

Appendix A: Overview of Multilevel Modeling Texts and Suggested Readings

Textbooks for Multilevel Modeling

These texts cover multilevel modeling within the context of clustered (nested) observations primarily. They are ordered in terms of my opinion of their accessibility (most to least).

Kreft, I., & de Leeuw, J. (1998). *Introducing multilevel modeling*. Thousand Oaks, CA: Sage.

Heck, R. H., & Thomas, S. L. (2008). *An introduction to multilevel modeling techniques* (2nd ed.). New York: Routledge

Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). New York: Routledge.

Snijders, T. A. B., & Bosker, R. (1999 1st ed.; 2011 2nd ed.). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. Thousand Oaks, CA: Sage.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd Ed.). Thousand Oaks, CA: Sage.

These texts cover multilevel modeling within the context of longitudinal observations primarily. They are ordered in terms of my opinion of their accessibility (most to least).

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.

Fitzmaurice, G., Laird, N. M., & Ware, J. H. (2004). *Applied longitudinal analysis*. New York: Wiley.

Hedeker, D., & Gibbons, R. D. (2006). *Longitudinal data analysis*. New York: Wiley.

Verbeke, G., & Molenberghs, G. (2001). *Linear mixed models for longitudinal data*. New York: Springer-Verlag.

Diggle, P. J., Heagerty, P. J., Liang, K. Y., & Zeger, S. L. (2002). *Analysis of longitudinal data* (2nd ed.). New York: Oxford University Press.

These texts cover longitudinal models within the context of structural equation modeling.

Preacher, K. J., Wichman, A. L., MacCallum, R. C., & Briggs, N. E. (2008). *Latent growth curve modeling. Quantitative applications in the social sciences, #157*. Thousand Oaks, CA: Sage.

Bollen, K. A., & Curran, P. J. (2005). *Latent curve models: A structural equation perspective*. New York: Wiley.

Duncan, T. E., Duncan, S. C., Strycker, L. A., Li, F., & Alpert, A. (1999). *An introduction to latent variable growth curve modeling: Concepts, issues, and applications*. Mahwah, NJ: Erlbaum.

The latter chapters in this ANOVA text introduce MLM from the ANOVA perspective.

Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data*. Mahwah, NJ: Erlbaum.

Suggested Readings by Topic

Lectures 1 and 2. Introduction to MLM

- Snijders & Bosker ch. 1-2
- Singer & Willett ch. 1-2
- Raudenbush & Bryk ch. 2
- Hoffman ch. 1

Lecture 1. Review of General Linear Models

- Hedeker & Gibbons ch. 1-3
- Fitzmaurice, Laird, & Ware ch. 5-6
- Hoffman ch. 2-3

Lecture 2. Fixed vs. Random Effects of Time

Lecture 3. Polynomial Random Effects Models

- Singer & Willett ch. 3-4
- Hedeker & Gibbons ch. 4
- Willett, J.B. (1989). Some results on reliability for the longitudinal measurement of change: Implications for the design of studies of individual growth. *Educational and Psychological Measurement*, 49, 587-602.
- Snijders & Bosker ch. 12
- Hox ch. 5
- Raudenbush & Bryk ch. 6
- Hoffman ch. 4-6

Lecture 2. Alternative Metrics of Time

- Hoffman, L. (in press). *Considering alternative metrics of time: Does anybody really know what "time" is?* Forthcoming in G. Hancock & J. Harring (Eds.), *Advances in Longitudinal Methods in the Social and Behavioral Sciences*.
- Sliwinski, M. J., Hoffman, L., & Hofer, S. M. (2010). Evaluating convergence of within-person change and between-person age differences in age-heterogeneous longitudinal studies. *Research in Human Development*, 7(1), 45-60.
- Sliwinski, M. J., Hofer, S. M., Hall, C. B., Buschke, H., & Lipton, R. B. (2003a). Modeling memory decline in older adults: The importance of preclinical dementia, attrition, and chronological age. *Psychology and Aging*, 18(4), 658-671.
- Singer & Willett ch. 5
- Hoffman ch. 10 (not drafted yet)

Lecture 2. Within-Person Change vs. Within-Person Fluctuation

- Hoffman, L. (2007). Multilevel models for examining individual differences in within-person variation and covariation over time. *Multivariate Behavioral Research*, 42(4), 609-629. Available at: <http://digitalcommons.unl.edu/psychfacpub/417/>.
- Hoffman ch. 1

