Modeling Intensive Repeated Measures Data

2022 CASMA/GRSC Statistics and Assessment Institute, University of Iowa
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This workshop will address quantitative research using intensive repeated measures (longitudinal) data, such as collected in multiple-baseline intervention designs (e.g., multiple observations for each subject during baseline, intervention, and follow-up), or collected in ecological momentary assessment designs (e.g., over multiple days per respondent, and potentially multiple observations per day). The workshop will have a conceptual, applied focus, largely concentrating on the correspondence between research questions, study designs, and how different statistical models (e.g., multilevel/mixed-effects/hierarchical linear models; "dynamic" structural equation models) can be used to optimally provide the answers needed. The workshop is designed for anyone who wishes to learn more about planning and executing longitudinal research (students, postdocs, faculty, and staff). Previous background in general linear models (e.g., regression and analysis of variance) will be helpful, as an important topic to be covered is how models for intensive repeated measures data necessarily differ from general linear models. Resources will also be provided for how one might estimate the models for the examples described, such as within SPSS, SAS, Stata, R, and Mplus analysis software.

Day	Topic
May 31	Lecture 1: Introduction to Concepts and Terminology in Longitudinal Modeling
June 1	Lecture 2: Time-Invariant Predictors and Treatment Effects in Longitudinal Models
June 2	Lecture 3: Time-Varying Predictors and Their Levels of Relations in Longitudinal Models
June 3	Lecture 4: Three-Level Longitudinal Models for Ecological Momentary Assessment Data

Suggested Readings:

Bauer, D. J. (2003). Estimating multilevel linear models as structural equation models. *Journal of Educational and Behavioral Statistics, 28*(2), 135-167.

Berry, D., & Willoughby, M. (2017). On the practical interpretability of cross-lagged panel models: Rethinking a developmental workhorse. *Child Development, 88*(4), 1186-1206.

Curran, P. J., Lee, T., Howard, A. L., Lane, S., & MacCallum, R. (2012). Disaggregating within-person and between-person effects in multilevel and structural equation growth models. In J. R. Harring & G. R. Hancock (Eds.), *Advances in longitudinal methods in the social and behavioral sciences* (pp. 217–253). IAP Information Age Publishing.

Curran, P. J., Howard, A. L., Bainter, S. A., Lane, S. T., & McGinley, J. S. (2014). The separation of between-person and within-person components of individual change over time: A latent curve model with structured residuals. *Journal of Consulting and Clinical Psychology, 82*(5), 879-894.

Cushing, C. C., Walters, R. W., & Hoffman, L. (2014). Aggregated N-of-1 randomized controlled trials: modern data analytics applied to a clinically valid method of intervention effectiveness. *Journal of Pediatric Psychology, 39*, 138-150.

Hoffman, L. (2015). *Longitudinal Analysis: Modeling Within-Person Fluctuation and Change*. Routledge Taylor and Francis. Supplemental materials at http://www.PilesOfVariance.com/; UIowa library access is available here

Hoffman, L. (2019). On the interpretation of multivariate multilevel model parameters across different combinations of model specification and estimation. *Advances in Methods and Practices in Psychological Science, 2*(3), 288-311.

Hoffman, L., & Walters, R. W. (2022). Catching up on multilevel modeling. *Annual Review of Psychology, 73*, 629-658.

Lüdtke, O., Marsh, H. W., Robitzsch, A., Trautwein, U., Asparouhov, T., & Muthén, B. (2008). The multilevel latent covariate model: A new, more reliable approach to group-level effects in contextual studies. *Psychological Methods, 13*(3), 203-229.

Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*(3), 209-233.

Walters, R. W., Hoffman, L., & Templin, J. (2018). The power to detect and predict individual differences in intra-individual variability using the mixed-effects location-scale model. *Multivariate Behavioral Research, 53*(3), 360-374.

Yaremych, H.E, Preacher, K.J., & Hedeker, D. (2021). Centering categorical predictors in multilevel models: Best practices and interpretation. Forthcoming in *Psychological Methods*. https://psycnet.apa.org/doi/10.1037/met0000434