



## Higher-Order Growth Curves and Mixture Modeling with Mplus: A Practical Guide (Multivariate Applications Series)

By Kandauda K.A.S. Wickrama, Tae Kyoung Lee, Catherine Walker O'Neal, Frederick O. Lorenz



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This practical introduction to second-order and growth mixture models using *Mplus* introduces simple and complex techniques through incremental steps. The authors extend latent growth curves to second-order growth curve and mixture models and then combine the two. To maximize understanding, each model is presented with basic structural equations, figures with associated syntax that highlight what the statistics mean, *Mplus* applications, and an interpretation of results. Examples from a variety of disciplines demonstrate the use of the models and exercises allow readers to test their understanding of the techniques. A comprehensive introduction to confirmatory factor analysis, latent growth curve modeling, and growth mixture modeling is provided so the book can be used by readers of various skill levels. The book's datasets are available on the web.

Highlights include:

- Illustrative examples using *Mplus* 7.4 include conceptual figures, *Mplus* program syntax, and an interpretation of results to show readers how to carry out the analyses with actual data.
- Exercises with an answer key allow readers to practice the skills they learn.
- Applications to a variety of disciplines appeal to those in the behavioral, social, political, educational, occupational, business, and health sciences.
- Data files for all the illustrative examples and exercises at [www.routledge.com/9781138925151](http://www.routledge.com/9781138925151) allow readers to test their understanding of the concepts.
- Point to Remember boxes aid in reader comprehension or provide in-depth discussions of key statistical or theoretical concepts.

Part 1 introduces basic structural equation modeling (SEM) as well as first- and

second-order growth curve modeling. The book opens with the basic concepts from SEM, possible extensions of conventional growth curve models, and the data and measures used throughout the book. The subsequent chapters in part 1 explain the extensions. Chapter 2 introduces conventional modeling of multidimensional panel data, including confirmatory factor analysis (CFA) and growth curve modeling, and its limitations. The logical and theoretical extension of a CFA to a second-order growth curve, known as curve-of-factors model (CFM), are explained in Chapter 3. Chapter 4 illustrates the estimation and interpretation of unconditional and conditional CFMs. Chapter 5 presents the logical and theoretical extension of a parallel process model to a second-order growth curve, known as factor-of-curves model (FCM). Chapter 6 illustrates the estimation and interpretation of unconditional and conditional FCMs. Part 2 reviews growth mixture modeling including unconditional growth mixture modeling (Ch. 7) and conditional growth mixture models (Ch. 8). How to extend second-order growth curves (curve-of-factors and factor-of-curves models) to growth mixture models is highlighted in Chapter 9.

Ideal as a supplement for use in graduate courses on (advanced) structural equation, multilevel, longitudinal, or latent variable modeling, latent growth curve and mixture modeling, factor analysis, multivariate statistics, or advanced quantitative techniques (methods) taught in psychology, human development and family studies, business, education, health, and social sciences, this book's practical approach also appeals to researchers. Prerequisites include a basic knowledge of intermediate statistics and structural equation modeling.

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## **Editorial Review**

### Review

*"This book goes way beyond the basics of growth curve modeling. The authors manage to explain complicated and potentially confusing models like factor-of-curves and curve-of-factors very well. I like the way they explain how to interpret the models, including substantive interpretations of real world examples."*  
- **Joop Hox, Utrecht University, The Netherlands**

"This timely work gives clear statistical advice and offers step-by-step coverage for Mplus users in the analysis of many kinds of growth curve models and also mixture models. A wealth of syntax examples and available data sets give additional opportunities for practice." - **Rex Kline, Concordia University, Canada**

"This book would be an excellent addition to graduate courses on the analysis of longitudinal data, advanced courses on structural equation modeling and multilevel regression, or for a workshop on how to conduct growth curve modeling analysis. This would also be an excellent resource for researchers conducting analyses of longitudinal data." - **Daniel W. Russell, Iowa State University, USA**

"The authors' approach to explaining statistical analysis is one of the best I've seen, and each chapter is clear and easy to read. ... I would recommend it to people attending courses I run in the Quantitative Research Methods Training Unit. ... This project fills a significant gap ... by providing step by step procedures in the application of latent growth modelling techniques and translating complicated statistical language into simple English." – **D. Daniel Boduszek, University of Huddersfield, UK**

"This book has the potential to contribute greatly to the field. ... A resource that integrates ... Mplus with the analysis of different kinds of growth models will be widely used. ... The style is straightforward and easy to follow. ... I would consider adopting it for my graduate course ... Longitudinal Research Methods & Analysis. ... I would seriously consider ... using it for both research and teaching needs." – **Joel Hektner, North Dakota State University, USA**

"Examples are provided to help researchers see how to apply the methodology with actual data, and interpret the results. ... The book will be of interest to students, faculty and researchers working with longitudinal data in such areas as behavioral science, business, social sciences, and human development and family studies. ... The book can be used ... in advanced undergraduate or graduate level statistics courses, or a welcome addition to the methodological reference resources for researchers." – **Lisa L. Harlow, University of Rhode Island, USA**

"I find the writing style simple and straightforward. ... I would recommend this book to my colleagues. ... It is appropriate ... for an advanced SEM course. ... The Mplus codes that accompany the models ... would be very helpful to researchers." – **Wen Luo, Texas A & M University, USA**

## About the Author

**Kandauda (K. A. S.) Wickrama** is a Georgia Athletic Association Endowed Professor in the Department of Human Development and Family Science at the University of Georgia.

**Tae Kyoung Lee** is a Senior Research Associate at the University of Miami in the Department of Public Health Sciences.

**Catherine Walker O'Neal** is an Assistant Research Scientist at the University of Georgia in the Department of Human Development and Family Science.

**Frederick O. Lorenz** is University Professor of Statistics and Psychology at Iowa State University.

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