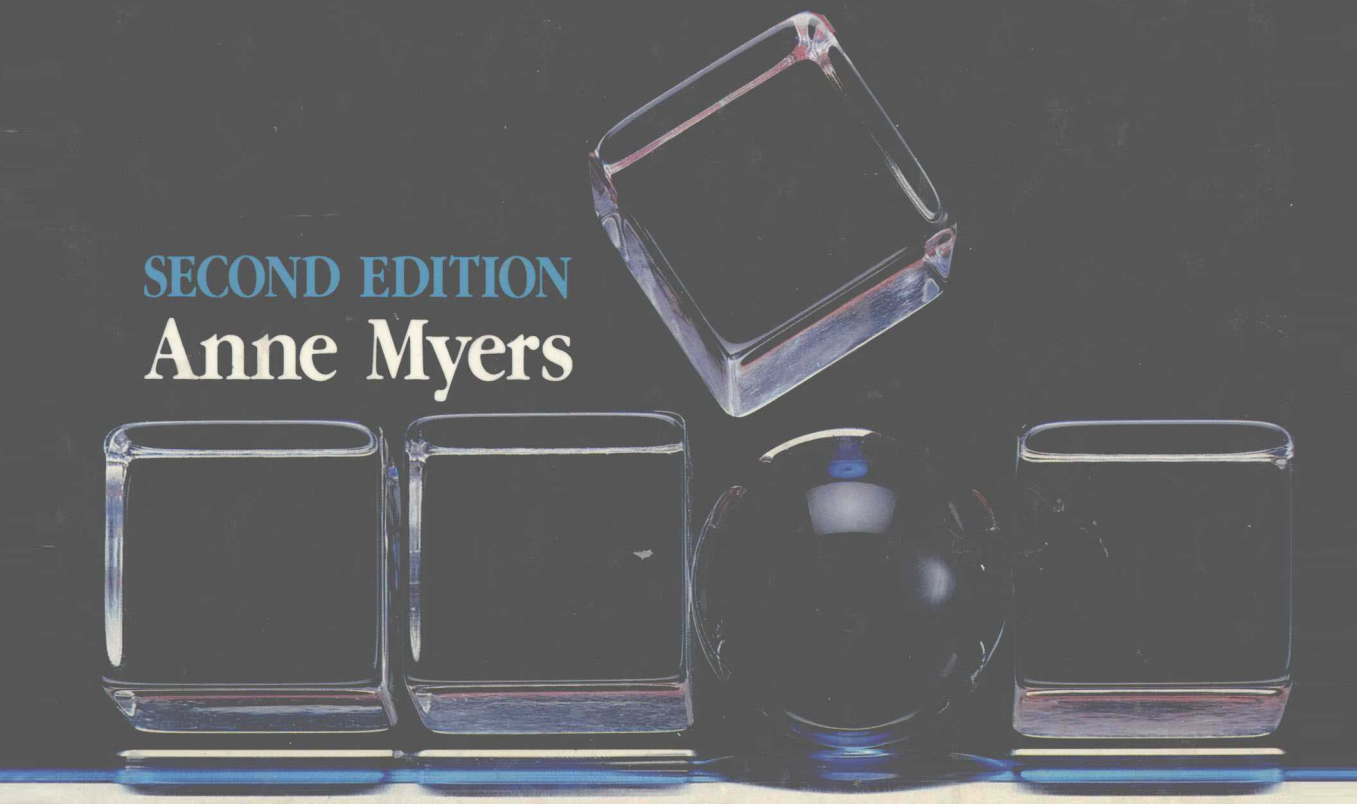
SECOND EDITION

Anne Myers



EXPERIMENTAL PSYCHOLOGY

Experimental Psychology

Second Edition

To my Dad, for many postcards

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Preface

Experimental Psychology, Second Edition, is an introduction to the basic principles of research in psychology. It explains the key principles of research, particularly experimental research, clearly and in the context of concrete examples. Enough information is presented to enable the student to design and execute an experiment, analyze and interpret the results, and write a research report. Although the main focus is on experimentation, alternative approaches are discussed as important complements to controlled laboratory designs.

Special Features of the Text

This text is unique in several important ways. First, it is organized to carry the student through the entire process of conducting an experiment. The major sections—Introduction, Methods, Results, and Discussion—parallel the major sections of the research report to clarify the relationship between designing and conducting the experiment and reporting it.

