Contents

Preface		xi
Chapter 1	Introduction to Multilevel and Longitudinal Modeling With IBM SPSS	1
	Our Intent	2
	Analysis of Multilevel Data Structures	3
	Partitioning Variation in an Outcome	6
	What SPSS Can and Cannot Do	7
	Developing a General Multilevel Modeling Strategy	9
	Illustrating the Steps in Investigating a Proposed Model	9
	One-Way ANOVA (No Predictors) Model	10
	Analyze a Level 1 Model With Fixed Predictors	11
	Add the Level 2 Explanatory Variables	12
	Examine Whether a Particular Slope Coefficient Varies Between Groups	13
	Adding Cross-Level Interactions to Explain Variation in the Slope	14
	Syntax Versus SPSS Menu Command Formulation	16
	Model Estimation and Other Typical Multilevel Modeling Issues	17
	Sample Size	18
	Power	18
	Differences Between Multilevel Software Programs	19
	A Note About Standardized and Unstandardized Coefficients	19
	Summary	20
Chapter 2	Preparing and Examining the Data for Multilevel Analyses	21
	Data Requirements	21
	File Layout	22
	Getting Familiar With Basic SPSS Data Commands	24
	Recode: Creating a New Variable Through Recoding	24
	Compute: Creating a New Variable That is a Function of Some Other Variable	29
	Match Files: Combining Data From Separate SPSS Files	30
	Aggregate: Collapsing Data Within Level 2 Units	36
	Varstocases: Vertical Versus Horizontal Data Structures	38
	Using "Rank" to Recode the Level 1 or Level 2 Data for Nested Models	44
	Creating an Identifier Variable	45
	Creating an Individual-Level Identifier Using Compute	45
	Creating a Group-Level Identifier Using Rank Cases	47
	Creating a Within-Group-Level Identifier Using Rank Cases	49
	Centering	51
	Grand-Mean Centering	53
	Group-Mean Centering	54
	Checking the Data	58
	A Note About Model Building	58
	Summary	59

Chapter 3	Defining a Basic Two-Level Multilevel Regression Model	91
	From Single-Level to Multilevel Analysis	61
	Building a Two-Level Model	63
	Research Questions	63
	The Data	64
	Graphing the Relationship Between SES and Math Test Scores With SPSS	
	Menu Commands	65
	Graphing the Subgroup Relationships Between SES and Math Test Scores	
	With SPSS Menu Commands	70
	Building a Multilevel Model With SPSS Mixed	72
	Step 1: Examining Variance Components Using the Null Model	73
	Defining the Null Model With SPSS Menu Commands	74
	Interpreting the Output From the Null Model	78
	Step 2: Building the Individual-Level (or Level 1) Random Intercept Model Model 1: Defining the Level 1 Random Intercept Model With SPSS Menu	80
	Commands	81
	Interpreting the Output From Model 1	83
	Step 3: Building the Group-Level (or Level 2) Random Intercept Model	86
	Model 2: Defining the Group-Level Random Intercept Model With SPSS	
	Menu Commands	87
	Interpreting the Output From Model 2	89
	Defining the Public School Variable as a Covariate Using SPSS Menu	01
	Commands	91
	Step 4: Adding a Randomly Varying Slope (the Random Slope and Intercept Model)	93
	Model 3: Defining the Random Slope and Intercept Model With SPSS Menu	75
	Commands	95
	Interpreting the Output From Model 3	97
	Step 5: Explaining Variability in the Random Slope (More Complex Random	
	Slopes and Intercept Models)	98
	Model 4: Defining More Complex Random Slope and Intercept Models With	
	SPSS Menu Commands	99
	Interpreting the Output From Model 4	104
	Graphing SES–Achievement Relationships in High- and Low-Achieving	
	Schools With SPSS Menu Commands	106
	Summary	110
Chapter 4	Three-Level Univariate Regression Models	111
	Three-Level Univariate Model	111
	Research Questions	111
	The Data	112
	Defining the Three-Level Multilevel Model	112
	Centering Predictors and Interactions	113
	The Null Model (No Predictors)	115
	Defining the Null Model (No Predictors) With SPSS Menu Commands	115
	Interpreting the Output From the Null Model	120
	Model 1: Defining Predictors at Each Level	121
	Defining Model 1 (Predictors at Each Level) With SPSS Menu Commands	122
	Interpreting the Output From Model 1	124

	Model 2: Group-Mean Centering	125
	Defining Model 2 With SPSS Menu Commands	125
	Interpreting the Output From Model 2	127
	Covariance Estimates	128
	Model 3: Does the Slope Vary Randomly Across Classrooms and Schools?	129
	Defining Model 3 With SPSS Menu Commands	130
	Interpreting the Output From Model 3	132
	Developing an Interaction Term	133
	Preliminary Investigation of the Interaction	133
	Model 4: Examining a Level 2 Interaction	134
	Defining Model 4 With SPSS Menu Commands	135
	Interpreting the Output From Model 4	138
	Comparing the Fit of Successive Models	139
	Summary	140
Chapter 5	Examining Individual Change With Repeated Measures Data	141
	An Example Study	141
	Research Questions	142
	Data	142
,	Univariate or Multivariate Approach	142
	Examining the Shape of Students' Growth Trajectories	143
	Graphing the Linear Growth Trajectories With SPSS Menu Commands	145
	Examining Growth Trajectories Using Repeated Measures ANOVA	151
	Conducting Repeated Measures ANOVA With SPSS Menu Commands	151
	Interpreting the Output From the Repeated Measures ANOVA	154
	Adding Between-Subjects Predictors	155
	Adding Between-Subjects Predictors With SPSS Menu Commands	156
	Interpreting the Output From Adding Between-Subjects Predictors	159
	Using SPSS Mixed to Examine Individual Change	160
	Developing a Two-Level Model of Individual Change	162
	Level 1 Covariance Structure	162
	Level 2 Covariance Structure	165
	Model 1: Does the Slope Vary Randomly Across Individuals?	165
	Defining Model 1 With SPSS Menu Commands	166
	Interpreting the Output From Model 1 Investigating Other Level 1 Covariance Structures	169 171
	Investigating Other Level 1 Covariance Structures Using SPSS Menu	1/1
	Commands	173
	Model 2: Adding the Between-Subjects Predictors	173
	Defining Model 2 With SPSS Menu Commands	178
	Interpreting the Output From Model 2	184
	Graphing the Growth Rate Trajectories With SPSS Menu Commands	187
	Summary	188
Chapter 6	Methods for Examining Organizational-Level Change	189
	Examining Changes in Institutions' Graduation Rates	189
	Research Questions	190
	Data	191

