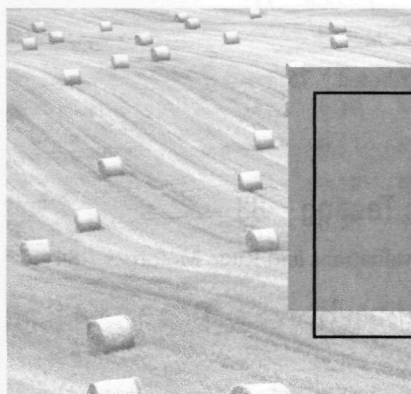


Brief Contents

CHAPTER 1	Basic Concepts	1
CHAPTER 2	Describing and Exploring Data	15
CHAPTER 3	The Normal Distribution	63
CHAPTER 4	Sampling Distributions and Hypothesis Testing	83
CHAPTER 5	Basic Concepts of Probability	107
CHAPTER 6	Categorical Data and Chi-Square	137
CHAPTER 7	Hypothesis Tests Applied to Means	177
CHAPTER 8	Power	229
CHAPTER 9	Correlation and Regression	251
CHAPTER 10	Alternative Correlational Techniques	303
CHAPTER 11	Simple Analysis of Variance	325
CHAPTER 12	Multiple Comparisons Among Treatment Means	369
CHAPTER 13	Factorial Analysis of Variance	411
CHAPTER 14	Repeated-Measures Designs	457
CHAPTER 15	Multiple Regression	507
CHAPTER 16	Analyses of Variance and Covariance as General Linear Models	573
CHAPTER 17	Meta-Analysis and Single-Case Designs	623
CHAPTER 18	Resampling and Nonparametric Approaches to Data	657



Contents

Preface xv

About the Author xix

CHAPTER 1

Basic Concepts 1

- 1.1 Important Terms 2
- 1.2 Descriptive and Inferential Statistics 5
- 1.3 Measurement Scales 6
- 1.4 Using Computers 8
- 1.5 What You Should Know about this Edition 9

CHAPTER 2

Describing and Exploring Data 15

- 2.1 Plotting Data 16
- 2.2 Histograms 18
- 2.3 Fitting Smoothed Lines to Data 21
- 2.4 Stem-and-Leaf Displays 24
- 2.5 Describing Distributions 27
- 2.6 Notation 30
- 2.7 Measures of Central Tendency 32
- 2.8 Measures of Variability 35
- 2.9 Boxplots: Graphical Representations of Dispersions and Extreme Scores 47
- 2.10 Obtaining Measures of Dispersion Using SPSS 51
- 2.11 Percentiles, Quartiles, and Deciles 51
- 2.12 The Effect of Linear Transformations on Data 52

CHAPTER 3**The Normal Distribution 63**

- 3.1 The Normal Distribution 66
- 3.2 The Standard Normal Distribution 69
- 3.3 Using the Tables of the Standard Normal Distribution 71
- 3.4 Setting Probable Limits on an Observation 74
- 3.5 Assessing Whether Data are Normally Distributed 75
- 3.6 Measures Related to z 78

CHAPTER 4**Sampling Distributions and Hypothesis Testing 83**

- 4.1 Two Simple Examples Involving Course Evaluations and Rude Motorists 84
- 4.2 Sampling Distributions 86
- 4.3 Theory of Hypothesis Testing 88
- 4.4 The Null Hypothesis 90
- 4.5 Test Statistics and Their Sampling Distributions 93
- 4.6 Making Decisions About the Null Hypothesis 93
- 4.7 Type I and Type II Errors 94
- 4.8 One- and Two-Tailed Tests 97
- 4.9 What Does it Mean to Reject the Null Hypothesis? 99
- 4.10 An Alternative View of Hypothesis Testing 99
- 4.11 Effect Size 101
- 4.12 A Final Worked Example 102
- 4.13 Back to Course Evaluations and Rude Motorists 103

CHAPTER 5**Basic Concepts of Probability 107**

- 5.1 Probability 108
- 5.2 Basic Terminology and Rules 110
- 5.3 Discrete versus Continuous Variables 114
- 5.4 Probability Distributions for Discrete Variables 115
- 5.5 Probability Distributions for Continuous Variables 115
- 5.6 Permutations and Combinations 117
- 5.7 Bayes' Theorem 120
- 5.8 The Binomial Distribution 124
- 5.9 Using the Binomial Distribution to Test Hypotheses 129
- 5.10 The Multinomial Distribution 131