Second, many practical aids are provided. Research ethics are discussed in detail, as are specific techniques for developing a research hypothesis. In presenting research methods, I have stressed the integral relationship between the experimental hypothesis and the research design. The process of selecting a design has been broken down into basic steps to provide more structure for the student. A detailed chapter on report writing includes a sample journal article to illustrate reporting conventions. (The manuscript version of this article is reproduced in Appendix C.) The rationale behind procedures is explained to help students apply them. Important terms are introduced in boldface type throughout the text. Each chapter includes a summary and a list of review and study questions. A random number table and combined index and glossary are included.

Third, examples are drawn from a variety of research areas to emphasize the importance of experimental procedures throughout psychological research. A few nonpsychological examples are in-

cluded, too, to encourage an appreciation of the experimental approach as a general thinking style. The content of the examples is not intended to be representative of the topics of research in psychology. Rather, the examples provide clear, concrete illustrations of the concepts at hand. The eclectic choice of examples creates a text that can be supplemented easily with content-oriented readings in areas of the instructor's choice.

Finally, unlike some methodology texts, statistical material is included. The results section of the text provides the student with a conceptual overview of the process of statistical inference and step-by-step instructions for selecting and carrying out the tests commonly used in simple experiments. Basic terms are reviewed, and statistical tables are included so that all the required information is available in this single source. The process of interpreting the results is also discussed.

Organization of This Edition

Those of you who used the text in its first edition will find that the overall plan and focus of the book remain unchanged. However, several topics have been updated and expanded in light of reviewer and user feedback. Chapter 1, for example, contains a more complete discussion of the links between theory and research. Additional information on nonexperimental approaches to research has been added. Chapters 5 and 6 have been reorganized, with Chapter 5 containing a more complete discussion of the ethical issues surrounding research with animals and Chapter 6 containing greater detail on sampling procedures.

Chapter 15 has been modified to reflect the 1983 changes in the publication style of the American Psychological Association. The manuscript version of a journal article is now included in Appendix C to help students write reports. The glossary has been incorporated into the index for ease of use.

Acknowledgments

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I am also deeply indebted to the many researchers whose work inspired much of this text and to the many authors and publishers

who permitted reproduction of portions of their works. They are cited throughout the text. I am grateful to the Literary Executor of the late Sir Ronald A. Fisher, F.R.S., to Dr. Frank Yates, F.R.S., and to Longman Group, Ltd., London, for permission to reprint portions of Tables III and XXXIII from their *Statistical Tables for Biological, Agricultural, and Medical Research* (6th edition, 1974).

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I would also like to thank the people at Brooks/Cole Publishing Company for their careful handling of the revised work, particularly C. Deborah Laughton, sponsoring editor, and Michael Oates, production editor. Special thanks to Cora Bennett-LeFevre for her invaluable assistance in many phases of the project. Special thanks also to Judith R. Joseph and Harriet Serenkin for their help in producing the first edition of this text, and to Harriet again for her editing skills on the second. Deborah Hoffman, Henie Lentz, and Alice Edelman played special roles for which I am very grateful. Finally, I would like to thank Robert Rossini for his patience and understanding.

