

Research Methods and Statistics in Psychology

Second edition

Research Methods and Statistics in Psychology provides a seamless introduction to statistics and research in psychology, identifying various research areas and analyzing how one can approach them statistically. The text provides a solid empirical foundation for undergraduate Psychology majors, and it prepares the reader to think critically and evaluate psychological research and claims they might hear in the news or popular press. This second edition features updated examples of research and new illustrations of important principles. It also includes updated coverage of ethical issues in research and of current diversity issues.

Bernard C. Beins is a professor of Psychology at Ithaca College. He received the Charles Brewer Excellence in Teaching Award from the American Psychological Foundation of APA. He has authored, co-authored, or co-edited 17 traditional and electronic books on research, critical thinking, and pedagogy; 50 peer-reviewed articles and book chapters; over 275 presentations; and overseen over 100 student presentations. He is a Fellow of the Association for Psychological Science; American Psychological Association Divisions 1 (Society for General Psychology), 2 (Society for the Teaching of Psychology), 3 (Society for Experimental and Cognitive Science), and 52 (International Psychology); and the Eastern Psychological Association and the New England Psychological Association.

Maureen A. McCarthy is dean of the College of Sciences and Humanities and professor of Psychological Science at Ball State University. She is a fellow of the Association for Psychological Science, the American Psychological Association (Division 2), and the Eastern Psychological Association. She has authored more than 50 publications including refereed journal articles, book chapters, edited books, policy documents, and books.

Research Methods and Statistics in Psychology

Second edition

BERNARD C. BEINS

Ithaca College, New York

MAUREEN A. McCARTHY

Ball State University, Indiana

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom
One Liberty Plaza, 20th Floor, New York, NY 10006, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
314-321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi - 110025, India
79 Anson Road, #06-04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781108436243

DOI: 10.1017/9781108399555

First edition © Pearson Education, Inc., 2012

First edition © Cambridge University Press 2018

Second edition © Cambridge University Press 2019

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First edition 2012

First edition reissued by Cambridge University Press 2018

Second edition 2019

A catalogue record for this publication is available from the British Library

ISBN 978-1-108-42311-3 Hardback

ISBN 978-1-108-43624-3 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

For my parents, Dennis and Mary Ann McCarthy.

— M.A.M.

For Linda, Agatha, Simon, Evie, and Julian, who are significant in so many ways.

— B.C.B.

Brief Contents

Preface	xv
Part I Understanding Research	1
1 Psychology, Science, and Life	3
2 Ethics in Research	37
3 Planning Research: Generating a Research Question	65
4 Practical Issues in Planning Your Research	99
Part II Basic Experimental Research and Data Analysis	131
5 Organizing Data with Descriptive Statistics	133
6 Conducting an Experiment: General Principles	157
7 Experimental Methods	177
8 Basic Inferential Statistics	197
9 Looking for Differences Between Two Treatments	225
Part III Advanced Research and Data Analysis	251
10 Looking for Differences among Multiple Treatments	253
11 Multiple Independent Variables: Factorial Designs	285
Part IV Nonexperimental Research Designs	307
12 Principles of Survey Research	309
13 Correlation, Regression, and Non-Parametric Tests	337
Part V Culture and Research	365
14 People Are Different: Considering Cultural and Individual Differences in Research	367
Appendix A: Writing a Research Report	399
Appendix B: Statistics Review	419
Appendix C: Statistical Tables	445
References	457
Author Index	495
Subject Index	507

