Research Methods

SIXTH EDITION

Donald H. McBurney
University of Pittsburgh

Theresa L. White
State University of New York
—Upstate Medical University
Le Moyne College
Contents

1 Psychology and Science 1

Ways of Knowing about Behavior 1
   Nonempirical Methods 2
   Empirical Methods 3
What Is Science? 5
   Characteristics of Science 6
   The Relation Between Science and Nonscience 9
Working Assumptions of Science 9
   The Reality of the World 9
   Rationality 10
   Regularity 10
   Discoverability 11
   Causality 11
The Goals of Science 12
   The Discovery of Regularities 12
   The Development of Theories 16
   The Role of Theories 18
   Hypotheses in Science 20
   The Nature of Scientific Progress 20
   A Note on Psychology and Science 21
Summary 22
Suggestions for Further Reading 23
A Case in Point 24
Reading Between the Lines 27
Exercises 29

2 Developing a Research Question 30

Choice of a Problem 30
The Literature Review 31
5 Variables 118

Types of Variables 119
- Dependent and Independent Variables 119
- Confounded Variables 120
- Quantitative and Categorical Variables 121
  - Continuous and Discrete Variables 121

Measurement 122
- What Is Measurement? 122
- Types of Measurement Scales 123
- Comparison of the Scales 125
- Measurement and Statistics? 127

Reliability and Validity of Measurements 128
- Variability and Error 128
- Validity of Measurements 129

Nuts and Bolts 131

Summary 133

Suggestions for Further Reading 135

A Case in Point 135

Reading Between the Lines 135

Exercises 137

6 Tabular and Graphical Description of Data 140

Tables and Graphs of Frequency Data of One Variable 141
- Frequency Tables 141
- Frequency Distributions 142
- Cumulative Frequency Distributions 144
- Percentiles 144

Tables and Graphs That Show the Relationship Between Two Variables 145
- Scattergrams 146
- Tables with One Independent and One Dependent Variable 147
- Graphs of Functions (Line Graphs) 148
- Bar Graphs 148

Relation Between Frequency Distributions and Other Graphs 149

Time-Series Graphs 152
7 Validity 169

Types of Validity 169
   Internal Validity 170
   Construct Validity 171
   External Validity 172
   Statistical Validity 173

Threats to Validity 173
   Threats to Internal Validity 173
   Threats to Construct Validity 176
   Threats to External Validity 177

Threats to Statistical Validity 179
   Summary Note on Validity 179

Nuts and Bolts 179
Summary 182
Suggestions for Further Reading 183
A Case in Point 183
Reading Between the Lines 185
Exercises 186

8 Control 189

The Concept of Control 189
   Control Provides a Standard of Comparison 190
   Control Reduces Variability 191

General Strategies 192
   Control in the Laboratory 192
   The Research Setting as a Preparation 193
   Instrumentation of the Response as Control 194

Specific Strategies 194
   Subject as Own Control (Within-Subjects Control) 194
   Random Assignment 196
   Matching 198
9 Nonexperimental Research, Part 1: Observational, Archival, and Case-Study Research 214

The Hermeneutic Approach 216
Observational Research 216
   Naturalistic Observation 217
   Participant-Observer Research 221
Archival Research 223
Case Studies 224
Theory Development and Testing in Observational and Archival Research 225
Nuts and Bolts 227
Summary 231
Suggestions for Further Reading 232
A Case in Point 232
Reading Between the Lines 235
Exercises 237

10 Nonexperimental Research, Part 2: Survey Research 238

How a Questionnaire Is Designed 238
   Determine the Purpose of the Questionnaire 239
Determine the Types of Questions 239
   Write the Items 240
   Determine How the Data Will Be Analyzed 244
Administering the Questionnaire 244
   Determine the Method of Administration 244
   The Problem of Response Rate 246
Sampling 247
   Types of Samples 247
   Probability Samples and Random Selection 248
   Summary of Sampling Procedures 253
Nuts and Bolts 254
Summary 256
11 True Experiments, Part 1: Single-Factor Designs 265

