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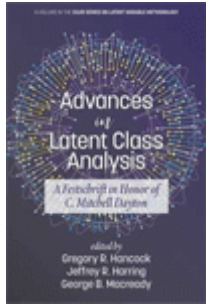***

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Advances in Latent Class Analysis
A Festschrift in Honor of C. Mitchell Dayton

Gregory R. Hancock, University of Maryland; Jeffrey R. Harring, University of Maryland; George B. Macready, University of Maryland

What is latent class analysis? If you asked that question thirty or forty years ago you would have gotten a different answer than you would today. Closer to its time of inception, latent class analysis was viewed primarily as a categorical data analysis technique, often framed as a factor analysis model where both the measured variable indicators and underlying latent variables are categorical. Today, however, it rests within much broader mixture and diagnostic modeling framework, integrating measured and latent variables that may be categorical and/or continuous, and where latent classes serve to define the subpopulations for whom many aspects of the focal measured and latent variable model may differ.

For latent class analysis to take these developmental leaps required contributions that were methodological, certainly, as well as didactic. Among the leaders on both fronts was C. Mitchell "Chan" Dayton, at the University of Maryland, whose work in latent class analysis spanning several decades helped the method to expand and reach its current potential. The current volume in the Center for Integrated Latent Variable Research (CILVR) series reflects the diversity that is latent class analysis today, celebrating work related to, made possible by, and inspired by Chan's noted contributions, and signaling the even more exciting future yet to come.

CONTENTS: Preface. Biographic Sketch of Chauncey Mitchell Dayton. Acknowledgments. On the Measurement of Noncompliance Using (Randomized) Item Response Models, *Ulf Böckenholt, Maarten Cruyff, Peter G. M. van der Heijden, and Ardo van den Hout.* Understanding Latent Class Model Selection Criteria by Concomitant-Variable Latent Class Models, *José G. Dias.* Comparison of Multidimensional Item Response Models: Multivariate Normal Ability Distributions Versus Multivariate Polytomous Ability Distributions, *Shelby J. Haberman, Matthias von Davier, and Yi-Hsuan Lee.* Nonloglinear Marginal Latent Class Models, Jacques A. Hagenaars, Wicher Bergsma, and Marcel Croon. Mixture of Factor Analyzers for the Clustering and Visualization of High-Dimensional Data, *Geoffrey J. McLachlan, Jangsun Baek, and Suren I. Rathnayake.* Multimethod Latent Class Analysis, *Fridtjof W. Nussbeck and Michael Eid.* The Use of Graphs in Latent Variable Modeling: Beyond Visualization, *Frank Rijmen.* Logistic Regression With Floor and Ceiling Effects: Fixed and Random Effects Models, *David Rindskopf and Patrick E. Shrout.* Model Based Analysis of Incomplete Data Using the Mixture Index of Fit, *Tamás Rudas, Emese Verdes, and Juraj Medzihorsky.* A Systematic Investigation of Within-Subject and Between-Subject Covariance Structures in Growth Mixture Models, *Junhui Liu and Jeffrey R. Harring.* Latent Class Scaling Models for Longitudinal and Multilevel Data Sets, *Jeroen K. Vermunt.* Modeling Structured Multiple Classification Latent Classes in Multiple Populations, *Xueli Xu and Matthias von Davier.* About the Editors.
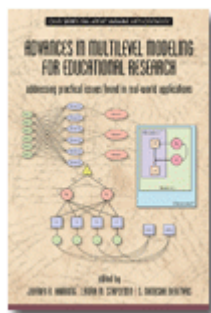
Advances in Multilevel Modeling for Educational Research
Addressing Practical Issues Found in Real-World Applications

Jeffrey R. Harring, University of Maryland; Laura M. Stapleton, University of Maryland; S. Natasha Beretvas, The University of Texas at Austin

The significance that practitioners are placing on the use of multilevel models is undeniable as researchers want to both accurately partition variance stemming from complex sampling designs and understand relations within and between variables describing the hierarchical levels of these nested data structures. Simply scan the applied literature and one can see evidence of this trend by noticing the number of articles adopting multilevel models as their primary modeling framework. Helping to drive the popularity of their use, governmental funding agencies continue to advocate the use of multilevel models as part of a comprehensive analytic strategy for conducting rigorous and relevant research to improve our nation's education system.

