PREFACE

This book offers a comprehensive presentation of quantitative research design and statistical methods in the context of education and related fields. The text is intended primarily for use by students who take intermediate and advanced quantitative research courses as a part of their graduate degree program, but it can be a useful resource for researchers in education, counseling, rehabilitation, psychology, sociology, social work, and human development as well.

The main purpose of this book is to provide the readers with an in-depth conceptual and methodological understanding of intermediate and advanced quantitative research methods, as well as the skills necessary to apply such methods using SPSS and to interpret the results. This is achieved by building layers of context-based understanding of research concepts and methods, their statistical translation, methodological principles, computer-based data analysis, presentation of the results in APA style format, and contextual interpretations. The text allows people who experience difficulties with analytic representations of statistical concepts to capitalize on conceptual understanding and still be able to master the research tools necessary for their work on theses, dissertations, and professional research.

While there are many excellent introductory books on research design and statistics in education and the social sciences, most books at the intermediate and advanced levels tend to be either too technical and mathematical or too simplistic. Typically, claiming to have an "applied orientation," such books are dominated by presentations of SPSS dialog boxes and printouts at the expense of theoretical and methodological rigor. To bridge the gap between these extremes, this book attempts to provide a balance between conceptual meaning and its statistical translation by developing understanding and application skills in a spiral exposure to quantitative concepts and methods. For example, the comparison of groups on variables of interest is addressed in a sequence from univariate cases of t-tests, nonparametric methods, and analysis of variance (ANOVA) to scenarios illustrating the use of multivariate analysis of variance (MANOVA) and structural equation modeling (SEM). As another example, the concept of validity is addressed in the framework of measurement, research design, and structural equation modeling. Particular attention is devoted to potential problems associated with violation of assumptions, common misconceptions (e.g., conducting MANOVA versus separate ANOVAs), effect sizes, confidence intervals, and sample size. The book is organized in four parts comprising 24 chapters. Each chapter ends with a summary and study questions.

**Part I [Measurement in Educational Research]** consists of three chapters. Chapter 1 presents variables and measurement scales in the context of education. The focus is on the nature of measurement in education, types of variables, types of scales and their transformations, permissible arithmetic operations with scale values, summation symbols, and basic rules of summation. Chapter 2 introduces the classical model of reliability of scores, types of reliability, and reliability of composite scores. Chapter 3 deals with the concept of validity for measurement instruments (e.g., tests, questionnaires, or inventories) and types of validity (content-related validity, criterion-related validity, and construct-related validity).

**Part II [Research Design]** consists of two chapters. Chapter 4 deals with research problems, hypotheses, and types of quantitative research: nonexperimental research, experimental research, and threats to internal and external validity. Chapter 5 presents pre-experimental and true experimental research designs that involve quantitative methods of data analysis. The focus is primarily on conceptual understanding and methodological principles underlying the application of such designs in educational research.
Part III [Univariate Statistics in Educational Research] consists of fourteen chapters. The first five of these chapters (6, 7, 8, 9, and 10) cover introductory statistics and prepare the ground for understanding and practical applications of intermediate statistics in educational research. The next six chapters (11 through 16) provide intermediate treatment of correlation, regression, and analysis of variance (ANOVA) including some nonparametric methods. The last three chapters in this section (17, 18, and 19) provide more advanced treatment of multiple regression, analysis of variance, and the relations between them.

Part IV [Multivariate Statistics in Educational Research] consists of five chapters. This part covers the topics of logistic regression, multivariate analysis of variance (MANOVA), exploratory factor analysis, confirmatory factor analysis, and elements of structural equation modeling (SEM). The analytic framework of these topics is simplified and tailored to conceptual understanding, computer-aided applications, and interpretations in the context of educational research.

Supplements
Data sets for computer-based applications in examples using SPSS can be downloaded from the online supplement to this book [http://cehd.gmu.edu/book/dimitrov]. This supplement provides also (a) answers to the study questions for each chapter, (b) addendum to some topics discussed in the book, (c) syntax for confirmatory factor analysis, path analysis, and group comparison on latent variables in the framework of major computer programs — LISREL, AMOS, EQS, and Mplus [used for illustrations in Chapters 23 and 24], and (d) additional references (books, articles, and online products) related to the content of this book.

