

# CONTENTS

## CHAPTER 1

### Scientific Thinking in Psychology 1

Why Take This Course?	3
Ways of Knowing	6
Authority	6
Use of Reason	6
Experience	7
The Ways of Knowing and Science	9
Science as a Way of Knowing	10
Science Assumes Determinism	10
Science Makes Systematic Observations	11
Science Produces Public Knowledge	12
Box 1.1 <i>ORIGINS—A Taste of Introspection</i>	13
Science Produces Data-Based Conclusions	14
Science Produces Tentative Conclusions	16
Science Asks Answerable Questions	17
Science Develops Theories That Can Be Disproven	18
Psychological Science and Pseudoscience	20
Recognizing Pseudoscience	21
Associates with True Science	21

<b>Box 1.2 CLASSIC STUDIES—Disproving Phrenology</b>	<b>23</b>
Relies on Anecdotal Evidence	25
Sidesteps Disproof	26
Reduces Complex Phenomena to Overly Simplistic Concepts	27
<b>The Goals of Research in Psychology</b>	<b>27</b>
Description	27
Prediction	28
Explanation	28
Application	29
<b>A Passion for Research in Psychology (Part I)</b>	<b>29</b>
Eleanor Gibson (1910–2002)	30
B. F. Skinner (1904–1990)	32

## CHAPTER 2

### Ethics in Psychological Research 39

Developing the APA Code of Ethics	40
<b>Box 2.1 CLASSIC STUDIES—Infants at Risk</b>	<b>41</b>
<b>Ethical Guidelines for Research with Humans</b>	<b>46</b>
Judging Benefits and Costs: The IRB	46
Informed Consent and Deception in Research	50
<b>Box 2.2 ETHICS—Historical Problems with Informed Consent</b>	<b>56</b>
Informed Consent and Special Populations	58
Treating Participants Well	60
Research Ethics and the Internet	63
<b>Ethical Guidelines for Research with Animals</b>	<b>64</b>
The Issue of Animal Rights	65
<b>Box 2.3 ORIGINS—Antivivisection and the APA</b>	<b>66</b>
Using Animals in Psychological Research	67
The APA Code for Animal Research	69
Justifying the Study	70
Caring for the Animals	70
Using Animals for Educational Purposes	71
<b>Scientific Fraud</b>	<b>71</b>
Data Falsification	72

**CHAPTER 3****Developing Ideas for Research in Psychology 81**

Varieties of Psychological Research	82
Basic versus Applied Research	82
The Setting: Laboratory versus Field Research	85
Box 3.1 <i>ETHICS—A Matter of Privacy</i>	88
Quantitative versus Qualitative Research	89
Asking Empirical Questions	90
Operational Definitions	90
Developing Research from Observations of Behavior and Serendipity	92
Box 3.2 <i>ORIGINS—Serendipity and Edge Detectors</i>	94
Developing Research from Theory	95
The Nature of Theory	95
The Relationship Between Theory and Data	97
Attributes of Good Theories	100
Falsification	100
Box 3.3 <i>CLASSIC STUDIES—Falsification and Der Kluge Hans</i>	101
Parsimony	103
Misunderstandings about Theories	104
Developing Research from Other Research	105
Research Teams and the “What’s Next?” Question	106
Replication and Extension	108
Creative Thinking in Science	109
Reviewing the Literature	112
Computerized Database Searches	112
Search Tips	114

**CHAPTER 4****Measurement and Data Analysis 123**

What to Measure—Varieties of Behavior	124
Developing Measures from Constructs	125
Box 4.1 <i>ORIGINS—Reaction Time: From Mental Chronometry to Mental Rotation</i>	128

<b>Evaluating Measures</b>	<b>130</b>
Reliability	130
Validity	131
Reliability and Validity	134
<b>Scales of Measurement</b>	<b>135</b>
Nominal Scales	135
Ordinal Scales	137
Interval Scales	137
<b>Box 4.2 CLASSIC STUDIES—Measuring Somatotypes on an Interval Scale: Hoping for 4-4-4</b>	<b>138</b>
Ratio Scales	139
<b>Statistical Analysis</b>	<b>140</b>
Descriptive and Inferential Statistics	141
Descriptive Statistics	141
<b>Box 4.3 ETHICS—Lying with Statistics</b>	<b>149</b>
Inferential Statistics	151
Hypothesis Testing	153
Type I and Type II Errors	154
Inferential Analysis	156
Interpreting Failures to Reject $H_0$	156
Going Beyond Hypothesis Testing	157
Effect Size	158
Confidence Intervals	159
Power	160

