

Child Language Doctoral Program (CLDP) 945: Advanced Multilevel Models

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Room:	3049 Dole	Office:	3042 Dole
Time:	MW 1:15–2:30	Office Hours:	MW 2:30–4:00 in 3049 Dole

Schedule of Topics and Events:

The online syllabus at the web address provided above will always have the most current information.

Course Objectives, Materials, and Pre-Requisites:

This course will continue to illustrate multilevel models (i.e., general linear mixed models, hierarchical linear models) for the analysis of longitudinal and repeated measures data, but will focus on more complex designs and advanced uses. After reviewing two-level longitudinal models, the course will cover multiple extensions, including models for accelerated time, cross-classification, univariate and multivariate models for time-varying predictors, three-level outcomes, and heterogeneity of variance. Class time will be devoted primarily to lectures and examples. Lecture materials in .pdf format will be available for download at the website above the day prior to class, or else paper copies can be requested. Video recordings of the class lectures will also be available online, but are not intended to take the place of class attendance. Selected book chapters and journal articles will be assigned for each specific topic as needed; the initial list of readings below may be updated. Because the course will have an applied focus using SAS software, instructor office hours will also be held in the 3049 Dole computer lab, in which participants will have opportunities to work on course assignments and receive immediate assistance. CLDP 945 has a pre-requisite of CLDP 944: Multilevel Models for Longitudinal and Repeated Measures Data (last offered Fall 2017). Participants should be comfortable with the CLDP 944 course material and SAS for mixed models prior to enrolling in this course.

Academic Honesty:

As a reminder, the University of Kansas has a formal policy on academic honesty. All assignments should be done individually without exception.

Accommodating Students with Disabilities:

Students with disabilities or who have other special needs are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation.

Course Requirements:

Participants will have the opportunity to earn **up to 100 total points** in this course. Up to **88 points** can be earned from **homework assignments** (one due approximately every two weeks). Up to **12 points** may be earned from **submitting outside-of-class quizzes**. Please note there will also be an opportunity to earn up to **3 points of extra credit** (labeled as homework 0; see the online syllabus for more information). There may be other opportunities to earn extra credit at the instructor's discretion.

Policy on Late Homework Assignments and Incompletes:

In order to be able to provide the entire class with prompt feedback, **late homework assignments will incur a 3-point penalty**. However, extensions will be granted as needed for extenuating circumstances (e.g., conferences, family obligations) if requested **at least two weeks in advance of the due date**. **Late or incomplete outside-of-class quizzes will incur a 1-point penalty when submitted**. Finally, a final grade of "incomplete" will only be given in the event of dire circumstances and at the instructor's discretion.

Any homework assignments that involve individual original writing will have the opportunity to be revised ONCE to earn the maximum total points. Written assignments **must be at least ¾ complete to be accepted, and late revisions will incur a 1-point penalty.** No late points will be returned through the revision process. Please use “track changes” and retain all original instructor comments (unless otherwise instructed) so that I can easily see how your revisions address the comments.

Final grades will be determined by the *proportion* earned out of the total possible points:

>92 = A, 90–92 = A–, 87–89 = B+, 83–86 = B, 80–82 = B–, < 80 = C or no pass

Course Software:

Participants will also need to have access to SAS software, which is freely available in 3049 Dole and in other computer labs across campus, as well as online through the KU Academic Computing Facility and by downloading the SAS University Edition (see course website for more info). Individual licenses can also be purchased from the KU software store (\$150 each; yearly renewal required).

Course Textbook:

Hoffman, L. (2015). *Longitudinal analysis: Modeling within-person fluctuation and change*. New York, NY: Routledge Academic.

Other Course Readings (all will be available via "Course Documents" on Blackboard):

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language*, 68, 255-278.

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

Bauer, D. (2009). A note on comparing the estimates of models for cluster-correlated or longitudinal data with binary or ordinal outcomes. *Psychometrika*, 74(1), 97-105.

