

## Psychology 878: Hierarchical Linear Modeling

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Spring 2017  
TR 2:00-3:15pm  
002 McKinly Lab

Instructor: Lisa Jaremka, PhD  
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Office Hrs: Thursdays 12:00-2:00pm  
Location: 105 McKinly Lab

**Website:** <http://sakai.udel.edu/portal>

**Textbook:** Bickel, R. (2007). *Multilevel analysis for applied research: It's just regression!* Guilford Press.

Optional: Heck, R.H., Thomas, S.L., & Tabata, L.N. (2013). *Multilevel and Longitudinal Modeling with IBM SPSS*, 2<sup>nd</sup> edition. Routledge Publishing.

NOTE: Additional readings may be assigned via Sakai and/or the library

### **Prerequisites:**

Students should have taken courses on ANOVA and multiple linear regression, and have a solid understanding of these topics. Students must also have a basic understanding of IBM SPSS, including syntax commands, as this will be the primary program used throughout the course. If you are unsure if this course is right for you, please see me as soon as possible and we can figure it out together.

### **Goals of the Course:**

The goal of this course is to provide a detailed introduction to the basic concepts in hierarchical linear modeling (HLM; also called multilevel modeling and linear mixed modeling). The basics of HLM are manageable and can be understood by most regular statistics users. However, HLM can become complicated fairly quickly once you get into advanced topics. Accordingly, we will focus on mastering the basics in this course, and leave the advanced topics for your future learning endeavors. Some examples of advanced topics that will not be covered in this class are: categorical outcomes, multivariate outcomes, multilevel survival analyses, and power analyses. Mastering the basics is essential for understanding this type of analysis, and so having a solid foundation will allow you to learn more advanced topics throughout your career.

HLM is a data analytic technique that is used when there is some form of dependency in the data - that is, when people or observations are more similar to each other than they would be to other people or observations. This dependency occurs in many different contexts. For example, repeated assessments of the same person, students who are grouped within classrooms, or people who are grouped within families. HLM provides a way to account for the dependency that is inherent in these types of data, while also allowing us to answer many

interesting questions!

All assignments and in-class exercises are designed to maximize your achievement of the following learning goals. By engaging fully in these activities, by the end of the semester you will be able to:

- Understand when we would use HLM and why
- Understand how to construct a multilevel model, choose random and/or repeated effects, and specify covariance structures
- Understand IBM SPSS syntax for the mixed command and how to interpret the output
- Understand how to problem solve if your model won't converge and how to check your own work
- Identify and implement the steps for model building (either bottom-up or top-down)
- Apply the concepts learned in class to a research question you generated

### Elements of Your Grade:

**Final grades** are non-negotiable – grade changes will be made only to correct clerical errors. Your *total points* will be based on the following components:

Exams	50%
Final Project	20%
Meeting about Final Project	10%
Participation	10%
HW Assignments	10%

### Exams:

There are two open-notebook take home exams in this course. All of the work that you turn in should be yours and yours alone. Do not copy your answers from another student! Since these will be take home exams and you will have a week to complete each, I will not allow make-up exams (except in the case of a documented emergency that spans the entire time of the exam period). Late exams will receive a 5% grade reduction for every day late.

### Final Project

You will complete a final project that involves generating a multilevel research question, building a model, analyzing the data, and writing up the results. This project will be worth 20% of your final grade. Around half-way through the semester, you will also need to come to my office hours to discuss ideas for your final project. This meeting will be worth 10% of your final grade. Details about the final project and the meeting will be discussed in class and posted on Sakai.

### Participation

Your participation grade will largely stem from completing the in-class activities. They will not

be announced ahead of time. However, we typically complete an activity in each class. The activities will be graded as participation points (i.e., if you turn something in with your name on it, you get credit). It is your responsibility to attend class, or make alternative arrangements with me ahead of time if you need to miss a specific class.

### **HW Assignments**

There will be a number of HW assignments. Every HW assignment will be announced ahead of time. Accordingly, you can plan in advance for any scheduling conflicts you might encounter. We will use a self-grading policy that is posted on Sakai in a separate document.