Advances in Multilevel Modeling for Educational Research: Addressing Practical Issues Found in Real-World Applications is a resource intended for advanced graduate students, faculty and/or researchers interested in multilevel data analysis, especially in education, social and behavioral sciences. The chapters are written by prominent methodological researchers

across diverse research domains such as educational statistics, quantitative psychology, and psychometrics. Each chapter exposes the reader to some of the latest methodological innovations, refinements and state-of-the-art developments and perspectives in the analysis of multilevel data including current best practices of standard techniques.

We believe this volume will be particularly appealing to researchers in domains including but not limited to: educational policy and administration, educational psychology including school psychology and special education, and clinical psychology. In fact, we believe this volume will be a desirable resource for any research area that uses hierarchically nested data. The book will likely be attractive to applied and methodological researchers in several professional organizations such as the American Educational Research Association (AERA), the American Psychological Association (APA), the American Psychological Society (APS), the Society for Research on Educational Effectiveness (SREE), and other related organizations.

CONTENTS: Foreword, *Sophia Rabe-Hesketh.* Preface, *Jeffrey R. Harring, Laura M. Stapleton, and S. Natasha Beretvas.* Acknowledgements. **PART I METHODOLOGICAL ISSUES IN MULTILEVEL MODELS.** The Discrepancy between Measurement and Modeling in Longitudinal Data Analysis, *Daniel J. Bauer and Patrick J. Curran.* Incomplete Multilevel Data: Problems and Solutions, *Joop Hox, Stef van Buuren, and Shahab Jolani.* Sampling Weight Considerations for Multilevel Modeling of Panel Data, *Laura M. Stapleton, Jeffrey R. Harring, and Daniel Y. Lee.* Residual Diagnostics and Model Assessment in a Multilevel Framework: Recommendations toward Best Practice, *Ann A. O'Connell, Gloria Yeomans-Maldonado, and D. Betsy McCoach.* **PART II HANDLING LONGITUDINAL DATA COMPLEXITIES: CROSSCLASSIFIED AND RANDOM EFFECTS LATENT VARIABLE MODELS.** Multilevel Cross-Classifi ed Testlet Model for Complex Item and Person Clustering in Item Response Data Analysis, *Hong Jiao, Akihito Kamata, and Chao Xie.* General Random Effect Latent Variable Modeling: Random Subjects, Items, Contexts, and Parameters, *Tihomir Asparouhov and Bengt Muthén.* N-Level Structural Equation Model of Student Achievement Data Nested with Repeated Teachers, Schools, and Districts, *Paras D. Mehta and Yaacov Petscher.* A Model for Cross-Classifi ed Nested Repeated Measures Data, *Jeffrey R. Harring, S. Natasha Beretvas, and Anita Israni.* Cross-classified Random Effects Models for Assessing Rater Severity and Differential Rater Functioning, *S. Natasha Beretvas, Daniel L. Murphy, and Matthew N. Gaertner.* **PART III. CAUSAL INFERENCE AND ADVANCED PSYCHOMETRIC MODELS.** Handling Measurement Error in Predictors with a Multilevel Latent Variable: Plausible Values Approach, *Ji Seung Yang and Michael Seltzer.* Mixture Modeling Methods for Causal Inference with Multilevel Data, *Jee-Seon Kim, Peter M. Steiner, and Wen-Chiang Lim.* Multilevel Social Network Models: Incorporating Network-Level Covariates into Hierarchical Latent Space Models. *Tracy Sweet and Qiwen Zheng.* Biographies.
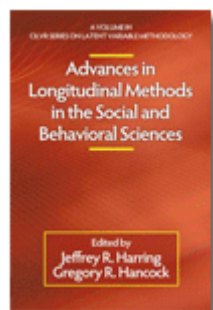
Advances in Longitudinal Methods in the Social and Behavioral Sciences