Anne Myers

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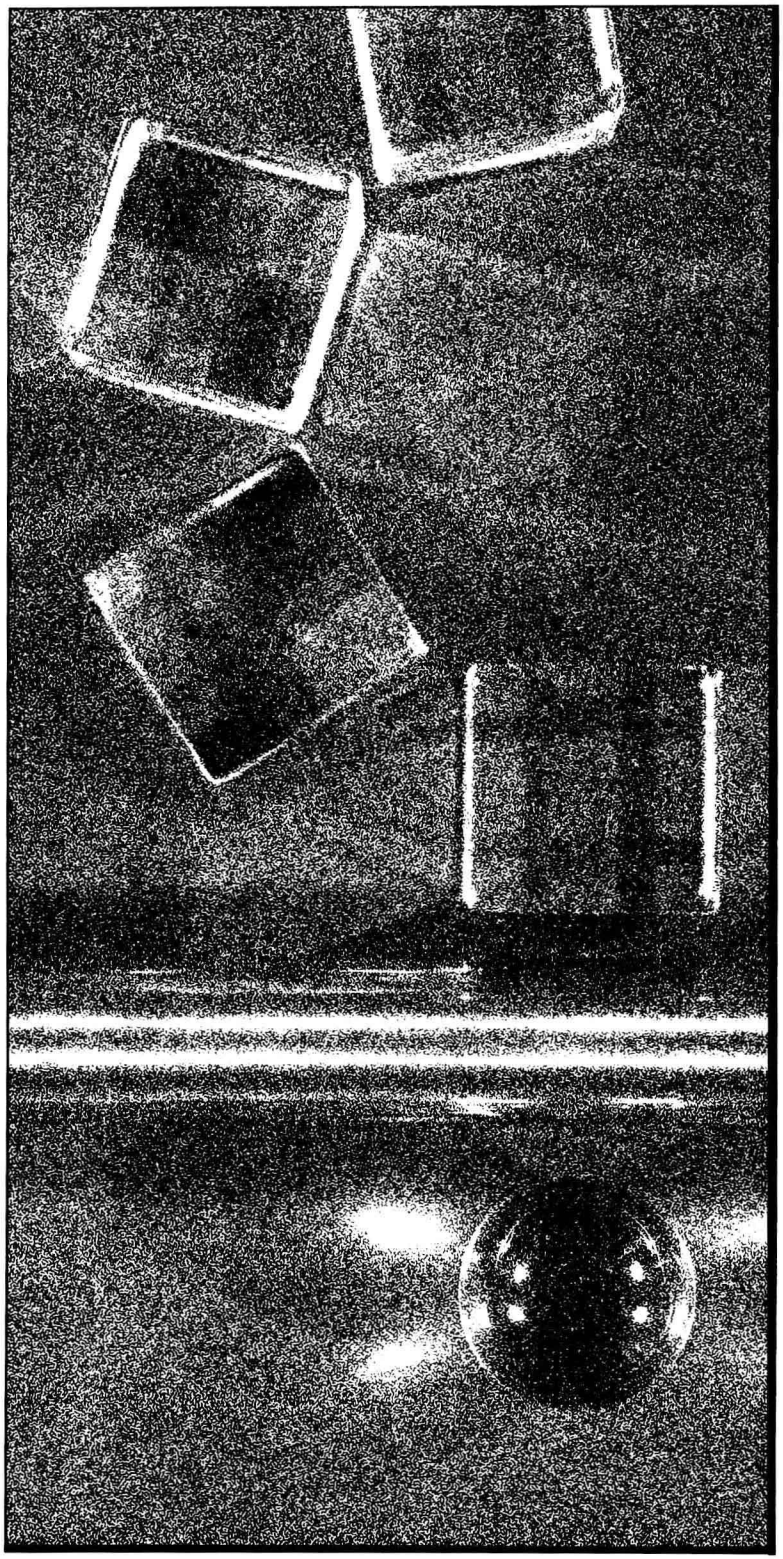

CHAPTER 1

Experimental Psychology and the Scientific Method

Psychology is the science of behavior; as psychologists we take a scientific approach. We work to explain, predict, and control behavior through scientific methods: We specify the conditions under which we make our observations; we observe in a systematic or orderly way; we accept or reject alternative explanations of behaviors on the basis of what we observe. In short, we do a great deal of research.

methodology

In this text we will examine some of the basic tactics of research in psychology. We will study **methodology,** the scientific techniques used to collect and evaluate psychological data. All areas of psychology use scientific research methods. For example, researchers studying perception collect data through formal laboratory experiments designed to provide the most precise information. Clinicians may collect data in an impressionistic manner from a variety of sessions with a variety of patients. But whether their data come from laboratory experiments or treatment sessions, all psychologists use scientific criteria to evaluate them.