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. C. (2012). *Disaggregating within-person and between-person effects in multilevel and structural equation growth models*. In G. Hancock & J. Harring (Eds.), *Advances in Longitudinal Methods in the Social and Behavioral Sciences* (pp. XX-XX). Charlotte, NC: 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.

Guo, G., & Wang, J. (2002). The mixed or multilevel model for behavior genetic analysis. *Behavior Genetics*, 32(1), 37-49.

Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. P. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, 20(1), 102-116.

Hedeker, D., & Mermelstein, R. J. (2012). Mood changes associated with smoking in adolescents: An application of a mixed-effects location scale model for longitudinal ecological momentary assessment (EMA) data. In G. Hancock & J. Harring (Eds.), *Advances in Longitudinal Methods in the Social and Behavioral Sciences* (pp. 59-79). Charlotte, NC: Information Age Publishing.

Hoffman, L. (2012). Considering alternative metrics of time: Does anybody really know what “time” is? In J. Harring & G. Hancock (Eds.), *Advances in Longitudinal Methods in the Social and Behavioral Sciences* (pp. 255-287). Charlotte, NC: Information Age Publishing.

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

- 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.
- Matuschek, H., Kliegl, R., Vasishth, S., Baayen, H., & Bates, D. (2017). Balancing Type I error and power in linear mixed models. *Journal of Memory and Language, 94*, 305-315.
- O'Keefe, P., & Rodgers, J. (2017). Double decomposition of level-1 variables in multilevel models: An analysis of the Flynn Effect in the NSLY Data. *Multivariate Behavioral Research, 52*(5), 630-647.
- Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2011). Alternative methods for assessing mediation in multilevel data: The advantages of multilevel SEM. *Structural Equation Modeling, 18*, 161-182.
- Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*(3), 209-233.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.
- Walters, R. W., & Hoffman, L. (2017). Applying the hierarchical linear model to longitudinal data. *Cultura y Educación, 29*(3), 666-701.

Tentative Schedule of Events:

Week	Date	Topics	Readings
1	1/15 1/17 1/19	NO CLASS OR OFFICE HOURS Course Introduction Lecture 1: Review of CLDP 944 NO HOMEWORK DUE	Hoffman ch. 1, 3-6
2	1/22 1/24 1/26	Lecture 1, continued QUIZ 1 DUE BY 1:00 PM VIA BLACKBOARD Story Time HOMEWORK 0 DUE BY 11:59 PM ONLINE: 3 points extra credit for testing the online homework system	Walters & Hoffman (2017) Hoffman ch. 2, 7
3	1/29 1/31 2/2	Lecture 2: Alternative Metrics of Time Example 2: Comparing Alternative Metrics of Time Lecture 2 and Example 2, continued HOMEWORK 1 DUE BY 11:59 PM ONLINE: Practice with Model-Predicted Fixed Effects	Hoffman ch. 10 sections 1-2 Hoffman (2012) O'Keefe & Rodgers (2017)
4	2/5 2/7 2/9	Lecture 3: Time-Varying Predictors of Within-Person Fluctuation Example 3a: Predicting Weekly Psoriasis from Weekly Stress QUIZ 2 DUE BY 1:00 PM VIA BLACKBOARD Lecture 3, continued Example 3b: Predicting Daily Glucose from Daily Negative Mood NO HOMEWORK DUE	Hoffman ch. 8 section 1-2 Hoffman ch. 8 section 3+
5	2/12 2/14 2/16	Lecture 3 and Example 3b, continued Lecture 3 and Example 3b, continued HOMEWORK 2 DUE BY 11:59 PM ONLINE: Growth Models for Accelerated Longitudinal Designs	
6	2/19 2/21 2/23	Lecture 4: Model Assumptions and Predicting Heterogeneity of Variance QUIZ 3 DUE BY 1:00 PM VIA BLACKBOARD Example 4: Predicting Within-Person Fluctuation and Heterogeneity NO HOMEWORK DUE	Hoffman ch. 7 Appendix Hoffman ch. 7 section 2C Hoffman ch. 8 section 3F Hedeker & Mermelstein (2012)