Acknowledgments
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Dimiter M. Dimitrov
# Contents

Preface xv

PART I MEASUREMENT IN EDUCATION 1

Chapter 1

**VARIABLES AND MEASUREMENT SCALES** 3

1.1 Variables in Educational Research 3
   1.1.1 Observable versus Latent Variables 4
   1.1.2 Continuous versus Discrete Variables 4

1.2 Scales of Measurement 5
   1.2.1 What is Measurement? 5
   1.2.2 Nominal Scale 6
   1.2.3 Ordinal Scale 6
   1.2.4 Interval Scale 6
   1.2.5 Ratio Scale 7
   1.2.6 Scale Transformations and Operations 7
   1.2.7 Scaling of Individual Items 8

1.3 Symbols and Rules for Summation of Variables 9
   1.3.1 Symbolic Notations 9
   1.3.2 Summation Operator 10

1.4 Summary 11

1.5 Study Questions 12

Chapter 2

**RELIABILITY** 15

2.1 What is Reliability? 15

2.2 Classical Concept of Reliability 16
   2.2.1 True Score 16
   2.2.2 Definition of Reliability 16
   2.2.3 Standard Error of Measurement 17

2.3 Types of Reliability 18
   2.3.1 Internal Consistency Reliability 18
   2.3.2 Test-retest Reliability 19
   2.3.3 Alternate Forms Reliability 20
   2.3.4 Criterion-referenced Reliability 20
   2.3.5 Interrater Reliability 22

2.4 Reliability of Composite Scores 23
   2.4.1 Reliability of Sum of Scores 23
   2.4.2 Reliability of Difference of Scores 24
2.5 Reliability Estimation with SPSS 25
  2.5.1 Calculation of Cronbach’s alpha 25
  2.5.2 Calculation of Cohen’s kappa 26
2.6 Summary 27
2.7 Study Questions 28

Chapter 3

VALIDITY 29
3.1 What is Validity? 29
3.2 Types of Validity 29
  3.2.1 Content-related Validity 30
  3.2.2 Criterion-related Validity 30
  3.2.3 Construct-related Validity 31
3.3 Summary 33
3.4 Study Questions 33

PART II RESEARCH DESIGN 35

Chapter 4

QUANTITATIVE RESEARCH 37
4.1 Research Questions and Hypotheses 37
4.2 Types of Quantitative Research 39
  4.2.1 Nonexperimental Research 39
    4.2.1.1 Descriptive research 39
    4.2.1.2 Correlational research 40
    4.2.1.3 Ex post facto research 41
    4.2.1.4 Meta-analysis research 41
  4.2.2 Experimental Research 43
    4.2.2.1 True experimental research 43
    4.2.2.2 Quasi-experimental research 44
    4.2.2.3 Single-case research 44
  4.2.3 Internal and External Validity in Experimental Research 45
    4.2.3.1 Threats to internal validity 45
    4.2.3.2 Threats to external validity 46
4.3 Summary 48
4.4 Study Questions 49

Chapter 5

BASIC RESEARCH DESIGNS 51
5.1 Pre-experimental Designs 51
  5.1.1 One Group Posttest-Only Design 51
  5.1.2 One Group Pretest-Posttest Design 52
PART III  UNIVARIATE DATA ANALYSIS  

Chapter 6  
REVIEW OF INTRODUCTORY STATISTICS  

6.1 Organizing and Graphing Data  
6.1.1 Frequency Table  
6.1.2 Basic Distribution Graphs  
6.2 Describing Distributions  
6.2.1 Percentiles  
6.2.2 Measures of Central Tendency  
6.2.2.1 Mode  
6.2.2.2 Median  
6.2.2.3 Mean  
6.2.2.4 Properties of the mode, median, and mean  
6.2.3 Measures of Variation  
6.2.3.1 Variance  
6.2.3.2 Standard deviation  
6.2.3.3 Pooled variance  
6.2.3.4 Some basic rules  
6.2.4 Standard Scores  
6.2.5 Scale Transformation  
6.3 Summary  
6.4 Study Questions  