CHAPTER 6**Categorical Data and Chi-Square 137**

- 6.1 The Chi-Square Distribution 138
- 6.2 The Chi-Square Goodness-of-Fit Test—One-Way Classification 139
- 6.3 Two Classification Variables: Contingency Table Analysis 144

6.4	An Additional Example—A 4×2 Design	148
6.5	Chi-Square for Ordinal Data	152
6.6	Summary of the Assumptions of Chi-Square	153
6.7	Dependent or Repeated Measures	154
6.8	One- and Two-Tailed Tests	156
6.9	Likelihood Ratio Tests	157
6.10	Mantel-Haenszel Statistic	158
6.11	Effect Sizes	160
6.12	Measure of Agreement	166
6.13	Writing up the Results	167

CHAPTER 7

Hypothesis Tests Applied to Means 177

7.1	Sampling Distribution of the Mean	178
7.2	Testing Hypotheses About Means— σ Known	181
7.3	Testing a Sample Mean When σ is Unknown—The One-Sample t Test	183
7.4	Hypothesis Tests Applied to Means—Two Matched Samples	197
7.5	Hypothesis Tests Applied to Means—Two Independent Samples	206
7.6	Heterogeneity of Variance: the Behrens–Fisher Problem	217
7.7	Hypothesis Testing Revisited	220

CHAPTER 8

Power 229

8.1	The Basic Concept of Power	231
8.2	Factors Affecting the Power of a Test	232
8.3	Calculating Power the Traditional Way	234
8.4	Power Calculations for the One-Sample t	236
8.5	Power Calculations for Differences Between Two Independent Means	238
8.6	Power Calculations for Matched-Sample t	241
8.7	Turning the Tables on Power	242
8.8	Power Considerations in More Complex Designs	243
8.9	The Use of G*Power to Simplify Calculations	243
8.10	Retrospective Power	245
8.11	Writing Up the Results of a Power Analysis	247

CHAPTER 9

Correlation and Regression 251

9.1	Scatterplot	253
9.2	The Relationship Between Pace of Life and Heart Disease	255
9.3	The Relationship Between Stress and Health	257
9.4	The Covariance	258
9.5	The Pearson Product-Moment Correlation Coefficient (r)	260

9.6	The Regression Line	261
9.7	Other Ways of Fitting a Line to Data	266
9.8	The Accuracy of Prediction	266
9.9	Assumptions Underlying Regression and Correlation	272
9.10	Confidence Limits on \hat{Y}	274
9.11	A Computer Example Showing the Role of Test-Taking Skills	277
9.12	Hypothesis Testing	280
9.13	One Final Example	288
9.14	The Role of Assumptions in Correlation and Regression	290
9.15	Factors that Affect the Correlation	291
9.16	Power Calculation for Pearson's r	293

CHAPTER 10 **Alternative Correlational Techniques 303**

10.1	Point-Biserial Correlation and Phi: Pearson Correlations by Another Name	304
10.2	Biserial and Tetrachoric Correlation: Non-Pearson Correlation Coefficients	313
10.3	Correlation Coefficients for Ranked Data	313
10.4	Analysis of Contingency Tables with Ordered Data	317
10.5	Kendall's Coefficient of Concordance (W)	320

CHAPTER 11 **Simple Analysis of Variance 325**

11.1	An Example	326
11.2	The Underlying Model	327
11.3	The Logic of the Analysis of Variance	329
11.4	Calculations in the Analysis of Variance	332
11.5	Writing Up the Results	338
11.6	Computer Solutions	339
11.7	Unequal Sample Sizes	341
11.8	Violations of Assumptions	343
11.9	Transformations	346
11.10	Fixed versus Random Models	353
11.11	The Size of an Experimental Effect	353
11.12	Power	357
11.13	Computer Analyses	361

CHAPTER 12 **Multiple Comparisons Among Treatment Means 369**

12.1	Error Rates	370
12.2	Multiple Comparisons in a Simple Experiment on Morphine Tolerance	373
12.3	A Priori Comparisons	376
12.4	Confidence Intervals and Effect Sizes for Contrasts	388