The Need for Scientific Methodology

We all collect and use psychological data in our daily lives. You notice that your roommate is upset, so you decide to postpone the news that your rent check is about to bounce. You do not invite Chris and Lee to the same party because you know they do not like each other. You can probably think of many more examples of situations in which you used psychological data. The kind of everyday data-gathering that we do may work well enough in a casual way. We may hit upon the "best" time to break some bad news to our roommates. But if we want to have confidence in our conclusions, if we want to apply them as general principles, we need to proceed more systematically. Scientific methods provide us with just such systematic, reliable, general principles of behavior. The data we collect in psycho-

logical research must be evaluated and interpreted according to scientific criteria. For example, were the data gathered objectively? Are they *representative* of what we would see if we studied many more people? Can our findings be *replicated*? We seldom worry about these questions as we form our day-to-day impressions. But these issues are critical to the value of all psychological research.

experimental method

In this text, we will focus mainly on one method—the psychology experiment, or the **experimental method.** Psychologists use other scientific methods too, but the experimental method is one they use quite often. It has certain advantages over other methods, as you will see in later chapters.

When we do an experiment, we make a controlled test of a hypothesis about behavior. Throughout the text, we will examine experimental techniques in a wide variety of areas. Experimentation might be used, for example, to study learning in rats and to specify the reinforcement contingencies that will lead to a particular behavior. This goal is best achieved by testing out various types, amounts, and schedules of reinforcement. We can also use experimental techniques to evaluate the effectiveness of a particular type of psychotherapy or to learn what personality traits distinguish a good therapist from a mediocre one. Do anxious people spend more time with others? Does adversity build character? These and many other questions may be studied through experimental methods.

In the following chapters, we will discuss the details of setting up and running experiments and evaluating the findings. By the time you have read the entire text, you will know why experimentation is important, be able to formulate a research hypothesis, design an experiment to test it, and analyze and interpret the results. You will also be a more sophisticated judge of others' findings.

Before we begin to examine specific methods of research, it will be helpful to look more closely at what we mean by science, the scientific method, and scientific explanation in psychology.

The Characteristics of Modern Science

science

When you think of **science,** you probably think first of biology, chemistry, or physics. We all take some of these science courses. The word "science" comes from the Latin word *scientia,* which means knowledge. As the word is used today, it has two connotations, content and process. The *content* of science is *what* we know, such as the facts we learn in our biology, chemistry, and physics courses. Science is also a *process*—that is, an activity that includes the systematic ways in which we go about gathering data, noting relationships, and offering explanations.

As psychologists our ultimate goal is to understand behavior well enough to predict the behavior that will occur in a specific situation, just as a physicist can predict certain occurrences such as how fast a ball will roll down a hill. Once we can predict behavior accurately,

we can also control it. We can increase the number of desired behaviors and decrease the number of harmful ones.

The Scientific Mentality

The psychologist's goal of prediction and control rests on an important assumption: If behavior can be predicted and controlled, it must follow a natural order. This assumption seems simple enough. Most of us share the belief that there are specifiable (although not necessarily obvious) reasons for the way people behave. However, this seemingly simple assumption lies at the heart of what Alfred North Whitehead called "the scientific mentality." Whitehead was a philosopher of science who traced the development of science in his now classic book *Science and the Modern World* (1925). He postulated that "faith" in an organized universe is essential to science. If there were no inherent order, there would be no point in looking for one. Hence, there would be no need to develop methods for doing so. Modern scientists have faith in a natural order of things, and so they seek examples and explanations of it. Their assumption is that the universe "makes sense" in ways that can be discovered through research.

Data-Gathering

Whitehead saw the forerunner of modern science in the works of Aristotle, the ancient Greek philosopher. Aristotle, like the contemporary scientist, assumed that order exists in the universe, and he set about to describe that order in a systematic way. Others followed his example. Still, there was little scientific progress until the sixteenth century. What was missing from Aristotle's approach was a second key feature of the scientific mentality: reliance on empirical—that is, *observable*—data. Aristotle argued that heavy objects fall faster than light objects because their "natural" place is down. When Galileo (1565–1642) finally performed observations to test Aristotle's reasoning, ideas about acceleration due to gravity were finally changed. Galileo's observations led to the inescapable conclusion that light objects fall just as fast as heavy ones, providing we set up the proper testing condition. This condition is a vacuum, which is needed so that air currents and resistance are eliminated.

Seeking General Principles

Modern scientists go beyond cataloging observations to proposing general principles—laws or theories—that will explain them. We could observe endless pieces of data, adding to the content of science. But our observations would be of limited use without general principles to structure them. When these principles have the generality to apply to all situations, they are called **laws.** Scientific laws are useful because they help us explain our universe and predict events.

laws