## CHAPTER 5

<b>Introduction to Experimental Research</b>	<b>167</b>
Essential Features of Experimental Research	169
<b>Box 5.1 ORIGINS—John Stuart Mill and the Rules of Inductive Logic</b>	<b>169</b>
Establishing Independent Variables	171
Varieties of Independent Variables	171
Control Groups	172
Controlling Extraneous Variables	174
Measuring Dependent Variables	176
<b>Manipulated versus Subject Variables</b>	<b>177</b>
Drawing Conclusions When Using Subject Variables	180

Box 5.2 <i>CLASSIC STUDIES—Bobo Dolls and Aggression</i>	182	
<b>The Validity of Experimental Research</b>		<b>184</b>
Statistical Conclusion Validity	184	
Construct Validity	185	
External Validity	186	
Other Populations	186	
Box 5.3 <i>ETHICS—Recruiting Participants: Everyone's in the Pool</i>	187	
Other Environments	189	
Other Times	190	
A Note of Caution	190	
Internal Validity	191	
<b>Threats to Internal Validity</b>		<b>192</b>
Studies Extending over a Period of Time		192
History and Maturation	193	
Regression	194	
Testing and Instrumentation		195
Participant Problems	196	
Subject Selection Effects	196	
Attrition	197	
<b>CHAPTER 6</b>		
<b>Control Problems in Experimental Research</b>		<b>205</b>
Between-Subjects Designs	207	
The Problem of Creating Equivalent Groups		208
Random Assignment	208	
Matching	210	
Within-Subjects Designs	213	
The Problem of Controlling Sequence Effects		217
Testing Once Per Condition	217	
Complete Counterbalancing	218	
Partial Counterbalancing	218	
Testing More Than Once per Condition		219
Reverse Counterbalancing	221	
Block Randomization	221	
<b>Control Problems in Developmental Research</b>		<b>224</b>

Box 6.1 <i>CLASSIC STUDIES—The Record for Repeated Measures</i>	226
<b>Problems with Biasing</b>	<b>227</b>
Experimenter Bias	228
Controlling for Experimenter Bias	229
Participant Bias	231
Box 6.2 <i>ORIGINS—Productivity at Western Electric</i>	232
Controlling for Participant Bias	234
Box 6.3 <i>ETHICS—Research Participants Have Responsibilities Too</i>	236

## CHAPTER 7

### Experimental Design I: Single-Factor Designs 241

Single Factor—Two Levels	243
Between-Subjects, Single-Factor Designs	244
Within-Subjects, Single-Factor Designs	247
Box 7.1 <i>CLASSIC STUDIES—Psychology's Most Widely Replicated Finding?</i>	248
Analyzing Single-Factor, Two-Level Designs	252
Single Factor—More Than Two Levels	253
Between-Subjects, Multilevel Designs	254
Box 7.2 <i>ORIGINS—Nonlinear Results: The Ebbinghaus Forgetting Curve</i>	255
Within-Subjects, Multilevel Designs	259
Presenting the Data	260
Types of Graphs	261
Analyzing Single-Factor, Multilevel Designs	263
Control Group Designs	267
Placebo Control Groups	267
Waiting List Control Groups	268
Box 7.3 <i>ETHICS—Who's in the Control Group?</i>	269
Yoked Control Groups	272

## CHAPTER 8

### Experimental Design II: Factorial Designs 281

Factorial Essentials	282
Identifying Factorial Designs	283

<b>Outcomes—Main Effects and Interactions</b>	<b>284</b>
Main Effects	284
Interactions	288
Interactions Sometimes Trump Main Effects	292
Combinations of Main Effects and Interactions	293
Box 8.1 <i>CLASSIC STUDIES—To Sleep, Perchance to Recall</i>	297
<b>Varieties of Factorial Designs</b>	<b>300</b>
Mixed Factorial Designs	301
Factorials with Subject and Manipulated Variables: $P \times E$ Designs	304
Recruiting Participants for Factorial Designs	311
Analyzing Factorial Designs	311
Box 8.2 <i>ETHICS—On Being a Competent and Ethical Researcher</i>	313
Box 8.3 <i>ORIGINS—Factorials Down on the Farm</i>	317

## CHAPTER 9

### Correlational Research 325

Psychology's Two Disciplines	326
Box 9.1 <i>ORIGINS—Galton's Studies of Genius</i>	327
<b>Correlation and Regression—The Basics</b>	<b>329</b>
Positive and Negative Correlations	329
Scatterplots	331
Assuming Linearity	332
Restricting the Range	334
Coefficient of Determination— $r^2$	335
Regression Analysis—Making Predictions	336
<b>Interpreting Correlations</b>	<b>339</b>
Correlations and Causality	339
Directionality	339
Third Variables	342
Caution: Correlational Statistics versus Correlational Research	344
<b>Using Correlations</b>	<b>346</b>
The Need for Correlational Research	346
Varieties of Correlational Research	347