Chapter 7  
BASIC DISTRIBUTIONS  

7.1 Normal Distribution  
7.1.1 What is a Normal Distribution?  
7.1.2 Basic Properties of the Normal Distribution  
7.1.3 Determining Percentiles and Percentile Ranks  
7.1.4 Sampling Distribution of the Mean
<table>
<thead>
<tr>
<th>Chapter 8</th>
<th>HYPOTHESIS TESTING</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>What is Hypothesis Testing?</td>
<td>95</td>
</tr>
<tr>
<td>8.2</td>
<td>When To Reject (or Not) the Null Hypothesis?</td>
<td>96</td>
</tr>
<tr>
<td>8.3</td>
<td>Testing Hypotheses about the Mean</td>
<td>98</td>
</tr>
<tr>
<td>8.3.1</td>
<td>One-sample Case for the Mean</td>
<td>98</td>
</tr>
<tr>
<td>8.3.2</td>
<td>Two-sample Case for the Mean: Independent Samples</td>
<td>104</td>
</tr>
<tr>
<td>8.3.3</td>
<td>Two-sample Case for the Mean: Dependent Samples</td>
<td>109</td>
</tr>
<tr>
<td>8.4</td>
<td>Summary</td>
<td>111</td>
</tr>
<tr>
<td>8.5</td>
<td>Study Questions</td>
<td>112</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 9</th>
<th>HYPOTHESIS TESTING FOR PROPORTIONS</th>
<th>115</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>One-Sample Case for Proportion</td>
<td>115</td>
</tr>
<tr>
<td>9.2</td>
<td>Testing H₀: ( P_1 = P_2 ) for Independent Samples</td>
<td>120</td>
</tr>
<tr>
<td>9.3</td>
<td>Testing H₀: ( P_1 = P_2 ) for Dependent Samples</td>
<td>125</td>
</tr>
<tr>
<td>9.4</td>
<td>Summary</td>
<td>129</td>
</tr>
<tr>
<td>9.5</td>
<td>Study Questions</td>
<td>130</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 10</th>
<th>CORRELATION AND SIMPLE REGRESSION</th>
<th>133</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1</td>
<td>Correlation between Two Variables</td>
<td>133</td>
</tr>
<tr>
<td>10.1.1</td>
<td>What is Linear Relationship (Correlation) between Two Variables?</td>
<td>133</td>
</tr>
<tr>
<td>10.1.2</td>
<td>The Pearson Product-Moment Correlation Coefficient</td>
<td>136</td>
</tr>
<tr>
<td>10.2</td>
<td>Simple Linear Regression</td>
<td>142</td>
</tr>
<tr>
<td>10.2.1</td>
<td>Correlation, Prediction, and Causation</td>
<td>142</td>
</tr>
<tr>
<td>10.2.2</td>
<td>The Regression Line</td>
<td>142</td>
</tr>
<tr>
<td>10.2.3</td>
<td>Interpretation of the Slope</td>
<td>145</td>
</tr>
<tr>
<td>10.2.4</td>
<td>Conditional Distributions of ( Y )-scores</td>
<td>147</td>
</tr>
<tr>
<td>10.2.5</td>
<td>Assumptions with Simple Linear Regression</td>
<td>150</td>
</tr>
<tr>
<td>10.3</td>
<td>Summary</td>
<td>152</td>
</tr>
<tr>
<td>10.4</td>
<td>Study Questions</td>
<td>153</td>
</tr>
</tbody>
</table>
Chapter 11

PARTIAL AND PART CORRELATION 157

11.1 Partial Correlation 157
11.2 Part Correlation 161
11.3 Summary 163
11.4 Study Questions 164

Chapter 12

NONPARAMETRIC TESTS 165

12.1 The Man-Whitney U Test 165
12.2 The Wilcoxon Signed-Rank Test for Dependent Samples 168
12.3 Chi-Square Goodness-of-fit Test 170
12.4 Chi-Square Test for Association 175
12.5 Summary 180
12.6 Study Questions 181

Chapter 13

MULTIPLE REGRESSION 183

13.1 The Concept of Multiple Regression 183
13.2 Comparison of Full and Restricted Regression Models 189
13.3 Multicollinearity 192
13.4 Cross-validation 195
13.5 Statistical Power, Effect Size, and Sample Size 195
13.6 Outliers and Influential Data Points 197
13.7 Categorical Predictors in Multiple Regression 199
13.8 Interaction between Predictors in Multiple Regression 201
  13.8.1 What is Interaction between Predictors? 201
  13.8.2 Testing for Interaction between Predictors 204
  13.8.3 Centering Predictors 205
13.9 Selection of Predictors in Multiple Regression 207
13.10 APA Style for Multiple Regression Results 208
13.11 Summary 208
13.12 Study Questions 212

