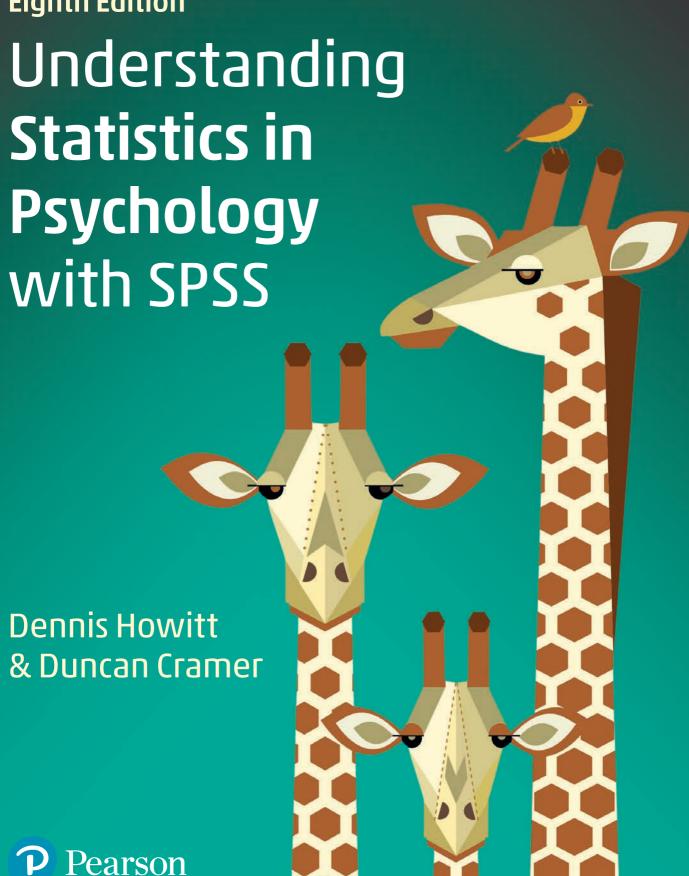
**Eighth Edition** 



Understanding Statistics in Psychology with SPSS

# Understanding Statistics in Psychology with SPSS

## **Table of Contents**

Front Cover

Half Title Page

Title Page

Copyright Page

**Brief Contents** 

Contents

Guided tour

Introduction

Acknowledgements

1 Why statistics?

Overview

- 1.1 Introduction
- 1.2 Research on learning statistics
- 1.3 Why is learning statistics difficult?
- 1.4 The importance of understanding research designs
- 1.5 Positive about statistics
- 1.6 What statistics can't do
- 1.7 Easing the way
- 1.8 What do I need to know to be an effective user of statistics?
- 1.9 A few words about SPSS
- 1.10 Quick guide to the book's procedures and statistical tests

Key points

Computer analysis: SPSS Analyze, Graphs and Transform drop-down menus

Part 1: Descriptive statistics

2 Some basics: Variability and measurement



Overview

- 2.1 Introduction
- 2.2 Variables and measurement
- 2.3 Major types of measurement

Key points

Computer analysis: Some basics of data entry using SPSS

3 Describing variables: Tables and diagrams

Overview

- 3.1 Introduction
- 3.2 Choosing tables and diagrams
- 3.3 Errors to avoid

Key points

Computer analysis: Tables, diagrams and recoding using SPSS

4 Describing variables numerically: Averages, variation and spread

Overview

- 4.1 Introduction
- 4.2 Typical scores: mean, median and mode
- 4.3 Comparison of mean, median and mode
- 4.4 Spread of scores: range and interquartile range
- 4.5 Spread of scores: variance

Key points

Computer analysis: Descriptive statistics using SPSS

5 Shapes of distributions of scores

Overview

- 5.1 Introduction
- 5.2 Histograms and frequency curves
- 5.3 Normal curve
- 5.4 Distorted curves
- 5.5 Other frequency curves

Key points

Computer analysis: Frequencies using SPSS

6 Standard deviation and z-scores: Standard unit of measurement in statistics

- 6.1 Introduction
- 6.2 Theoretical background



- 6.3 Measuring the number of standard deviations the z-score
- 6.4 Use of z-scores
- 6.5 Standard normal distribution
- 6.6 Important feature of z-scores