Contents

Preface	xv
Part I Understanding Research	1
1 Psychology, Science, and Life	3
Learning Objectives	3
Key Terms	3
1.1 Chapter Preview	3
1.2 Why Are Research Methods Important Tools for Life?	4
1.3 Why We Do Research	8
1.4 What Should You Believe?	14
1.5 Characteristics of Science	15
1.6 Culture and Research	21
1.7 The Interaction of Science and Society	22
1.8 Scientific Literacy	25
1.9 Controversy: The Myth of Vaccination and Autism Continues	30
1.10 Chapter Summary	31
Chapter Review Questions	33
Answers to Chapter Review Questions	35
2 Ethics in Research	37
Learning Objectives	37
Key Terms	38
2.1 Chapter Preview	38
2.2 Unethical Research Practices: Past and Present	39
2.3 Ethical Guidelines Created by the American Psychological Association	44
2.4 Legal Requirements and Ethics in Research	48
2.5 The Importance of Social Context in Deciding on Ethics in Research	49
2.6 What You Need to Do if Your Research Involves Deception	51
2.7 The Controversy about Deception	53
2.8 Ethical Issues in Special Circumstances	55
2.9 Chapter Summary	59
Chapter Review Questions	59
Answers to Chapter Review Questions	63
3 Planning Research: Generating a Research Question	65
Learning Objectives	65
Key Terms	65
3.1 Chapter Preview	65
3.2 Where Research Ideas Begin: Everyday Observations and Systematic Research	66

x Contents

3.3	How Can You Develop Research Ideas?	71
3.4	The Virtual Laboratory: Research on the Internet	75
3.5	Checking on Research: The Role of Replication	83
3.6	Don't Reinvent the Wheel: Reviewing the Literature	85
3.7	How to Conduct a Literature Review	86
3.8	How to Read a Journal Article	90
3.9	Chapter Summary	94
	Chapter Review Questions	94
	Answers to Chapter Review Questions	97
4	Practical Issues in Planning Your Research	99
	Learning Objectives	99
	Key Terms	99
4.1	Chapter Preview	99
4.2	Psychological Concepts	100
4.3	Defining and Measuring Variables	103
4.4	Choosing Your Participants or Subjects	115
4.5	Research Applied to Life: Can Animal Research Help Us Understand Human Stress?	118
4.6	Probability Sampling	119
4.7	Nonprobability Sampling	122
4.8	Chapter Summary	125
	Chapter Review Questions	126
	Answers to Chapter Review Questions	129
	Part II Basic Experimental Research and Data Analysis	131
5	Organizing Data with Descriptive Statistics	133
	Learning Objectives	133
	Key Terms	133
5.1	Chapter Preview	134
5.2	Using Statistics to Describe Results	134
5.3	Descriptive Statistics	135
5.4	Chapter Summary	151
	Chapter Review Questions	152
	Answers to Chapter Review Questions	153
	Symbols and Formulas for Chapter 5	155
6	Conducting an Experiment: General Principles	157
	Learning Objectives	157
	Key Terms	157
6.1	Chapter Preview	157
6.2	Choosing a Methodology: The Practicalities of Research	158
6.3	Determining the Causes of Behavior	159
6.4	The Logic of Experimental Manipulation	161
6.5	Research Applied to Life: Withholding Treatment in Medical Research	162

6.6	Experimental Control: Or What Can Go Wrong	163
6.7	Lack of Control in Experimental Research: Extraneous Variable and Confounds	164
6.8	Experimenter and Participant Effects	167
6.9	Minimizing the Likelihood of Experimenter and Participant Effects	168
6.10	The Hawthorne Effect	169
6.11	Research Applied to Life: Drug-Sniffing Dogs	171
6.12	Realism in Research	172
6.13	Chapter Summary	172
	Chapter Review Questions	173
	Answers to Chapter Review Questions	175
7	Experimental Methods	177
	Learning Objectives	177
	Key Terms	177
7.1	Chapter Preview	177
7.2	Independent and Dependent Variables	178
7.3	Research with Multiple Independent Variables	183
7.4	A 2×2 Factorial Design with Repeated Measures	186
7.5	Research Applied to Life: Cell Phones, Alcohol, and Driving	191
7.6	Chapter Summary	192
	Chapter Review Questions	192
	Answers to Chapter Review Questions	195
8	Basic Inferential Statistics	197
	Learning Objectives	197
	Key Terms	197
8.1	Chapter Preview	198
8.2	Probability	198
8.3	Hypothesis Testing	199
8.4	Chapter Summary	221
	Chapter Review Questions	221
	Answers to Chapter Review Questions	222
	Formulas for Chapter 8	223
9	Looking for Differences Between Two Treatments	225
	Learning Objectives	225
	Key Terms	225
9.1	Chapter Preview	226
9.2	Statistical Testing for Two Independent Groups	226
9.3	Statistical Testing for Related and Repeated Measures	236
9.4	Chapter Summary	246
	Chapter Review Questions	247
	Answers to Chapter Review Questions	248
	Formulas for Chapter 9	249

