PSYC 646 – Longitudinal Data Analysis

**Fall 2019**

Tuesdays & Thursdays 9:00–10:15

Innovation Hall 333

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**Course Description**

The purpose of this course is to train students to think deeply about techniques for measuring developmental change across lifespan. As such, we focus on sophisticated techniques for measuring change that can be used with repeated measures of individuals. Although many of the techniques are special cases of familiar statistical techniques (e.g., regression), many additional opportunities and considerations need to be explored in a focused, supported way. With this in mind, the course will introduce students to using Hierarchical Linear Modeling (HLM) and Structural Equation Modeling (SEM) to analyze longitudinal datasets.

**Student Learning Objectives:**

* Analyze and interpret multi-level analyses
* Describe multi-level models from equations and convert research questions into equations
* Account for missing data through multiple imputation and full information maximum likelihood estimation
* Perform nested comparisons of SEM models
* Analyze and interpret transactional and growth SEM models
* Perform multigroup analyses
* Apply statistical techniques to a dataset

**Textbook and Readings**

Raudenbush, S. W., & Bryk, A. S. (2001). [Hierarchical linear models: Applications and data analysis methods.](http://smile.amazon.com/Hierarchical-Linear-Models-Applications-Quantitative/dp/076191904X/ref%3Dsr_1_1?s=books&ie=UTF8&qid=1401716307&sr=1-1&keywords=hierarchical+linear+models) London: Sage Publications. ISBN-10: 076191904X

Selected articles (download from Blackboard)

**Course Requirements and Assignments**

1) **Attendance** (10%) You need to be in class if you are going to learn this material.

2) **Exams** (40%) There will be two take-home exams. One will largely cover HLM and the other will cover SEM. The exams will be distributed in class and will be due (approximately) one week later as defined below. The exams are to be done individually with no outside help from another person.

3) **Weekly Assignments** (25%) There are going to be assignments of varying intensity and difficulty that require you to apply your knowledge of material from class to additional questions, data, et cetera. Some of these assignments will be directly related to the poster assignment.

4) **Poster** (25%) Students will analyze a longitudinal, developmental dataset from beginning to end and present it in poster form at the end of the course. Students will need to choose a dataset, decide on research questions, decide on a data analysis plan, implement data analyses, interpret the results, and summarize salient pieces into a poster.

*Datasets.* Students may use their own data set (if one is available to them, if it is longitudinal, with at least three time points AND if it is approved by the instructor) or one provided by the instructor. The data must already be in some kind of electronic form (i.e., database, spreadsheet, or statistical package file). Because of the depth of the work and the fact that the end result of this project may be eventually worthy of publication, students are encouraged to obtain a dataset with which they have some reasonable personal interest/commitment. It is expected that multiple office meetings between students and the instructor/TA will be needed in order to complete the assignment. Also see data provided by ICPSR at the University of Michigan, Open Science, and the Databrary at NYU.

**Grading Scale**

Grades will be calculated as follows: > 93% = A, 90 – 92% = A-, 87 – 89% = B+, 83 – 86% = B, 80 – 82% = B-, 70 – 79% = C, 60 – 69% = D, < 60% = F

**Software & Computers**

Three software packages will be needed at various points in the class: SPSS, HLM, and ΩNYX. SPSS and ΩNYX are the full versions while HLM is the student version. Some SPSS functionality may be replaced by Excel, but I cannot promise that SPSS can be totally replaced by it. A student version of HLM is available for free download for use on personal computers.

Students in this course are expected to behave at all times in a manner consistent with the GMU Honor System and Code. (<http://mason.gmu.edu/~montecin/plagiarism.htm>). Students are encouraged to study together as much as possible throughout the course, however, no assistance, sharing of information, or discussion of test items or answers between students may take place. For all work, the name that appears on the paper must be the author. Violations of the Honor Code will not be tolerated in this course and will be immediately reported according to GMU procedures. The instructor reserves the right to use software to determine the extent to which the work is the student’s. The instructor for this course reserves the right to enter a failing grade to any student found guilty of an honor code violation.

Students may not reproduce (including uploading to the Internet) any portion of any test. Students who attempt to photograph or in any way capture information about tests for others’ use will be reported for an honor violation, even if the violation happens after the end of the term.

**Miscellaneous**

The deadlines for adding and dropping classes are as follows:

Last Day to Add Classes- September 3

Drop Deadline with no tuition penalty- September 9

<https://registrar.gmu.edu/calendars/fall-2019/>

Classes may be cancelled by either the University or the Instructor (via email). In the event of a cancelled class, the instructor will either try to make up the material during other meetings of the class or provide a supplementary assignment/video.