Week	Date	Topics	Readings
7	2/26	Lecture 5: Analysis of Crossed Repeated Measures Designs not Involving Time	Hoffman ch. 12
	2/28	Example 5a: Crossed Subjects and Items Lecture 5 and Example 5a, continued Example 5b: Analysis of Eye Movements	
	3/2	HOMEWORK 3 DUE BY 11:59 PM ONLINE: Univariate Approach to Time-Varying Predictors	
8	3/5	Lecture 6: Two-Level Models for Clustered Data Example 6a: Cross-Section Models for Children Nested in Schools	Raudenbush & Bryk (2002) ch. 5
	3/7	QUIZ 4 DUE BY 1:00 PM VIA BLACKBOARD Lecture 6 and Example 6a, continued	
	3/9	NO HOMEWORK DUE	
9	3/12	Lecture 6 and Example 6a, continued Example 6b: Cross-Classified Models for Clustered Data	Raudenbush & Bryk (2002) ch. 12
	3/14	Example 6c: Changes in Nesting over Time	Hoffman ch. 11 section 1, 3
	3/16	HOMEWORK 4 DUE BY 11:59 PM ONLINE: Crossed Random Effects Models	
10	3/19	NO CLASS OR OFFICE HOURS	
	3/21	NO CLASS OR OFFICE HOURS	
	3/23	NO HOMEWORK DUE	
11	3/26	Review of Two-Level Models	
	3/28	Lecture 7: Generalized Multilevel Models Example 7a: Clustered Models with Binary Outcomes	Hoffman ch. 13 sec. 2 Bauer (2009)
	3/30	HOMEWORK 5 DUE BY 11:59 PM ONLINE: Models for Clustered Observations	
12	4/2	Lecture 7 and Example 7a, continued	
	4/4	QUIZ 5 DUE BY 1:00 PM VIA BLACKBOARD Example 7b: Longitudinal Models with Ordinal Outcomes Example 7c: Longitudinal Models for Percent Correct	Hox (2010) ch. 6-7
	4/6	NO HOMEWORK DUE	
13	4/9	Lecture 8: Three-Level Random Effects Models Example 8a: Three-Level Models for Measurement Burst Designs	Hoffman ch. 10 section 3
	4/11	Lecture 8 and Example 8a, continued	
	4/13	HOMEWORK 6 DUE BY 11:59 PM ONLINE: Generalized Multilevel Models	
14	4/16	Example 8b: Three-Level Models for Clustered Longitudinal Data	Hoffman ch. 11 section 2
	4/18	QUIZ 6 DUE BY 1:00 PM VIA BLACKBOARD Lecture 9: Multivariate Longitudinal Models Example 9a: Multivariate Within-Person Fluctuation Example 9b: Multivariate Within-Family Change	Hoffman ch. 9
	4/20	NO HOMEWORK DUE	
15	4/23	Lecture 9, continued Example 9c: Mediation of Within-Person Fluctuation	Lüdtke et al. (2008) Preacher et al. (2010; 2011)
	4/25	Example 9c, continued	Hamaker et al. (2015)
	4/27	HOMEWORK 7 DUE BY 11:59 PM ONLINE: Three-Level Models	
16	4/30	Lecture 9, continued Example 9d: Seven Ways of Estimating Multivariate Change	Bauer (2003) Curran et al. (2012, 2014)
	5/2	Example 9d, continued Course Evaluations	Berry & Willoughby (2017)
	5/4	NO HOMEWORK DUE	
17	5/11	HOMEWORK 8 DUE BY 11:59 PM VIA BLACKBOARD: Multivariate Multilevel Models	