Key points

Computer analysis: Standard deviation and z-scores using SPSS

#### 7 Relationships between two or more variables: Diagrams and tables

Overview

- 7.1 Introduction
- 7.2 Principles of diagrammatic and tabular presentation
- 7.3 Type A: both variables numerical scores
- 7.4 Type B: both variables nominal categories
- 7.5 Type C: one variable nominal categories, the other numerical scores

Key points

Computer analysis: Crosstabulation and compound bar charts using SPSS

#### 8 Correlation coefficients: Pearson's correlation and Spearman's rho

Overview

- 8.1 Introduction
- 8.2 Principles of the correlation coefficient
- 8.3 Some rules to check out
- 8.4 Coefficient of determination
- 8.5 Significance testing
- 8.6 Spearman's rho another correlation coefficient
- 8.7 Example from the literature

Key points

Computer analysis: Correlation coefficients using SPSS

Computer analysis: Scattergram using SPSS

9 Regression: Prediction with precision

Overview

- 9.1 Introduction
- 9.2 Theoretical background and regression equations
- 9.3 Confidence intervals and standard error: how accurate are the predicted score and the regression equations?

Key points

Computer analysis: Simple regression using SPSS



## Part 2: Significance testing

#### 10 Samples from populations

Overview

- 10.1 Introduction
- 10.2 Theoretical considerations
- 10.3 Characteristics of random samples
- 10.4 Confidence intervals

Key points

Computer analysis: Selecting a random sample using SPSS

## 11 Statistical significance for the correlation coefficient: A practical introduction to statistical inference

Overview

- 11.1 Introduction
- 11.2 Theoretical considerations
- 11.3 Back to the real world: null hypothesis
- 11.4 Pearson's correlation coefficient again
- 11.5 Spearman's rho correlation coefficient

Key points

Computer analysis: Correlation coefficients using SPSS

## 12 Standard error: Standard deviation of the means of samples

Overview

- 12.1 Introduction
- 12.2 Theoretical considerations
- 12.3 Estimated standard deviation and standard error

Key points

Computer analysis: Standard error using SPSS

#### 13 Related t-test: Comparing two samples of related/correlated/paired scores

Overview

- 13.1 Introduction
- 13.2 Dependent and independent variables
- 13.3 Some basic revision
- 13.4 Theoretical considerations underlying the computer analysis
- 13.5 Cautionary note

Key points



Computer analysis: Related/correlated/paired t-test using SPSS

## 14 Unrelated t-test: Comparing two samples of

unrelated/uncorrelated/independent scores

Overview

- 14.1 Introduction
- 14.2 Theoretical considerations
- 14.3 Standard deviation and standard error
- 14.4 Cautionary note

Key points

Computer analysis: Unrelated/uncorrelated/independent t-test using SPSS

#### 15 What you need to write about your statistical analysis

Overview

- 15.1 Introduction
- 15.2 Reporting statistical significance
- 15.3 Shortened forms
- 15.4 APA (American Psychological Association) style

Key points

#### 16 Confidence intervals

Overview

- 16.1 Introduction
- 16.2 Relationship between significance and confidence intervals
- 16.3 Regression
- 16.4 Writing up a confidence interval using APA style
- 16.5 Other confidence intervals

Key points

Computer analysis: Examples of SPSS output containing confidence intervals

#### 17 Effect size in statistical analysis: Do my findings matter?

- 17.1 Introduction
- 17.2 Statistical significance and effect size
- 17.3 Size of the effect in studies
- 17.4 Approximation for nonparametric tests
- 17.5 Analysis of variance (ANOVA)
- 17.6 Writing up effect sizes using APA style
- 17.7 Have I got a large, medium or small effect size?