True Experiments 265
Factors, Levels, Conditions, and Treatments 266
Some Designs to Avoid 266
   The One-Group Posttest-Only Design 267
   The Posttest-Only Design with Nonequivalent Control Groups 267
   The One-Group Pretest-Posttest Design 268
The Basic Elements of a Valid Experimental Design 269
Within-Subjects Designs 270
   Controlling for Order and Sequence Effects 270
   Two Conditions, Tested Within Subjects 274
   Multiple Conditions, Tested Within Subjects 275
Between-Subjects Designs 277
   Two Conditions, Tested Between Subjects 277
   Multiple Conditions, Tested Between Subjects 277
Summary 279
Suggestions for Further Reading 280
A Case in Point 280
Reading Between the Lines 282
Exercises 284

12 True Experiments, Part 2: Factorial Designs 286

A Simple Factorial Design 288
Main Effects 289
Interactions 290
   Interactions When There Is No Main Effect 291
   Types of Interactions 294
Within-Subjects, Between-Subjects, and Mixed Designs 294
   Advantages of Within-Subjects Designs 299
   Control in Within-Subjects Factorial Experiments 299
Some Representative Factorial Designs 300
   Factorial, Within-Subjects 300
   Factorial, Between-Subjects 301
   A Mixed Factorial Design 301
Summary 302
Suggestions for Further Reading 303
A Case in Point 303
13 Single-Participant Experiments 309

Advantages of the Single-Participant Approach 310

- Focusing on Individual Performance 311
- Focusing on Big Effects 312
- Avoiding Ethical and Practical Problems 313
- Flexibility in Design 313

Disadvantages of the Single-Participant Approach 313

Basic Control Strategies in Single-Participant Research 314

- Obtaining a Stable Baseline 314
- Comparison (AB Design) 315
- Withdrawal of Treatment (ABA Designs) 315
- Repeating Treatments (ABAB Designs) 315
- Changing Only One Variable at a Time 318
- Using Multiple Baselines 319
- Employing a Changing Criterion 321
- Two Examples from Psychophysics 321

Summary 324
Suggestions for Further Reading 325
A Case in Point 326
Reading Between the Lines 326
Exercises 328

14 Quasi Experiments 330

The Principal Difference Between Quasi Experiments and True Experiments 330

- Other Features of Quasi Experiments 332
- Which Is the Best Research Method? 332

Nonequivalent Control Group Designs 333

- Mixed Factorial Design with One Nonmanipulated Variable 336

Designs Without Control Groups 336

- Interrupted Time-Series Designs 337
- Repeated-Treatment Designs 340

Designs to Test Developmental Changes 341

Program Evaluation 345

- Sources of Resistance to Program Evaluations 346
- Steps in Planning an Evaluation 347
- Two Examples of Program Evaluation 349

Nuts and Bolts 350
Summary 353
Suggestions for Further Reading 354
A Case in Point 355
| Contents |
|-----------------|-----------------|
| **Reading Between the Lines** | **357** |
| **Exercises** | **359** |
| **Epilogue** | **361** |
| **Biases and Limitations of Experimental Psychology** |
| **Biases** | **362** |
| **Science as Conservative** | **362** |
| **Science as Liberal** | **364** |
| **Limitations of Science** | **365** |
| **Essential Limitations** | **366** |
| **Practical Limitations** | **368** |
| **The Responsibilities of the Scientist** | **368** |
| **Summary Note on Biases and Limitations of Science** | **369** |
| **Summary** | **370** |
| **Suggestions for Further Reading** | **371** |
| **Reading Between the Lines** | **371** |
| **Exercises** | **372** |
| **Appendix A** | **373** |
| **Review of Statistics** |
| **Some Basic Terms** | **373** |
| **Descriptive Statistics** | **374** |
| **Measures of Central Tendency** | **374** |
| **Measures of Variability** | **377** |
| **Correlation and Regression** | **380** |
| **Inferential Statistics** | **385** |
| **Sampling Distributions** | **385** |
| **Testing Hypotheses** | **387** |
| **Dealing with Uncertainty in Hypothesis Testing** | **389** |
| **The Significance of Significance** | **392** |
| **Effect Size** | **393** |
| **Analysis of Variance** | **394** |
| **Exercises** | **401** |
| **Appendix B** | **406** |
| **Random-Number Table** |
| **Appendix C** | **408** |
| **Population Data Set** |
| **Appendix D** | **410** |
| **Suggested Answers to “Reading Between the Lines”** |
| **Appendix E** | **417** |
| **Key for Identifying Appropriate Graphs and Statistics** |
| **References** | **421** |
| **Indexes** | **429** |