	Defining the Model	191
	Level 1 Model	191
	Level 2 Model	192
	Level 3 Model	192
	Null Model: No Predictors	194
	Level 1 Error Structures	194
	Defining the Null Model (No Predictors) With SPSS Menu Commands	196
	Interpreting the Output From the Null Model	201
	Model 1: Adding Growth Rates	202
	Level 1 Model	202
	Coding the Time Variable	202
	Defining Model 1 With SPSS Menu Commands	204
	Interpreting the Output From Model 1	207
	Model 2: Adding Time-Varying Covariates	208
	Defining Model 2 With SPSS Menu Commands	209
	Interpreting the Output From Model 2	211
	Model 3: Explaining Differences in Growth Trajectories Between Institutions	211
	Defining Model 3 With SPSS Menu Commands	212
	Interpreting the Output From Model 3	216
	Model 4: Adding a Model to Examine Growth Rates at Level 3	217
	Defining Model 4 With SPSS Menu Commands	218
	Interpreting the Output From Model 4	221
	Other Types of Random-Coefficients Growth Models	222
	Summary	222
Chapter 7	Multivariate Multilevel Models	223
	Multilevel Latent-Outcome Model	223
	Research Questions	224
	The Data	224
	Defining a Latent Variable for a Multilevel Analysis	226
	Null Model: No Predictors	227
	Defining the Null Model (No Predictors) With SPSS Menu Commands	229
	Interpreting the Output of the Null Model	234
	Model 1: Building a Three-Level Model	234
	Defining Model 1 With SPSS Menu Commands	235
	Interpreting the Output of Model 1 (Explaining Student Achievement)	237
	Model 2: Investigating a Random Slope	238
	Defining Model 2 With SPSS Menu Commands	238
	Interpreting the Output of Model 2	241
	Model 3: Explaining Variation in Slopes	241
	Defining Model 3 (Variation in Academic Achievement Slopes) With SPSS	
	Menu Commands	242
	Interpreting the Output of Model 3	246
	Comparing Model Estimates	246
	Multivariate Multilevel Model for Correlated Outcomes	247
	The Data	247
	Research Questions	248
	Formulating the Basic Model	248
	Null Model (No Predictors)	249
	Model 1: Building a Complete Model (Predictors and Cross-Level Interactions)	262

	Ca	ontents	■ i	×
	Testing the Hypotheses		268	8
	Covariance Components		268	8
	Summary		270	0
Chapter 8	Cross-Classified Multilevel Models		273	1
	Students Cross-Classified in High Schools and Universities		273	1
	Research Questions		273	1
	The Data		273	1
	Descriptive Statistics		273	3
	Defining Models in SPSS		274	
	Model 1: Adding a Set of Level 1 and Level 2 Predictors		275	
	Defining Model 1 With SPSS Menu Commands		276	
	Interpreting the Output From Model 1		283	
	Model 2: Investigating a Random Slope		282	
	Defining Model 2 With SPSS Menu Commands		282	
	Interpreting the Output From Model 2		286	
	Model 3: Explaining Variation Between Variables		286	
	Defining Model 3 With SPSS Menu Commands		287 290	
	Interpreting the Output From Model 3 Developing a Cross-Classified Teacher Effectiveness Model		29:	
	The Data Structure and Model		29:	
	Research Questions		292	
	Model 1: Intercept-Only Model		293	
	Defining Model 1 With SPSS Menu Commands		29	
	Model 2: Defining the Cross-Classified Model With Previous Achievemen	ıt	300	
	Defining Model 2 With SPSS Menu Commands		30	1
	Interpreting the Output From Models 1 and 2		303	3
	Model 3: Adding Teacher Effectiveness and a Student Background Contro	1	30	4
	Defining Model 3 With SPSS Menu Commands		30.	5
	Interpreting the Output From Model 3		30	7
	Model 4: Adding a School-Level Predictor and a Random Slope		30	
	Defining Model 4 With SPSS Menu Commands		30	
	Interpreting the Output From Model 4		31	
	Model 5: Examining Level 3 Differences Between Institutions		31	
	Defining Model 5 With SPSS Menu Commands		31:	
	Interpreting the Output From Model 5		31	
	Model 6: Adding a Level 3 Cross-Level Interaction		31.	
	Defining Model 6 With SPSS Menu Commands		31. 31	
	Interpreting the Output From Model 6 Summary		31	
Chapter 9	Concluding Thoughts		31	9
References			32	3
Appendice	s			
•	x Statements		32	
	l Comparisons Across Software Applications		33	
Author Index			ు	ノ

Subject Index

341