17.8 Method and statistical efficiency

Key points

## 18 Chi-square: Differences between samples of frequency data

Overview

- 18.1 Introduction
- 18.2 Theoretical issues
- 18.3 Partitioning chi-square
- 18.4 Important warnings
- 18.5 Alternatives to chi-square
- 18.6 Chi-square and known populations
- 18.7 Chi-square for related samples the McNemar test
- 18.8 Example from the literature

Key points

Computer analysis: Chi-square using SPSS

Recommended further reading

#### 19 Probability

Overview

- 19.1 Introduction
- 19.2 Principles of probability
- 19.3 Implications

Key points

## 20 One-tailed versus two-tailed significance testing

Overview

- 20.1 Introduction
- 20.2 Theoretical considerations
- 20.3 Further requirements

Key points

Computer analysis: One- and two-tailed statistical significance using SPSS

#### 21 Ranking tests: Nonparametric statistics

Overview

- 21.1 Introduction
- 21.2 Theoretical considerations
- 21.3 Nonparametric statistical tests
- 21.4 Three or more groups of scores

Key points



Computer analysis: Two-group ranking tests using SPSS

Recommended further reading

## Part 3: Introduction to analysis of variance

22 Variance ratio test: F-ratio to compare two variances

Overview

22.1 Introduction

22.2 Theoretical issues and application

Key points

Computer analysis: F-ratio test using SPSS

## 23 Analysis of variance (ANOVA): One-way unrelated or uncorrelated ANOVA

Overview

23.1 Introduction

23.2 Some revision and some new material

23.3 Theoretical considerations

23.4 Degrees of freedom

23.5 Analysis of variance summary table

Key points

Computer analysis: Unrelated one-way analysis of variance using SPSS

## 24 ANOVA for correlated scores or repeated measures

Overview

24.1 Introduction

24.2 Theoretical considerations underlying the computer analysis

24.3 Examples

Key points

Computer analysis: Related analysis of variance using SPSS

## 25 Two-way or factorial ANOVA for unrelated/uncorrelated scores: Two studies for the price of one?

Overview

25.1 Introduction

25.2 Theoretical considerations

25.3 Steps in the analysis

25.4 More on interactions

25.5 Three or more independent variables



Key points

Computer analysis: Unrelated two-way analysis of variance using SPSS

#### 26 Multiple comparisons within ANOVA: A priori and post hoc tests

Overview

26.1 Introduction

26.2 Planned (a priori) versus unplanned (post hoc) comparisons

26.3 Methods of multiple comparisons testing

26.4 Multiple comparisons for multifactorial ANOVA

26.5 Contrasts

26.6 Trends

Key points

Computer analysis: Multiple comparison tests using SPSS

Recommended further reading

## 27 Mixed-design ANOVA: Related and unrelated variables together

Overview

27.1 Introduction

27.2 Mixed designs and repeated measures

Key points

Computer analysis: Mixed design analysis of variance using SPSS

Recommended further reading

## 28 Analysis of covariance (ANCOVA): Controlling for additional variables

Overview

28.1 Introduction

28.2 Analysis of covariance

Key points

Computer analysis: Analysis of covariance using SPSS

Recommended further reading

## 29 Multivariate analysis of variance (MANOVA)

Overview

29.1 Introduction

29.2 MANOVA's two stages

29.3 Doing MANOVA

29.4 Reporting your findings

Key points

Computer analysis: Multivariate analysis of variance using SPSS



Recommended further reading

## 30 Discriminant (function) analysis - especially in MANOVA

Overview

30.1 Introduction

30.2 Doing the discriminant function analysis

30.3 Reporting your findings

Key points

Computer analysis: Discriminant function analysis using SPSS

Recommended further reading

## 31 Statistics and analysis of experiments

Overview

31.1 Introduction

31.2 The Patent Stats Pack

31.3 Checklist

31.4 Special cases

Key points

Computer analysis: Selecting subsamples of your data using SPSS

Computer analysis: Recoding groups for multiple comparison tests using SPSS

#### Part 4: More advanced correlational statistics

32 Partial correlation: Spurious correlation, third or confounding variables, suppressor variables

Overview

32.1 Introduction

32.2 Theoretical considerations

32.3 Doing partial correlation

32.4 Interpretation

32.5 Multiple control variables

32.6 Suppressor variables

32.7 Example from the research literature

32.8 Example from a student's work

Key points

Computer analysis: Partial correlation using SPSS

33 Factor analysis: Simplifying complex data



- 33.1 Introduction
- 33.2 A bit of history
- 33.3 Basics of factor analysis
- 33.4 Decisions, decisions, decisions
- 33.5 Exploratory and confirmatory factor analysis
- 33.6 Example of factor analysis from the literature
- 33.7 Reporting the results

