



Introduction to MPlus for Latent Variable Modeling

Instructors: [Dr. Matthias Blümke](#), [Dr. Clemens Lechner](#)

Time: Thursday, January 31, 2019: 09.00 – 18.00 c.t.

Friday, February 01, 2019: 09.00 – 18.00 c.t.

Place: Feldkirchenstr. 21, **RZ/00.07**

Registration: Please send a mail to courses.bagss@uni-bamberg.de to register.

Registration Deadline: **Friday, 18 January 2018**

Description

This two-day course is an introduction to the statistical software Mplus. Mplus is a very flexible, powerful, and widely used software package for multivariate statistical models, including latent-variable models. Its capacities include – but are not limited to – exploratory (EFA) and confirmatory factor analysis (CFA), structural equation modelling (SEM), item response theory (IRT) models, multilevel models, and latent class analysis. Mplus can handle both continuous and categorical variables, provides different estimators and ways of handling missing data, and offers single-group and multiple-group analyses.

The first part of the course will familiarize participants with the basics of the Mplus. They will learn about the key features of Mplus, the typical Mplus work flow, and helpful resources to consult. Participants will learn how to prepare their data for Mplus and work with Mplus directly from SPSS, Stata, or R. They will become familiar with the structure of Mplus input and output files and the syntax of Mplus code.

The second part focuses on the practical implementation of basic and advanced CFA and SEM in Mplus. Using practical examples, participants will learn how to write Mplus input files for multivariate models, run these files, and interpret the output. Participants will learn how to represent a theoretical model in Mplus notation, how it can be applied to empirical data with the help of estimation algorithms, and how the fit between model and data can be assessed and outcomes interpreted. Throughout the course, different modeling techniques such as uni- and multidimensional measurement models (CFA), simultaneous CFA (SCFA) for testing

convergent/divergent validity, Multiple Group CFA (MGCFA) for measurement equivalence testing, higher-order CFA and bifactor models (general factor + method factor[s]) will be introduced. More advanced topics such as model constraints, estimation methods, and handling missing data will be covered.

Throughout the course, participants will consolidate the knowledge and skills acquired in parts 1–2 by learn to will develop statistical models that matches the research question and implement this model in Mplus. At participants' request, and only if time allows, additional topics (e.g., specific statistical models) may be covered.

Throughout the course, materials and data will be provided. Participants will work on examples provided by the lecturers. For the part of preparing data for Mplus, the needs of SPSS-, Stata- and R-users will be addressed.

MPlus Demo licenses are installed on the computers within the seminar room (RZ/00.07). If you intend to bring your own device, please install the [demo version](#) beforehand!

Day-to-day Schedule and Literature

Day	Topics
1	▪ Knowing the syntactical structure of Mplus code ▪ Preparing your data and creating Mplus readable data files ▪ Basic analytical commands ▪ Reading and interpreting your output ▪ Model identification and dealing with model estimation problems ▪ Latent variable models: Single-group CFA, Simultaneous CFA (SCFA) ▪ Mplus-Diagrammer
	Suggested reading (suggested, not compulsory): ▪ Geiser (2011/2012): Chapter 1, 2, Chapter 3.4 (CFA) ▪ Christ & Schlüter, 2011: 1-30
2	▪ Estimation procedures/algorithms and evaluating model fit ▪ Advanced latent variable modeling with model constraints ▪ Multi-group comparisons and measurement equivalence: MG-CFA ▪ Latent variable models: CFA with method factors; higher-order CFA; bifactor model
	Suggested reading (suggested, not compulsory): ▪ Geiser (2011/2012): Chapter 4.1.4 (Measurement Invariance); Chapter 4.2 (LST models = Latent-State-Trait Models) ▪ Brown (2007/2015): Chapter 7 (Multiple Groups/Equality Constraints); Chapter 8 (Higher-Order Factor Models); Chapter 9 (Categorical Data)

Target Group

Participants will find the course useful if they:

(On a more basic level)

- want to get an introduction into the Structural Equation Model (SEM) framework
- have had prior training on CFA/SEM, but still find the whole matter rather complicated
- they want to further their understanding of Mplus
- wish to assess measurement quality or use Mplus for Structural Equation Modeling in the future

(On the level of their research questions)

- work with models that involve a complex structure of variables involving latent concepts and their relationships to each other
- have a strong deductive framework and want to verify theoretical assumptions derived from substantive theories
- need to gather information on measurement quality (construct validity and reliability testing)

Recommended Reading

Exploratory vs confirmatory factor analysis: Brown, T. (2006/2015). *Confirmatory Factor Analysis for Applied Research* / 2nd edition. New York, NY: Guilford.

Introduction to SEM: Kline, R. B. (2015). *Principles and practice of structural equation modeling* (4th ed.). New York: Guilford.

Introductions to the Mplus software: Geiser, C. (2012). *Data Analysis with Mplus* (Series: Methodology in the Social Sciences). New York, NY: Guilford.

For participants who understand German:

Geiser, C. (2011). *Datenanalyse mit Mplus: Eine anwendungsorientierte Einführung* (2. Auflage). Wiesbaden, Germany: VS Verlag.

Additional Reading

Byrne, B.M. (2011). *Structural Equation Modeling with Mplus: Basic concepts, applications, and programming*. Hoboken, NJ: Taylor & Francis.

Muthén, L.K., & Muthén, B.O. (1998–2017). *Mplus User's Guide* (8th ed.). Los Angeles, CA: Muthén & Muthén. Available online at www.statmodel.com.

Tabachnick, B.G., & Fidell, L.S. (2012). *Using Multivariate Statistics* (6th ed.). Boston, MA: Pearson.

Wang, J., & Wang, X. (2012). Structural Equation Modeling: Applications using Mplus. West Sussex, UK: Wiley.

For participants who understand German:

Christ, O., & Schlüter, E. (2011). Strukturgleichungsmodelle mit Mplus: Eine praktische Einführung.

München, Germany: Oldenbourg Verlag.

About the Lecturers

Matthias Blümke is a senior researcher in the Department of Survey Design and Methodology at GESIS – Leibniz-Institute for the Social Sciences. He studied Psychology at the Universities of Trier and Heidelberg, and earned his doctoral degree in 2006. After spending two years as a postdoc at the University of Otago, Dunedin (New Zealand), he acquired a masters degree in medical biometry/biostatistics from the University of Heidelberg. In his research and service at GESIS, he is concerned with the validation of items and construction of questionnaires for social surveys. His research interests include methodological challenges such as between-group equivalence of measurement models as well as substantive research questions with regard to basic human traits, values, and cognition including psychological resources and behavior-in-context.

Clemens Lechner is the head of the team “Scale Development and Documentation” at the Department of Survey Design and Methodology at GESIS – Leibniz-Institute for the Social Sciences. He studied psychology and sociology in Jena and Warsaw (2005–2011) and earned his doctoral degree in developmental psychology (2014) at the Center for Applied Developmental Science in Jena. He was a postdoctoral fellow in the international “Pathways to Adulthood” program of the Jacobs foundation. His research interests concern the interplay of personality and contexts – from macro to micro – in shaping human development across the lifespan. He currently focuses on the effects of educational contexts on personality development and is concerned with methodological challenges in the assessment of self-reported personality.