Behavioral Statistics in Action

THIRD EDITION

MARK VERNOY • DIANA J. KYLE

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To Judy Vernoy, my partner for life, for her collaboration on the first two editions and her unconditional love, support, and good humor through the writing of the third edition.
Mark Vernoy

This book is dedicated in grateful memory of my parents, Theodore and June Rutherford, who taught me the value of approaching life courageously with a smile, determined with patience, and understanding with love, and that laughter is truly the best medicine.
Diana Kyle

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Preface

When we initially conceived the idea of writing a statistics book, our first thought was that it must be entertaining enough to keep students reading, relevant enough to maintain their interest, and comprehensible enough to ensure that students would understand the concepts. Yet it needed to be so extensive in coverage and exacting in detail that it would stand as a comprehensive, rigorous textbook, one that would be treasured as a reference book when students went on to conduct experiments of their own or analyze research done by others. We hoped to write a book that would help students grasp that critical connection between behavioral science research and the study of statistics. We wanted to help them understand not only the *how* of conducting statistical tests but also, even more important, the *why*—why it is necessary to show statistical significance and why any particular test is used in a given situation.

As we began writing the text, we found that it was easy to maintain my ideals. It was easy to write in an entertaining manner. We truly enjoyed writing about Mark Twain, the effect of television on the behavior of children, the Stroop effect, and automobile crashes. We felt that if we were having so much fun writing it, readers would doubtlessly have fun reading it. Writing about topics relevant to students was also easy. Our students and college-age children continually reveal their interests in casual conversation, so it was easy to write about topics relevant to them. As for being comprehensible, we have written this book in a light, conversational tone so that students can and will actually read it. We have been careful to include all the topics and concepts necessary for a comprehensive introduction to statistics, thanks in part to the expert reviewers of the original manuscript. However, underlying the extensive coverage, painstaking explanations, and engaging examples has been our compulsion to infuse the logic behind the methods, concepts, and procedures described in the textbook. It is through grasping the logic behind the concepts and procedures that students come to truly comprehend what the various statistics are all about.

This is a book intended for use in an introductory behavioral science statistics class. Students taking this course are interested in pursuing their interests in education, psychology, sociology, anthropology, or any other field of behavioral science. Examples pertaining to those interests are found throughout the text. This book is intended for all students, not only those who grasp math concepts

readily, but also those who have traditionally had trouble learning math, even those who may be a little math phobic. In some of the chapter openers and in many of the examples, a little levity breaks up the intensity of the text. With all students in mind, we have designed a book that is full of helpful pedagogy to facilitate success. The pedagogical aids to student success revolve around the SQ4R study technique.

As behavioral scientists, we know that learning is most effective when the student is an active participant in the learning process. To enable students to actively participate in learning statistics, the book is structured around the SQ4R (**S**urvey, **Q**uestion, **R**ead, w**R**ite, **R**ecite, **R**eview) technique. When students use the technique on their own, it becomes tedious and they tend to stop using it. However, this text helps them use the technique with minimum effort by involving them in the study and use of statistical concepts in the course of reading each chapter.

Incorporated in the book are several features that are designed to support SQ4R. Each chapter begins with a **chapter outline** that encourages students to *survey* the major topics that will be presented in that chapter. **Student questions** are found throughout each chapter that help develop a questioning attitude in the students. Our experience in teaching statistics has enabled us to anticipate many student questions. These questions are embedded within the text, and the answers follow them.

An informal writing style facilitates *reading* of the chapters. **Chapter openers** introduce each chapter with a provocative research question. Each opener is integrated into the text and in most cases is used as the basis for many examples within that chapter. Although this is a statistics book, we have tried to keep the reading at an easy level and have tried to include extensive applications of statistical concepts and methods. Students should find that reading the text is enjoyable and that the writing style facilitates ease of learning.

Students are encouraged to *write* as they read. As much as possible, they should jot notes in the margins and summaries written in their own words next to new concepts as they are presented. They should have scratch paper available as they read so that they can work the samples presented in the text. In addition, they should be encouraged to work the **problems** at the end of each chapter to practice concepts presented in that chapter. Professors can assign only odd- or only even-numbered problems for homework and be assured that all main concepts will be covered by an adequate number of problems. Answers to odd-numbered problems can be found in Appendix B, and even-numbered answers are included in the Instructor's Manual.

Even more than learning how to perform statistical procedures, learning the logic behind statistical concepts—the rationale behind each concept, test, or procedure and why one is used over another—is the core of the statistics course. To help students evaluate their understanding of the concepts covered in the text, students find **concept quizzes** periodically throughout each chapter. These learning checks are in the form of short questions that invite each student to *recite* the conceptual content of the material just covered.

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At the end of each chapter there is a **chapter summary,** a list of the **key terms** in the chapter, and a list of all new **formulas.** Defining each of the key terms provides an additional opportunity for students to *recite* the material covered in the chapter, and reading the summaries and formulas enables them to *review* the material. A significant new feature that also provides a chance for *review* are the **visual summaries** of major statistical procedures in the form of a flow chart found where applicable throughout the chapters. These visual summaries enable students to review the procedures at a glance without having to wade through the explanations and examples after they have already internalized the logic behind the procedures. They can be especially helpful as handouts or as the basis of review sessions.

Acknowledgments

The writing and publishing of any college textbook is a group effort involving the input and support of many people. We would like to thank our families, our friends, and our colleagues. In addition there are several persons who deserve special recognition.

We would first like to thank our editors. Frank Graham who brought the book to Mayfield and Ken King whose wisdom, insight, and commitment to excellence greatly enhanced the project. We thank Linda Ward who orchestrated the final editing and production of the third edition. Thanks also to Robin Mouat, Marty Granahan, Helen Walden, and Stan Loll for their contributions. To the following reviewers we offer our sincere appreciation: Gregory Burton, Seton Hall University; James F. Juola, University of Kansas, Lawrence; Daniel G. Mossler, Hampden-Sydney College; and David Wallace, Ohio University.

Finally, we would like to express our continuing appreciation to our students. They are our inspiration, and we wrote this book for them.

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A child watches a film of a woman repeatedly kicking and hitting a "Bobo" doll, one of those blow-up clowns that pop back up after being knocked down. The woman not only punches the doll, but she also absolutely batters it, flinging it up into the air and even pouncing on it to thrash it as much as she can. After watching her, the child, alone in the room with the Bobo doll, jumps up, whacks the doll around, and abuses it in precise imitation of the adult in the film. Another child watches a different film of the same woman in the same room with the same toys, including the Bobo doll, but in this film the woman sits passively, ignoring the inflatable doll. At the end of the film, this second child exhibits a similar passive behavior, quite different from the full-blown aggression demonstrated by the first child.

Media violence has been a research concern for over 50 years (see MacCoby, 1954) and continues to be a concern of researchers, parents, and politicians. Children spend thousands of hours in front of the television; it has been estimated that by age 18 the average young person has viewed over 200,000 acts of TV violence (American Academy of Pediatrics, 1995). Around 40 years ago, Albert Bandura and Richard Walters (1963) wrote a fascinating book exploring how people learn a repertoire of behaviors through watching and imitating others. One of their research projects, described in the opening vignette, was a study of how children's aggressive behavior can be shaped by watching aggressive models on film. The design of their experiment was relatively simple. One group of children was shown the film described previously of an adult model hitting and kicking a Bobo doll; another group was shown a film of the passive model; and still another group, the control group, was shown no film. When left alone in the room with the inflatable doll and other toys, the children who had seen the violent film

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