Key points

Computer analysis: Principal components analysis using SPSS

Recommended further reading

## 34 Multiple regression and multiple correlation

Overview

- 34.1 Introduction
- 34.2 Theoretical considerations
- 34.3 Assumptions of multiple regression
- 34.4 Stepwise multiple regression example
- 34.5 Reporting the results
- 34.6 Example from the published literature

Key points

Computer analysis: Stepwise multiple regression using SPSS

Recommended further reading

#### 35 Path analysis

Overview

- 35.1 Introduction
- 35.2 Theoretical considerations
- 35.3 Example from published research
- 35.4 Reporting the results

Key points

Computer analysis: Hierarchical multiple regression using SPSS

Recommended further reading

## Part 5: Assorted advanced techniques

36 Meta-analysis: Combining and exploring statistical findings from previous research

Overview

36.1 Introduction



- 36.2 Pearson correlation coefficient as the effect size
- 36.3 Other measures of effect size
- 36.4 Effects of different characteristics of studies
- 36.5 First steps in meta-analysis
- 36.6 Illustrative example
- 36.7 Comparing a study with a previous study
- 36.8 Reporting the results

Key points

Computer analysis: Some meta-analysis software

Recommended further reading

#### 37 Reliability in scales and measurement: Consistency and agreement

Overview

- 37.1 Introduction
- 37.2 Item-analysis using item-total correlation
- 37.3 Split-half reliability
- 37.4 Alpha reliability
- 37.5 Agreement among raters

Key points

Computer analysis: Cronbach's alpha and kappa using SPSS

Recommended further reading

#### 38 Influence of moderator variables on relationships between two variables

Overview

- 38.1 Introduction
- 38.2 Statistical approaches to finding moderator effects
- 38.3 Hierarchical multiple regression approach to identifying moderator effects (or interactions)
- 38.4 ANOVA approach to identifying moderator effects (i.e. interactions)

Key points

Computer analysis: Regression moderator analysis using SPSS

Recommended further reading

#### 39 Statistical power analysis: Getting the sample size right

- 39.1 Introduction
- 39.2 Types of statistical power analysis and their limitations
- 39.3 Doing power analysis



39.4 Calculating power

39.5 Reporting the results

Key points

Computer analysis: Power analysis with G\*Power

## Part 6: Advanced qualitative or nominal techniques

40 Log-linear methods: Analysis of complex contingency tables

Overview

40.1 Introduction

40.2 Two-variable example

40.3 Three-variable example

40.4 Reporting the results

Key points

Computer analysis: Log-linear analysis using SPSS

Recommended further reading

## 41 Multinomial logistic regression: Distinguishing between several different categories or groups

Overview

41.1 Introduction

41.2 Dummy variables

41.3 What can multinomial logistic regression do?

41.4 Worked example

41.5 Accuracy of the prediction

41.6 How good are the predictors?

41.7 Prediction

41.8 Interpreting the results

41.9 Reporting the results

Key points

Computer analysis: Multinomial logistic regression using SPSS

#### 42 Binomial logistic regression

Overview

42.1 Introduction

42.2 Typical example

42.3 Applying the logistic regression procedure

42.4 Regression formula

42.5 Reporting the results



Key points

Computer analysis: Binomial logistic regression using SPSS

43 Data mining and big data

Overview

43.1 Introduction

43.2 Adopting a new thinking mode

43.3 Dissatisfactions with traditional psychology

43.4 Web scraping

43.5 Data mining and statistical techniques

Key points

## **Appendices**

Appendix A Testing for excessively skewed distributions

Appendix B1 Large-sample formulae for the nonparametric tests

Appendix B2 Nonparametric tests for three or more groups

Computer analysis: Kruskalâ Wallis and Friedman nonparametric tests using SPSS

Appendix C Extended table of significance for the Pearson correlation coefficient

Appendix D Table of significance for the Spearman correlation coefficient

Appendix E Extended table of significance for the t-test

Appendix F Table of significance for chi-square

Appendix G Extended table of significance for the sign test

Appendix H Table of significance for the Wilcoxon matched pairs test

Appendix I Tables of significance for the Mann-Whitney U-test

Appendix J Tables of significance values for the F-distribution

Appendix K Table of significance values for t when making multiple t-tests

Glossary

References

Index

**Back Cover** 