Chapter 14

ONE-FACTOR ANALYSIS OF VARIANCE 215

14.1 The Concept of One-Factor Analysis of Variance 215
14.2 Assumptions in ANOVA 217
14.3 Effects in One-factor ANOVA 218
14.4 Within-groups and Between-groups Variance 219
14.5 Linear Model for One-factor ANOVA 221
14.6 Testing the ANOVA Null Hypothesis 221
14.7 Multiple Comparisons 223
14.7.1 Post Hoc Comparisons 223
14.7.1.1 The Tukey method of multiple comparisons 223
14.7.1.2 Bonferroni method of (post hoc) multiple comparisons 224
14.7.2 Planned Comparisons 225
14.7.2.1 Contrasts for planned multiple comparisons 225
14.7.2.2 Dunnett method of multiple comparisons 226
14.8 Determining Effect Size 228
14.8.1 Effect Size of Mean Differences 228
14.8.2 Omnibus Effect Size 228
14.9 Determining the Sample Size 232
14.10 Consequences of Violating the ANOVA Assumptions 232
14.11 Interpretation of SPSS Output for One-factor ANOVA 234
14.12 Summary 236
14.13 Study Questions 237

Chapter 15

**TWO- AND THREE-FACTOR ANOVA** 239

15.1 Two-factor ANOVA 239
15.1.1 Null Hypotheses in Two-factor ANOVA 239
15.1.2 Assumptions in Two-factor ANOVA 240
15.1.3 Effects in Two-factor ANOVA 241
15.1.4 Linear Model for the Data in Two-factor ANOVA 243
15.1.5 Sum of Squares in Two-factor ANOVA 243
15.1.6 Mean Squares in Two-factor ANOVA 245
15.1.7 Testing the Null Hypotheses in Two-factor ANOVA 246
15.1.8 Omnibus Effect Size in Two-factor ANOVA 247
15.1.9 Types of Interaction in Two-factor ANOVA 249
15.1.10 Testing for Simple Main Effects 250
15.1.11 Using SPSS for Two-factor ANOVA 250
15.2 Three-factor ANOVA 255
15.3 Summary 262
15.4 Study Questions 263

Chapter 16

**ANALYSIS OF COVARIANCE** 265

16.1 The Logic Behind ANCOVA 265
16.1.1 Basic Concepts in ANCOVA 265
16.1.2 Adjusted Group Means in ANCOVA 266
16.1.3 Increased Test Power with ANCOVA 268
16.1.4 Assumptions in ANCOVA 269
16.2 Performing ANCOVA and Interpreting the Results 269
16.3 ANCOVA versus ANOVA on Gain Score 275
Chapter 17

MULTIPLE REGRESSION AND ANOVA

17.1 One-Factor ANOVA via Multiple Regression
17.1.1 Contrast Coding for ANOVA with Two Groups
17.1.2 Contrast Coding for One-factor ANOVA with Three Groups
17.1.3 Orthogonal Contrasts
17.2 Two-Factor ANOVA via Multiple Regression
17.3 Summary
17.4 Study Questions

Chapter 18

ANOVA WITH RANDOM FACTORS

18.1 ANOVA with One Random Factor
18.1.1 Random Effects
18.1.2 Assumptions of the Random-factor ANOVA
18.1.3 Expected Mean Square in the Random-factor ANOVA
18.1.4 The Primary Question in a Random-factor ANOVA
18.2 Two-factor Mixed-Effects ANOVA Model
18.2.1 The Concept of a Mixed-effects Model
18.2.2 Assumptions of the Two-factor Mixed ANOVA Model
18.2.3 Expected Mean Square in the Two-factor Mixed ANOVA
18.2.4 Effect Size of Mean Differences among Levels of the Fixed Factor
18.2.5 Generalizations with the Two-factor Mixed ANOVA
18.3 Summary
18.4 Study Questions

Chapter 19

REPEATED-MEASURES ANOVA

19.1 A Simple Repeated-Measures ANOVA
19.1.1 Univariate Repeated-measures Analysis
19.1.2 Assumptions in Repeated-measures ANOVA
19.1.3 The Multivariate Test for Repeated-measures ANOVA
19.1.4 Univariate or Multivariate Approach to Repeated-measures ANOVA?
19.1.5 SPSS for the Simple Repeated-measures ANOVA
19.2 Repeated-Measures ANOVA with One Between-Subjects Factor
19.3 Caution with Repeated-Measures ANOVA for Pretest-Posttest Data
19.4 Summary
19.5 Study Questions
PART IV  MULTIVARIATE DATA ANALYSIS  327

