriously.

## CONTROL GROUPS

The contrast of two similar groups, the only difference being that one group receives a specific treatment and the other does not, is an excellent situation for testing a treatment's effectiveness. It permits two conditions to be compared, where only one contains the component being tested. This is an example of one kind of observational circumstance that a researcher would deliberately create in order to test a treatment. In this research design, the group without the treatment is called the **control group** or **control condition**, and the group with the treatment is called the **experimental group** or **experimental condition**. It took the presence of a simultaneous control condition, along with an experimental condition (the subjects in the experimental condition receiving the treatment), for the surgeon to be able to recognize that the boiling oil treatment was a poor one. The opportunity, simultaneously, to compare the results in