

Psychology 944: Multilevel Models for Longitudinal and Repeated Measures Data

Instructor:	Dr. Lesa Hoffman	Website:	http://psych.unl.edu/psycrs/944/index.html
Email:	Lesah@unl.edu	Phone:	(402) 472-6930
Room:	79 Burnett Hall	Office:	219 Burnett Hall (office hours in 234 Burnett)
Time:	10:30–12:20 WF	Office Hours:	Wednesdays and Fridays 2–4 PM

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 illustrate the uses of multilevel models (i.e., general linear mixed models, hierarchical linear models) for analysis of longitudinal and repeated measures data. The course is organized to take participants through each of the cumulative steps in a multilevel analysis: deciding which type of model is appropriate, organizing the data file and coding predictor variables, evaluating fixed and random effects and/or alternative covariance structures, predicting multiple sources of variation, and interpreting and presenting empirical findings. 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 will be provided in class. Audio/Video recordings of the class lectures in .mp4 format will also be posted 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 if needed. Because the course will have an applied focus using SAS software, instructor office hours will be held in the 234 Burnett computer lab, in which participants will have opportunities to work on course assignments and receive immediate software assistance.

Participants should be familiar with the general linear model (analysis of variance, regression) and repeated measures ANOVA prior to enrolling in this course (i.e., through PSYC 941, 942, and 943). Participants will also need to have access to SAS software, available in rooms 234, 227, and 230 Burnett. Student licenses can be purchased from the Psychology department (\$25; yearly renewal required).

Academic Honesty:

As a reminder, the University has a policy on academic honesty (see the Graduate Studies Bulletin for further details). All course assignments and individual projects should be done individually.

Accommodating Persons with Disabilities:

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of UNL to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

Course Requirements: Course performance will be evaluated as follows.

Homework Assignments (74 possible points): Throughout the semester, 8 online homework assignments will be administered in order to give participants practice applying techniques discussed in class and will be due as listed on the online syllabus. All homework assignments will be administered and submitted online at <http://psych.unl.edu/psycrs/944hw/index.asp>. Each assignment will be worth between **8 and 10 points** and will consist of data analysis, results interpretations, and questions about the topics assigned. There will also be a “homework 0” designed to familiarize participants with the online homework system and HCC access to SAS software that will be worth up to 3 bonus points.

In-Class Assessments (6 possible points): Throughout the semester, short questions about the course material will be asked in class that participants will be expected to answer immediately via paper and pencil. Accordingly, please bring some form of scrap paper to each class. Make-up questions may be given only in the event of advanced notice of a class absence.

Individual Project (20 possible points): Participants will get the opportunity to analyze data of their choosing to complete an individual project. Portions of the project will be due throughout the semester as noted in the online syllabus. Documents should be submitted electronically via the online homework system as a Microsoft Word document using this naming convention:

944_Section_Lastname_Firstname_Project#.docx (e.g., 944_1_Hoffman_Lesa_Project1.docx).

Please use **track changes** in Microsoft Word when revising parts of the project previously submitted.

Policy on Late Homework Assignments: In order to be able to provide the entire class with prompt feedback, any late homework assignment will incur a **3 point penalty** if submitted at any point past the due date. If extenuating obligations or circumstances will prevent you from completing any course requirements (e.g., conferences, family obligations), please contact the instructor at least three weeks advance so that we can create a modified deadline together.

Policy on Late Individual Projects: The due date for submitting the completed projects falls shortly before course grades are due. Therefore, **late projects will not be accepted.**

Policy on Assigning Incompletes: A grade of “incomplete” will be assigned ONLY in the case of extenuating circumstances that prevent participants from completing course requirements on time (e.g., a health emergency).

Final grades will be determined by number of points earned out of 100 possible points:

≥97 = A+ 93-96 = A 90–92 = A- 87-89 = B+ 83-86 = B 80-82 = B- < 80 = C or no pass

Electronic readings will be available for download from the online homework portal.

These will include the following textbook chapters, other book chapters, and journal articles:

Curran, P. J., & Bauer, D. J. (2007). Building path diagrams for multilevel models. *Psychological Methods*, 12(3), 283-297.

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, 12(2), 121-138.

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 J. Harring & G. Hancock (Eds.), *Advances in longitudinal methods in the social and behavioral sciences*.

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

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*.

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.

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

Raudenbush, S.W., Brennan, R.T., & Barnett, R.C. (1995). A multivariate hierarchical model for studying psychological change within married couples. *Journal of Family Psychology*, 9(2), 161-174.

- Sayer, A. G., & Klute, M. M. (2005). Analyzing couples and families. In V. L. Bengtson, A. Acock, K. R. Allen, P. Dilworth-Anderson & D. M. Klein (Eds.), *Sourcebook of family theory and research* (pp. 289-313). Thousand Oaks, CA: Sage.
- Sliwinski, M. J., & Buschke, H. (2004). Modeling intraindividual cognitive change in aging adults: Results from the Einstein Aging Studies. *Aging, Neuropsychology, and Cognition*, 11(2-3), 196-211.
- 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.
- 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.