Box 9.2 <i>ETHICS—APA Guidelines for Psychological Testing</i>	348	
Box 9.3 <i>CLASSIC STUDIES—The Achieving Society</i>		351
<b>Multivariate Analysis</b>	<b>353</b>	
Multiple Regression	354	
Factor Analysis	355	

## CHAPTER 10

### Quasi-Experimental Designs and Applied Research 363

Beyond the Laboratory	365	
Applied Psychology in Historical Context		367
Box 10.1 <i>CLASSIC STUDIES—The Hollingworths, Applied Psychology, and Coca-Cola</i>	369	
Design Problems in Applied Research		370
<b>Quasi-Experimental Designs</b>	<b>371</b>	
Nonequivalent Control Group Designs		372
Outcomes	373	
Regression and Matching	375	
Interrupted Time Series Designs		381
Outcomes	381	
Variations on the Basic Time Series Design		384
Research Using Archival Data		386
<b>Program Evaluation</b>	<b>390</b>	
Box 10.2 <i>ORIGINS—Reforms as Experiments</i>		390
Planning for Programs—Needs Analysis		392
Monitoring Programs—Formative Evaluation		395
Evaluating Outcomes—Summative Evaluation		395
Weighing Costs—Cost-Effectiveness Analysis		397
A Note on Qualitative Analysis		399
Box 10.3 <i>ETHICS—Evaluation Research and Ethics</i>		400

## CHAPTER 11

### Small *N* Designs 407

Research in Psychology Began with Small <i>N</i>	408
Box 11.1 <i>ORIGINS—Cats in Puzzle Boxes</i>	411
Reasons for Small <i>N</i> Designs	413



Misleading Results from Statistical Summaries of Grouped Data	413
Practical Problems with Large <i>N</i> Designs	416
<b>The Experimental Analysis of Behavior</b>	<b>416</b>
Operant Conditioning	417
Applied Behavior Analysis	421
Box 11.2 <i>ETHICS—Controlling Human Behavior</i>	422
<b>Small <i>N</i> Designs in Applied Behavior Analysis</b>	<b>425</b>
Elements of Single-Subject Designs	425
Withdrawal Designs	426
Multiple Baseline Designs	428
Changing Criterion Designs	435
Other Designs	436
Evaluating Single-Subject Designs	438
Case Study Designs	440
Box 11.3 <i>CLASSIC STUDIES—The Mind of a Mnemonist</i>	442
Evaluating Case Studies	443

## CHAPTER 12

### Observational and Survey Research Methods 451

<b>Observational Research</b>	<b>452</b>
Varieties of Observational Research	452
Naturalistic Observation	453
Participant Observation	454
Box 12.1 <i>CLASSIC STUDIES—When Prophecy Fails</i>	455
Challenges Facing Observational Methods	457
Absence of Control	457
Observer Bias	458
Participant Reactivity	459
Ethics	459
<b>Survey Research</b>	<b>463</b>
Box 12.2 <i>ORIGINS—Creating the "Questionary"</i>	464
Probability Sampling	466
Random Sampling	468
Stratified Sampling	470
Cluster Sampling	470

Varieties of Survey Methods	471	
Interviews	471	
Phone Surveys	472	
Electronic Surveys	473	
Written Surveys	474	
Creating an Effective Survey	475	
Types of Survey Questions or Statements		475
Assessing Memory and Knowledge		478
Adding Demographic Information		478
A Key Problem: Survey Wording		479
Surveys and Ethics		481
Box 12.3 <i>ETHICS—Using and Abusing Surveys</i>		482

## EPILOGUE

What I Learned in My Research Methods Course	491
A Passion for Research in Psychology (Part II)	494
Elliot Aronson	494
Elizabeth Loftus	496

## APPENDIX A

### Communicating the Results of Research in Psychology 499

Research Reports, APA Style	499
General Guidelines	500
Writing Style	500
Reducing Bias in Language	501
Avoiding Plagiarism	504
Miscellaneous	505
Main Selections of the Lab Report	506
Title Page	506
The Manuscript Page Header/Page Number	506
Running Head	506
Title/Author/Affiliation	507
Abstract	508
Introduction	509
APA Citation Format	509
Method	510

Results	510	
Reporting the Data: Statistics	511	
Portraying the Data: Tables and Figures		511
Discussion	512	
References	513	
<b>Presentations and Posters</b>	<b>514</b>	
Tips for Presenting a Paper	514	
Tips for Presenting a Poster	515	

## **APPENDIX B**

### **The Ethics Code of the American Psychological Association 533**

The APA Ethics Code for Research with Human Participants	533
--	-----

## **APPENDIX C**

### **Answers to Selected End-of-Chapter Applications Exercises 539**

**GLOSSARY 561**

**REFERENCES 573**

**NAME INDEX 589**

**SUBJECT INDEX 595**