Chapter 20  

LOGISTIC REGRESSION  329
20.1 The Concept of Logistic Regression  329
20.1.1 Probability, Odds, and Odds Ratio  329
20.1.2 The Logistic Model  331
20.1.3 Logit Form of the Logistic Regression Model  332
20.1.4 Interpretation of the Regression Coefficients  332
20.2 Tests and Interpretations of Logistic Regression Results  334
20.2.1 Goodness-of-fit Tests  334
20.2.2 Hosmer-Lemeshow Goodness-of-fit Test  335
20.2.3 Test for Significance of Predictor Variables  336
20.2.4 Effect Size Information with Logistic Regression  337
20.2.5 Classification Table  339
20.3 Coding Categorical Predictors  340
20.4 Using SPSS for Binary Logistic Regression  341
20.5 Comparison of Full and Restricted Models  345
20.6 Selection of Predictors in Logistic Regression  346
20.7 Assumptions in Logistic Regression  347
20.8 Summary  347
20.9 Study Questions  349

Chapter 21  

MULTIVARIATE ANALYSIS OF VARIANCE  351
21.1 The Concept of MANOVA  351
21.2 MANOVA versus Separate ANOVAs  352
21.3 When to Use Separate ANOVAs?  352
21.4 When to Use MANOVA?  353
21.5 Assumptions in MANOVA  353
21.6 MANOVA with Discriminant Analysis  354
21.7 MANOVA with Planned Comparisons  359
21.8 Sample Size in MANOVA  364
21.9 Summary  365
21.10 Study Questions  366

Chapter 22  

EXPLORATORY FACTOR ANALYSIS  367
22.1 Correlated Variables and Underlying Factors  367
22.2 Basic Concepts in Exploratory Factor Analysis  368
22.3 Communalities and Eigenvalues  370
Chapter 22

CONCEPTS OF FACTOR ANALYSIS 345

22.1 Introduction 345
22.2 Factor Analysis    346
22.3 Factor Rotation 348
22.4 The Principle Factor Method of Extracting Factors 371
22.5 Rotation of Factors 372
22.6 Determining the Number of Factors 374
  22.6.1 “Eigenvalues of one or higher” Criterion 375
  22.6.2 Scree Test 375
  22.6.3 Parallel Analysis 376
22.7 Using SPSS for Exploratory Factor Analysis 377
22.8 Summary 381
22.9 Study Questions 382

Chapter 23

CONFIRMATORY FACTOR ANALYSIS 385

23.1 Differences between EFA and CFA Models 385
23.2 Basic Steps for CFA 387
  23.2.1 Specification of the CFA Model 387
  23.2.2 Evaluation of the CFA Model Adequacy 388
23.3 Summary 395
23.4 Study Questions 396

Chapter 24

ELEMENTS OF STRUCTURAL EQUATION MODELING 399

24.1 Path Analysis 399
  24.1.1 Path Coefficients 400
  24.1.2 Exogenous and Endogenous Variables 401
  24.1.3 Assumptions 402
  24.1.4 Decomposition of Correlation Coefficients 402
  24.1.5 Testing the Causal Model for Data Fit 404
    24.1.5.1 Just-identified models 404
    24.1.5.2 Overidentified models 405
24.2 Elements of Structural Equation Modeling 410
  24.2.1 Upgrading Models for Path Analysis to Typical SEM Models 410
  24.2.2 Comparing Groups on Latent Variables (Constructs) 411
    24.2.2.1 SEM versus MANOVA 411
    24.2.2.2 Factorial invariance across groups 412
    24.2.2.3 Partial measurement invariance 413
    24.2.2.4 Structured means modeling 414
    24.2.2.5 Group-code (MIMIC) modeling 417
24.3 Summary 423
24.4 Study Questions 425

REFERENCES 427
## Statistical Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>Standard normal (z-score) probabilities (upper tail)</td>
<td>432</td>
</tr>
<tr>
<td>A-2</td>
<td>Critical values of the Student's t-distribution</td>
<td>433</td>
</tr>
<tr>
<td>A-3</td>
<td>Critical values of the chi-square distribution</td>
<td>434</td>
</tr>
<tr>
<td>A-4</td>
<td>Critical values of the F-distribution</td>
<td>435</td>
</tr>
</tbody>
</table>

### Author Index

439

### Subject Index

441