12.5	Reporting Results	391
12.6	Post Hoc Comparisons	391
12.7	Tukey's Test	393
12.8	Which Test?	398
12.9	Computer Solutions	398
12.10	Trend Analysis	401

CHAPTER 13 **Factorial Analysis of Variance 411**

13.1	An Extension of the Eysenck Study	414
13.2	Structural Models and Expected Mean Squares	418
13.3	Interactions	419
13.4	Simple Effects	420
13.5	Analysis of Variance Applied to the Effects of Smoking	423
13.6	Comparisons Among Means	426
13.7	Power Analysis for Factorial Experiments	427
13.8	Alternative Experimental Designs	430
13.9	Measures of Association and Effect Size	437
13.10	Reporting the Results	443
13.11	Unequal Sample Sizes	444
13.12	Higher-Order Factorial Designs	446
13.13	A Computer Example	451

CHAPTER 14 **Repeated-Measures Designs 457**

14.1	The Structural Model	460
14.2	<i>F</i> Ratios	460
14.3	The Covariance Matrix	461
14.4	Analysis of Variance Applied to Relaxation Therapy	462
14.5	Contrasts and Effect Sizes in Repeated Measures Designs	465
14.6	Writing Up the Results	466
14.7	One Between-Subjects Variable and One Within-Subjects Variable	467
14.8	Two Between-Subjects Variables and One Within-Subjects Variable	478
14.9	Two Within-Subjects Variables and One Between-Subjects Variable	484
14.10	Intraclass Correlation	489
14.11	Other Considerations with Repeated Measures Analyses	491
14.12	Mixed Models for Repeated-Measures Designs	492

CHAPTER 15 **Multiple Regression 507**

15.1	Multiple Linear Regression	508
15.2	Using Additional Predictors	519

15.3	Standard Errors and Tests of Regression Coefficients	521
15.4	A Resampling Approach	522
15.5	Residual Variance	524
15.6	Distribution Assumptions	524
15.7	The Multiple Correlation Coefficient	525
15.8	Partial and Semipartial Correlation	527
15.9	Suppressor Variables	531
15.10	Regression Diagnostics	532
15.11	Constructing a Regression Equation	539
15.12	The “Importance” of Individual Variables	543
15.13	Using Approximate Regression Coefficients	545
15.14	Mediating and Moderating Relationships	546
15.15	Logistic Regression	556

CHAPTER 16

Analyses of Variance and Covariance as General Linear Models 573

16.1	The General Linear Model	574
16.2	One-Way Analysis of Variance	577
16.3	Factorial Designs	580
16.4	Analysis of Variance with Unequal Sample Sizes	587
16.5	The One-Way Analysis of Covariance	594
16.6	Computing Effect Sizes in an Analysis of Covariance	604
16.7	Interpreting an Analysis of Covariance	606
16.8	Reporting the Results of an Analysis of Covariance	607
16.9	The Factorial Analysis of Covariance	607
16.10	Using Multiple Covariates	615
16.11	Alternative Experimental Designs	616

CHAPTER 17

Meta-Analysis and Single-Case Designs 623

Meta-Analysis		624
17.1	A Brief Review of Effect Size Measures	625
17.2	An Example—Child and Adolescent Depression	628
17.3	A Second Example—Nicotine Gum and Smoking Cessation	638
Single-Case Designs		641
17.4	Analyses that Examine Standardized Mean Differences	641
17.5	A Case Study of Depression	642
17.6	A Second Approach to a Single-Case Design—Using Piecewise Regression	646

CHAPTER 18	Resampling and Nonparametric Approaches to Data	657
18.1	Bootstrapping as a General Approach	659
18.2	Bootstrapping with One Sample	661
18.3	Bootstrapping Confidence Limits on a Correlation Coefficient	662
18.4	Resampling Tests with Two Paired Samples	665
18.5	Resampling Tests with Two Independent Samples	667
18.6	Wilcoxon's Rank-Sum Test	668
18.7	Wilcoxon's Matched-Pairs Signed-Ranks Test	673
18.8	The Sign Test	677
18.9	Kruskal–Wallis One-Way Analysis of Variance	678
18.10	Friedman's Rank Test for k Correlated Samples	679
	Appendices	685
	References	719
	Answers to Exercises	733
	Index	757
	Glossary of Symbols	771