Jeffrey R. Harring, University of Maryland; Gregory R. Hancock, University of Maryland

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The importance that practitioners are placing on longitudinal designs and analyses signals a critical shift toward methods that enable a better understanding of developmental processes thought to underlie many human attributes and behaviors. A simple scan of one's own applied literature reveals evidence of this trend through the increasing number of articles adopting longitudinal methods as their primary analytic tools.

Advances in Longitudinal Methods in the Social and Behavioral Sciences is a resource intended for advanced graduate students, faculty, and applied researchers interested in longitudinal data analysis, especially in the social and behavioral sciences. The chapters are written by established methodological researchers from diverse research domains such as psychology, biostatistics, educational statistics, psychometrics, and family sciences. Each chapter exposes the reader to some of the latest methodological developments and perspectives in the analysis of longitudinal data, and is written in a didactic tone that makes the content accessible to the broader research community.

This volume will be particularly appealing to researchers in domains including, but not limited to: human development, clinical psychology, educational psychology, school psychology, special education, epidemiology, family science, kinesiology, communication disorders, and education policy and administration. The book will also be attractive to members of several professional organizations such as the American Educational Research Association (AERA), the American Psychological Association (APA), the American Psychological Society (APS), the Society for Research on Adolescence (SRA), the Society of Research in Child Development (SRCD), Society for Research in Adult Development (SRAD), British Psychological Society (BPS), Canadian Psychological Association (CPA), and other related organizations.

CONTENTS: Foreword. Preface. Acknowledgments. **PART I: MODELING LONGITUDINAL DATA: EXAMINING FACETS OF CHANGE OR VARIABILITY.** A Template for Describing Individual Differentces in Longitudinal Data, with Application to the Connection Between Learning and Ability, *Robert Cudeck and Casey L. Codd.* On Interpretable Reparameterizations of Linear and Nonlinear Latent Growth Curve Models, *Kristopher J. Preacher and Gregory R. Hancock.* Mood Changes Associated with Smoking in Adolescents: An Application of a Mixed-Effects Location Scale Model for Longitudinal Ecological Momentary Assessment Data, *Donald Hedeker and Robin J. Mermelstein.* Tethering Theory to Method: Using Measures of Intraindividual Variability to Operationalize Individuals' Dynamic Characteristics, *Nilam Ram, David Conroy, Aaron Pincus, Amanda Hyde, and Lauren Molloy.* Dynamic Systems Analysis of Affective Processes in Dyadic Interactions Using Differential Equations, *Emilio Ferrer and Joel Steele.* **PART II: DRAWING VALID INFERENCES: LONGITUDINAL DESIGN CONSIDERATIONS AND MODEL ASSUMPTIONS.** Sensitivity Analysis of Mixed-Effects Models When Longitudinal Data Are Incomplete, *Shelley A. Blozis.* Finite Mixtures of Nonlinear Mixed-Effects Models, *Jeffrey R. Harring.* Growth Mixture Modeling and Causal Inference, *Booil Jo.* **PART III: THE ROLE OF MEASUREMENT IN MODELING WITHIN-SUBJECT AND BETWEEN SUBJECT EFFECTS.** Disaggregating Within-Person and Between-Person Effects in Multilevel and Structural Equation Growth Models, *Patrick J. Curran, Taehun Lee, Andrea L. Howard, Stephanie Lane, and Robert MacCallum.* Considering Alternative Metrics of Time: Does Anybody Really Know What "Time" Is? *Lesa Hoffman.* Valid Measurement Without Factorial Invariance: A Longitudinal Example, *Michael C. Edwards and Robert J. Wirth.* The Discrimination-Sensoring Paradox in Item Response Growth Models, *Jennifer Koran.* About the Contributors.

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