xii Contents

Part III Advanced Research and Data Analysis	251
10 Looking for Differences among Multiple Treatments	253
Learning Objectives	253
Key Terms	253
10.1 Chapter Preview	253
10.2 Statistical Testing for Multiple Treatments	254
10.3 Statistical Testing for Multiple Groups	255
10.4 Statistical Testing for Repeated Measures	269
10.5 Chapter Summary	276
Chapter Review Questions	277
Answers to Chapter Review Questions	279
Formulas for Chapter 10	281
11 Multiple Independent Variables: Factorial Designs	285
Learning Objectives	285
Key Terms	285
11.1 Chapter Preview	285
11.2 Factorial ANOVA	286
11.3 Calculating the Factorial ANOVA	289
11.4 Chapter Summary	303
Chapter Review Questions	304
Answers to Chapter Review Questions	304
Formulas for Chapter 11	305
Part IV Nonexperimental Research Designs	307
12 Principles of Survey Research	309
Learning Objectives	309
Key Terms	310
12.1 Chapter Preview	310
12.2 Surveys: Answering Diverse Questions	310
12.3 Ethics in Survey Research	312
12.4 Selecting Your Methodology	313
12.5 Research Applied to Life: How Many Adolescents Smoke?	321
12.6 Culture and Response Styles	326
12.7 Studying Sensitive Issues	328
12.8 Crowdsourcing in Research	329
12.9 Sampling Issues	329
12.10 Chapter Summary	332
Chapter Review Questions	332
Answers to Chapter Review Questions	335
13 Correlation, Regression, and Non-Parametric Tests	337
Learning Objectives	337
Key Terms	337

13.1	Chapter Preview	337
13.2	Correlation Studies	338
13.3	Correlation Analysis	339
13.4	Regression	348
13.5	Chi-Square Goodness-of-Fit	352
13.6	Chi-Square Test of Independence	355
13.7	Chapter Summary	359
	Chapter Review Questions	360
	Answers to Chapter Review Questions	361
	Formulas for Chapter 13	363
Part V Culture and Research		365
14	People Are Different: Considering Cultural and Individual Differences in Research	367
	Learning Objectives	367
	Key Terms	368
14.1	Chapter Preview	368
14.2	Different Cultural Perspectives	369
14.3	Defining an Individual's Culture, Ethnicity, and Race	371
14.4	Cross-Cultural Concepts in Psychology	376
14.5	Is There a Biological Basis for Race?	378
14.6	Practical Issues in Cultural Research	381
14.7	Why the Concepts of Culture and Ethnicity Are Essential in Research	382
14.8	Cultural Factors in Mental Health Research	385
14.9	Sex and Gender: Do Men and Women Come from Different Cultures?	390
14.10	Research Applied to Life: Are Men Better than Women at Mathematics?	392
14.11	Chapter Summary	393
	Chapter Review Questions	393
	Answers to Chapter Review Questions	396
	Appendix A: Writing a Research Report	399
	Appendix B: Statistics Review	419
	Appendix C: Statistical Tables	445
	References	457
	Author Index	495
	Subject Index	507

Preface

Students who are curious and who like solving puzzles are ideal candidates for a course in research methods and statistics. We developed this book to meet the needs of students who are learning to investigate human behavior. We assume that you have already completed one course in psychology and have developed an interest in the discipline, so you are ready to apply your knowledge to ask questions about behavior. Throughout this book, we tried to show how research methods and statistics can be used to help us understand people. We worked to create a book that will help you understand that psychologists focus on questions about what people do and why they do it.

Psychologists have also used research to help us understand and predict behavior. Courses in statistics and research methods will give you the tools to conduct research yourself. Any study you conduct could add to our knowledge of what people are like, how they behave, and what you might predict about them in the future. You can use the tools that you will learn to conduct your own research into human behavior. At the end of your research project, you will have discovered something that nobody else in the world knows; you have created knowledge that helps us advance, one step at a time, what we know about people.