### **Academic Integrity:**

Academic dishonesty is unacceptable under all circumstances. All exam work in this class is to be your own. All written work is to be your own. It is not acceptable to re-use the exact wording that I provide in my answer keys; you must re-word using your own words. You are responsible for keeping drafts, references, and backup copies of all of your written assignments, to turn in upon my request until final grades are completed. If I discover that you have copied all or part of an exam or written assignment from another source (including another student, a web page, a textbook, my handouts, or other published source), you will be reported to the Office of Student Conduct for disciplinary action (I usually recommend an F grade in the course). To avoid plagiarizing, you must educate yourself about appropriate citation procedures and follow them carefully. When in doubt, ask. Please do not put your career at risk!

### **Students with Disabilities:**

If you need special academic accommodations due to a documented physical or sensory disability, please contact the Office of Disability Support Services at [www.udel.edu/DSS/](http://www.udel.edu/DSS/) *during the first two weeks of class*. The office provides academic support services to eligible students with temporary and permanent disabilities.

### **General Note:**

I support LGBTQ+ people, and people of all nationalities, races, religions, ethnicities, abilities, and gender identities. This means that everyone is welcome in this class. My goal is to foster an environment that embraces diversity of all kinds, so please let me know if there is anything I can do to improve the class along these lines.

### Lecture Schedule and Reading Assignments

Class	Day	Date	Topic	Readings and Assignments	HW Assignments
1	T	2/7	Overview and introductions	Reading supplement: Pages 2-3	
2	R	2/9	GLM - Data Preparation	Reading supplement: Pages 4-6	
3	T	2/14	GLM - Main Effects and Interactions 1	Reading supplement: Pages 7-10	
4	R	2/16	GLM - Main Effects and Interactions 2	Reading supplement: Pages 7-10	
5	T	2/21	GLM - Main Effects and Interactions 3		HW Assigned
6	R	2/23	What is HLM and Why Do We Use It?	Book: Chapter 1	
7	T	2/28	Some HLM basics	Book: Chapter 2	HW 1a Due 2/28
8	R	3/2	Handling dependency 1	Book: Chapter 3 Reading supplement: Pages 11-17	HW 1b Due 3/3
9	T	3/7	Handling dependency 2		HW 2 Assigned
10	R	3/9	Random intercepts vs slopes	Book: Chapter 4	HW 2a Due 3/11
11	T	3/14	Covariance Structures	Reading supplement: Pages 23-26 Start meetings to discuss final project	HW 2b Due 3/14 HW 3 Assigned
12	R	3/16	Model fit indices and other output		HW 3a Due 3/18
13	T	3/21	Mixed versus other Analyses	Reading supplement: Page 18-22	HW 3b Due 3/21
14	R	3/23	Class Cancelled - Work on Exam #1	Exam #1 DUE (covers up to lecture 12)	

15	T	3/28	Class Cancelled - Spring Break		
16	R	3/30	Class Cancelled - Spring Break		
17	T	4/4	HLM Equation 1	Book: Chapter 5	
18	R	4/6	Class Cancelled - Out of Town		
19	T	4/11	HLM Equation 2	Book: Chapter 5	
20	R	4/13	Centering	Book: Pages 134-143	HW 4 Assigned
21	T	4/18	Misc Extra Topics	Reading supplement: Pages 27-32	
22	R	4/20	Model building - Bottom Up	Hox Chapter 4 - posted on Sakai	HW 4a Due 4/20
23	T	4/25	Model building - Top Down		HW 4b Due 4/25
24	R	4/27	Semi-Advanced #1 (changes over time)	Book: Chapter 11	
25	T	5/2	Semi-Advanced #2 (changes over time)		HW 5 Assigned
26	R	5/4	Semi-Advanced #3 (mediation)		
27	T	5/9	Semi-Advanced #4 (3+ levels)	Book: Chapter 8	HW 5a Due 5/9
28	R	5/11	Writing up results		HW 5b Due 5/11
28	T	5/16	Class Cancelled - Work on Exam #2	Exam #2 DUE (covers up to lecture 27)	
		TBA		Final Project DUE via Sakai	

\*Schedule and readings subject to change