Lecture 3. Fun with Model Comparisons

- Singer & Willett ch. 4
- Snijders & Bosker ch. 6-7
- Raudenbush & Bryk ch. 3
- Stoel, R. D., Garre, F. G., Dolan, C., & van den Wittenboer, G. (2006). On the likelihood ratio test in structural equation modeling when parameters are subject to boundary constraints. *Psychological Methods*, 11(4), 439-455.
- Verbeke & Molenberghs ch. 5-6
- Hoffman ch. 3 and 5

Lecture 4. Piecewise (Spline) Random Effects Models

- Hernandez-Lloreda, M. V., Colmenares, F., & Martinez-Arias. (2004). Application of piecewise hierarchical linear growth modeling to the study of continuity in behavioral development of baboons (*Papio hamadryas*). *Journal of Comparative Psychology*, 118(3), 316-324.
- Singer & Willett ch. 5-6
- Hoffman ch. 6

Lecture 4. Negative Exponential (and other Nonlinear Models)

- Cudeck, R., & Harring, J. R. (2007). Analysis of nonlinear patterns of change with random coefficient models. *Annual Review of Psychology*, 58, 615-637.
- Grimm, K. J., & Ram, N. (2009). Nonlinear growth models in Mplus and SAS. *Structural Equation Modeling*, 16, 676-701.
- Hoffman ch. 6

Lecture 3. Interpreting Random Effects Variances and Covariances

- Rovine, M. J., & Molenaar, P. C. M. (1998). The covariance between level and shape in the latent growth curve model with estimated basis vector coefficients. *Methods of Psychological Research Online*, 3(2), 95-107.
- Snijders & Bosker ch. 4
- Hoffman ch. 5

Lecture 4. Alternative Covariance Structure Models

- Maxwell & Delaney ch. 13-15
- Singer & Willett ch. 7
- Snijders & Bosker ch. 12
- Fitzmaurice, Laird, & Ware ch. 7-8
- Hedeker & Gibbons ch. 6-7
- Wallace, D., & Green, S.B. (2002). Analysis of repeated measures designs with linear mixed models. In D.S. Moskowitz & S.L. Hershberger (Eds.), *Modeling intraindividual variability with repeated measures data* (pp. 103-134). Mahwah, NJ: Erlbaum.
- Hoffman ch. 4

Lecture 5. Time-Invariant Predictors

Lecture 6. Time-Varying Predictors and Centering Decisions

- Hoffman, L., & Stawski, R. (2009). Persons as contexts: Evaluating between-person and within-person effects in longitudinal analysis. *Research in Human Development*, 6(2-3), 97-100. Available at: <http://digitalcommons.unl.edu/psychfacpub/415/>.
- Hofmann, D. A., & Gavin, M. B. (1998). Centering decisions in hierarchical linear models: Implications for research in organizations. *Journal of Management*, 24(5), 623-641.
- Kreft, I. G. G., de Leeuw, J., & Aiken, L. S. (1995). The effect of different forms of centering in hierarchical linear models. *Multivariate Behavioral Research*, 30(1), 1-21.
- 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.
- Singer & Willett ch. 5
- Snijders & Bosker ch. 3-5
- Raudenbush & Bryk ch. 5
- Fitzmaurice, Laird, & Ware ch. 15
- Hedeker & Gibbons ch. 4
- Hoffman ch. 7-9 (chapter 9 not drafted yet)

Lecture 6. Assumptions of MLM

- Snijders & Bosker ch. 6, 9
- Raudenbush & Bryk ch. 9
- Hoffman ch. 9 (not drafted yet)

Lecture 5-6. Effect Size via Pseudo- R^2

- Snijders & Bosker ch. 7
- Hox ch. 4
- Raudenbush & Bryk ch. 5
- Hoffman ch. 7-9

Lecture 7. Two-Level Models for Clustered Observations

Lecture 9. Three-Level Models for Clustered Longitudinal Observations

- Raudenbush & Bryk ch. 5, 8
- Snijders & Bosker ch. 4-5
- Hedeker & Gibbons ch. 13

Lecture 8. Multilevel Models for Crossed Observations

- Raudenbush & Bryk ch. 12
- Snijders & Bosker ch. 11
- Hoffman ch. 15