Notice of mandatory reporting of sexual assault, interpersonal violence, and stalking. As a faculty member, I am a designated a “Responsible Employee,” and must report all disclosures of sexual assault, interpersonal violence, and stalking to Mason’s Title IX Coordinator per University Policy 1412. If you wish to speak with someone confidentially, please contact one of Mason’s confidential resources, such as Student Support and Advocacy Center (703-993-2380). You may seek assistance from Mason’s Title IX Coordinator by calling 703-993-8730.

Official Communications via GMU E-mail: Mason uses electronic mail to provide official information to students. Examples include communications from course instructors, notices form the library, notices about academic standing, financial aid information, class materials, assignments, questions, and instructor feedback. Students are responsible for the content of university communication sent to their mason e-mail account and are required to activate that account and check it regularly.

Any video/audio recording of classroom lectures is not allowed without explicit permission by the instructor. Any video recordings of the course provided by the instructor are shared with the understanding that they will not be shared with others not enrolled in the course without the explicit permission of the instructor.

Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu | Phone: (703) 993-2474

Information about Student Privacy and Student Rights under FERPA can be found at: <http://registrar.gmu.edu/ferpa/>

Life is stressful and we all need a little support sometimes. Students are encouraged to contact Counseling Services (364 Student Union I) at 993-2385 for assistance with any kind of psychological/life problem or crisis situation. I can help with referrals for students with particular counseling needs so please feel free to talk with me for help with anything.

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| **Tentative Course Schedule** |
| Date | Topic | Assignment | Reading |
| 8/27/19 | HLM Intro--equations, random v. fixed effects | Describe Interests Paragraph | R&B Ch. 1 & 2 |
| 8/29/19 | HLM--Specifying multi-level equations, making MDMs |  | R&B Ch. 3 |
| 9/3/19 | HLM--running models practice | Working with HLM Part I | R&B Ch. 4 |
| 9/5/19 | HLM--running models practice | Working with HLM Part II | Raudenbush et al. (2004) *HLM 6,* Ch. 2 |
| 9/10/19 | HLM--running models practice | Finish HLM Part III | Exemplar: Rimm-Kaufman et al. (2009)  |
| 9/12/19 | Moderation in multi-level models |  | Peugh (2009) |
| 9/17/19 | HLM Workshop | Finish HLM Workshop | Enders & Tofighi (2007) |
| 9/19/19 | HLM Growth |  | R&B Ch. 6 |
| 9/24/19 | HLM Growth | HLM Growth | Fairchild & McQuillin (2010)  |
| 9/26/19 | Missing Data: Mean, Single, Stochastic, Multiple Imputation | Multiple Imputation | Enders (2013)  |
| 10/1/19 | Missing Data: Analyzing Multiply Imputed Data with Blimp 2 | Poster: "Intro" and RQs | Davis-Kean et al (2015) |
| 10/3/19 | Catch Up Day, [Mplus TYPE=COMPLEX] | **EXAM 1 Out** |  |
| 10/8/19 | Poster Check in |  | Loehlin (2004)  |
| 10/10/19 | SEM Intro | **Exam 1 Due** | [Ωnyx User Manual](http://onyx.brandmaier.de/userguide.pdf) |
| 10/15/19 | **NO CLASS - MONDAY CLASSES MEET** |  |  |
| 10/17/19 | Ωnyx Tutorials | CFA | Oertzen et al (2015) |
| 10/22/19 | SEM - path analysis | Poster: Codebook |  |
| 10/24/19 | SEM - transactional |  | Exemplar: Verboom et al (2013) |
| 10/29/19 | SEM - growth | Poster: Analysis Plan | Hamaker et al (2015) |
| 10/31/19 | SEM - growth & latent basis growth |  | Exemplar: Curby et al. (2008) |
| 11/5/19 | SEM - bivariate growth | SEM Growth |  |
| 11/7/19 | SEM- multi-group analysis |  |  |
| 11/12/19 | SEM- multi-group analysis (re-do path analysis) | Poster: Results | Selig & Preacher (2009) |
| 11/14/19 | SEM- multi-group analysis |  |  |
| 11/19/19 | Latent Difference Score Model | **Poster Rough Draft Due; Exam 2 OUT** | Grimm et al (2016) |
| 11/21/19 | SEM- Onyx imputation, factor scores, Bayesian |  |  |
| 11/26/19 | Poster Check in | **EXAM 2 DUE** |  |
| 11/28/19 | **NO CLASS THANKSGIVING** |  |  |
| 12/3/19 | Student Poster Presentations |  |  |
| 12/5/19 | Student Poster Presentations |   |   |