Tentative Schedule of Events:

Week	Date	Topics and Downloads	Readings
1	1/9	Lecture 1: Introduction to Analysis of Longitudinal and Repeated Measures Data	Hoffman ch. 1; Willett (1989)
	1/10	HOMEWORK #0 (online portion) DUE MONDAY 1/14 BY 11:59 PM	
	1/11	Lecture 2: Interpreting General Linear Models Example 2: Practice with Interactions	Hoffman ch. 2
2	1/16	Lecture 3: Introduction to Within-Person Analysis and RM ANOVA Example 3a: Between vs. Within-Person Models	Hoffman ch. 3 sec. 1
	1/17	HOMEWORK #1 DUE THURSDAY 1/24 BY 11:59 PM	
	1/18	Lecture 3, continued Example 3b: Repeated Measures Analysis of Variance	Hoffman ch. 3 sec. 2-6
3	1/23	Lecture 4: Describing Within-Person Fluctuation over Time via ACS Models Example 4: Within-Person Fluctuation in Symptom Severity over Time	Hoffman ch. 4 sec. 1-2
	1/24	HOMEWORK #2 DUE THURSDAY 1/31 BY 11:59 PM	
	1/25	Lecture 4 and Example 4, continued	Hoffman ch. 4 sec. 3-6
4	1/30	Lecture 5: Introduction to Random Effects of Time and Model Estimation Example 5: Practice with Random Effects	Hoffman ch. 5 sec. 1-2
	1/31	HOMEWORK #3 DUE THURSDAY 2/7 BY 11:59 PM	
	2/1	Lecture 5, continued	Hoffman ch. 5 sec. 3-6
5	2/6	Lecture 6: Describing Within-Person Change Example 6a: Polynomial Models of Change	Hoffman ch. 6 sec. 1-2A
	2/7	PROJECT PART 1 DUE THURSDAY 2/14 BY 11:59 PM	
	2/8	Lecture 6, continued Example 6b: Piecewise Models of Change	Hoffman ch. 6 sec. 2B
6	2/13	Lecture 6 and Example 6b, continued Example 6c: Negative Exponential and Other Nonlinear Models of Change	Hoffman ch. 6 sec. 2C-6
	2/14	HOMEWORK #4 DUE THURSDAY 2/21 BY 11:59 PM	
	2/15	Lecture 7: Time-Invariant Predictors in Longitudinal Models Example 7a: Time-Invariant Predictors in Models of Fluctuation	Hoffman ch. 7 sec. 1-2
7	2/20	Lecture 7, continued Example 7b: Time-Invariant Predictors in Models of Change	Hoffman ch. 7 sec. 3-6
	2/21	HOMEWORK #5 DUE MONDAY 3/4 BY 11:59 PM	
	2/22	NO CLASS	

Week	Date	Topics and Downloads	Readings
8	2/27	Lecture 7 and Example 7b, continued	Hedeker et al. (2012)
	2/28	HOMEWORK #6 DUE THURSDAY 3/7 BY 11:59 PM	
	3/1	Lecture 8: Analysis of Repeated Measures Designs not Involving Time Example 8a: Crossed Persons and Words	Hoffman ch. 15 sec. 1-2
9	3/6	Example 8b: Analysis of Eye Movements	Hoffman ch. 15 sec. 3-6
	3/7	HOMEWORK #7 DUE THURSDAY 3/14 BY 11:59 PM	
	3/8	Group Discussion of Individual Projects	
10	3/13	Lecture 9: Time-Varying Predictors in Models of Within-Person Fluctuation Example 9: Predicting Daily Glucose from Daily Negative Mood	Hoffman ch. 8 sec. 1-2B
	3/14	HOMEWORK #8 DUE THURSDAY 3/28 BY 11:59 PM	
	3/15	Lecture 9 and Example 9, continued	Hoffman ch. 8 sec. 2C-6
11	3/20	NO CLASS	
	3/21	NO NEW HOMEWORK	
	3/22	NO CLASS	
12	3/27	Lecture 10: Multilevel Models for Clustered Data Example 10: Modeling Children Nested within Schools	Raudenbush & Bryk (2002) ch. 5
	3/28	PROJECT PARTS 1 and 2 DUE THURSDAY 4/4 BY 11:59 PM	
	3/29	Lecture 10 and Example 10, continued	Enders & Tofighi (2007); Hofmann & Gavin (1998)
13	4/3	Lecture 11: Time-Varying Predictors in Models of Within-Person Change Example 11: Predicting Change in Cognition from Change in Physical Function	Hoffman ch. 9; Sliwinski & Buschke (2004); Curran & Bauer (2007)
	4/4	PROJECT PARTS 1, 2, and 3 DUE THURSDAY 4/18 BY 11:59 PM	
	4/5	Lecture 12: Evaluating Alternative Metrics of Time Example 12: Alternative Models of Aging	Hoffman (2012); Sliwinski, Hoffman, & Hofer (2010)
14	4/10	Lecture 13: Multivariate Longitudinal Models Example 13a: Multivariate Fluctuation Models	Raudenbush et al. (1995)
	4/11	FEEDBACK AVAILABLE FOR PROJECT PART 2; NO NEW HOMEWORK	
	4/12	Lecture 13, continued Example 13b: Longitudinal Difference Score Models	
15	4/17	Example 13c: Multivariate Longitudinal Models for Family Data	Sayer & Klute (2005)
	4/18	NO NEW HOMEWORK	
	4/19	Lecture 14: Three-Level Models Example 14: Models for Clustered Longitudinal Data	Raudenbush & Bryk (2002) ch. 8
16	4/24	Course Evaluations Lecture 14 and Example 14, continued	
	4/25	FEEDBACK AVAILABLE FOR PROJECT PART 3; NO NEW HOMEWORK	
	4/26	NO CLASS	
17	5/3	COMPLETED PROJECT DUE FRIDAY 5/3 BY 11:59 PM	