Throughout the book, we have tried to make our writing as clear and accessible as possible. There are technical terms that you need to learn, but we strove to minimize wording that would distract you from the essential points that you need to understand. This book is designed to help you build your skill set. First, we introduce basic tools for understanding research, then we demonstrate how to use these tools. At each step along the way we introduce new tools, so that by the end of the text you will understand the entire process of planning a research project, conducting the project, and drawing conclusions.

We also provide guidance for writing research reports. Psychologists typically use the style of the American Psychological Association (APA) to write reports. There are a lot of details, so we have outlined them in a way that will allow you to create a report that conforms to APA style. We have also included ways that you can enhance a poster presentation of your work.

Your course in statistics and psychological research will let you develop skills needed to conduct research projects yourself. But even if you don't engage in research, this course will help you learn to evaluate information to determine if it is credible. This is one of the most important aspects of becoming scientifically literate and becoming an effective contributor to society, which increasingly relies on scientific knowledge. Scientific awareness is important because, with newly developed artificial intelligence applications, a computer can gather information and summarize it more quickly than a person can. But the computer can't evaluate the validity of claims that are made. That is something that you need to do. Understanding research can aid you in evaluating claims that people make.

Ultimately, knowledge about how we use statistics and understand research helps us live better lives through understanding human behavior. The purpose of this book is to show you how scientists apply statistics to research that has helped us to discover why we think, act, and behave as we do. Beyond this, it is as important to be able to recognize good arguments based on statistics and research and to reject invalid claims that do not use scientific methods. With this knowledge, you will be able to make better decisions as you move through life.

Advantages to this Book

There are several advantages to using this book. We hope the format of the chapters and the varied features both enhance the learning of statistical and research techniques and foster an appreciation of why research is important. The features include the following:

- Clear and engaging writing style that will capture the reader's interest.
- Presentation of important concepts without reliance on excess technical jargon.
- A chapter focusing specifically on diversity and its importance in understanding behavior.
- Presentation of research that involves diversity in sampling, going beyond the typical American undergraduate groups.
- Demonstrations of the wide range of methods that psychological scientists use to address varied research questions.
- Interesting examples that relate to the lives that people lead.
- Discussions that show how laboratory studies are important to everyday life.
- Explanations of research that has an impact on important societal issues.
- Inclusion of end-of-chapter practice quizzes with multiple-choice and short-answer items for each chapter.

Using this Book

This book is intended for students who are newly involved in learning about and conducting research, and applying statistics. Instructors do not need to follow the order of chapters. Students can benefit from the material in the book when the presentation of chapters is changed.

The order of the chapters is such that the first four chapters provide the basic philosophy of research and elements of critical thinking and scientific literacy. After students learn this introductory material, they will have the essential tools to create a research project. The next five chapters provide the basis for understanding and applying elementary statistics with the context of experimental research designs, while the following two chapters cover more advanced research and data analysis techniques. The subsequent two chapters deal with nonexperimental designs and correlational approaches that are valuable in spotting relations among variables even when we cannot draw conclusions about causation.

Finally, we have included a chapter that specifically addresses diversity in psychological research. With the changes in society associated with issues of race, ethnicity, nationality, sex and gender, and so forth, it is important to be aware of the impact of these factors on the people we study.

This text provides comprehensive coverage of research methods and statistical analysis consistent with the undergraduate curriculum in psychology (APA, 2013). This book can be used as the text for a single combined statistics and methods course. Some departments offer a methods course and a statistics course, and this text could be used for both courses, either course, or a combined course.

Supplementary Material

Part of the pedagogical package for this book is an instructor's manual with activities, demonstrations, and data-collection exercises. Data sets for increasing the power of statistical analysis are available to supplement data collected in small classes.

There is also a test bank that contains multiple-choice questions, short-answer questions, and other integrative questions. The items generally focus on understanding concepts rather than simply repeating vocabulary, and they require that students go beyond simple memorization.

The supplementary material also includes PowerPoint files that track the material in the chapters. Some of the material in these files goes beyond what appears in the book so that the instructor can generate useful discussion of actual research projects.