

Contents

1	Data, models and a little history	1
1.1	Introduction	1
1.2	Statistics descriptive, statistics inferential and statistical models	2
1.3	Types of study	7
1.4	Types of data	10
1.5	A little history	12
1.6	Why can't a psychologist be more like a statistician (and vice versa)?	14
1.7	Computers and statistical software	15
1.8	Summary	15
	Exercises	16
	Further reading	17
2	Graphical methods of displaying data	18
2.1	Introduction	18
2.2	Pop charts	19
2.3	Histograms, stem-and-leaf plots and box plots	23
2.4	The simple scatter plot and related graphical displays	30
2.5	Representing multivariate data by cartoon faces	39
2.6	Graphical deception	43
2.7	Summary	47
	Exercises	47
	Further reading	49
3	Analysis of variance: the one-way design	50
3.1	Introduction	50
3.2	Student's <i>t</i> -tests	50
3.3	Initial examination of the data on teaching methods	52
3.4	One-way analysis of variance	53
3.5	Multiple comparison techniques	56
3.6	Planned comparisons	57
3.7	The use of orthogonal polynomials: trend analysis	61
3.8	Analysis of covariance	62
3.9	Hotelling's T^2 -test and one-way multivariate analysis of variance	68
3.10	Summary	73
	Exercises	73
	Further reading	76
4	Analysis of variance: factorial designs	77
4.1	Introduction	77

4.2	Interactions in a factorial design	77
4.3	Two-way designs	79
4.4	Higher-order factorial designs	84
4.5	Random effects and fixed effects models	86
4.6	Analysis of covariance in factorial design	90
4.7	Factorial designs with unequal numbers of observations in each cell	93
4.8	Multivariate analysis of variance	98
4.9	Summary	98
	Exercises	100
	Further reading	102
5	Analysis of variance: repeated measures designs	103
5.1	Introduction	103
5.2	Plotting repeated measures data	108
5.3	Analysing each repeated measurement separately	110
5.4	Response feature analysis: the use of summary measures	116
5.5	Analysis of variance for repeated measures data	121
5.6	Other approaches to the analysis of repeated measures designs	130
5.7	Summary	130
	Exercises	131
	Further reading	132
6	Simple linear regression and multiple regression analysis	133
6.1	Introduction	133
6.2	Simple linear regression	133
6.3	Multiple regression	141
6.4	Multicollinearity	159
6.5	Summary	160
	Exercises	160
	Further reading	164
7	The analysis of categorical data: log-linear models and logistic regression	165
7.1	Introduction	165
7.2	The two-dimensional contingency table	166
7.3	Three-dimensional contingency tables	171
7.4	Models for contingency tables	178
7.5	Logistic regression	186
7.6	Summary	189
	Exercises	189
	Further reading	191
8	An introduction to the generalized linear model	192
8.1	Introduction	192
8.2	Linear and non-linear models	192

8.3	Analysis of variance and multiple regression models	192
8.4	Link functions and the generalized linear model	200
8.5	Summary	201
	Exercises	202
	Further reading	202
9	Distribution-free, computer-intensive methods	203
9.1	Introduction	203
9.2	The Wilcoxon–Mann–Whitney test	204
9.3	Permutation tests	207
9.4	The bootstrap	211
9.5	Summary	213
	Exercises	214
	Further reading	214
10	Multivariate analysis I: the analysis of covariances and correlations (principal components and exploratory factor analysis)	215
10.1	Introduction	215
10.2	Covariances and correlations	215
10.3	Principal components analysis	217
10.4	Exploratory factor analysis	225
10.5	Factor rotation	231
10.6	Comparison of exploratory factor analysis and principal components	239
10.7	Summary	241
	Exercises	241
	Further reading	242
11	Multivariate analysis II: confirmatory factor analysis and covariance structure models	243
11.1	Introduction	243
11.2	Path diagrams	243
11.3	Confirmatory factor analysis models	245
11.4	An example of a structural equation model for longitudinal data: the stability of alienation	251
11.5	Latent variables and structural equation models—some caveats	254
11.6	Summary	255
	Exercises	255
	Further reading	256
12	Multivariate analysis III: cluster analysis, discriminant analysis and multidimensional scaling	257
12.1	Introduction	257
12.2	Cluster analysis	258
12.3	Discriminant function techniques	269
12.4	Multidimensional scaling	278

12.5 Summary	281
Exercises	282
Further reading	285
13 The assessment of reliability	286
13.1 Introduction	286
13.2 Reliability measures for categorical data	287
13.3 Measuring reliability for quantitative variables	292
13.4 Split halves and the internal consistency of tests	298
13.5 How long is a piece of string? The use of confirmatory factor analysis in the assessment of reliability	300
13.6 Summary	302
Exercises	303
Further reading	304
Appendix A Statistical glossary	305
Appendix B Answers to selected exercises	328
Appendix C About the diskette	340
References	341
Index	347