Enrollment Restrictions
Enrollment in this course is restricted to graduate students in Psychology who have completed either PSY9555A/B or PSY9542A/B or PSY9545A as well as any student in another program (pending class size) who has completed one of the above-mentioned courses and has obtained special permission to enroll in this course from the course instructor as well as the Graduate Chair (or equivalent) from the student’s home program.

Instructor and Information
Instructor: Paul F. Tremblay
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Office Phone: (519) 661-2111 x85644
Office Hours: by appointment
Email: ptrembla@uwo.ca

Course Description
This advanced course focuses on various techniques within the domain of structural equation modeling and multilevel modeling to analyze repeated-measures, particularly longitudinal data. Topics within the SEM domain will include longitudinal measurement models, basic panel models with autoregressive and cross-lagged processes, latent growth curve models, growth mixture models (to investigate prototypical trajectories), longitudinal mediation models and multiple group models. Within the MLM domain, topics will include models for multiple repeated observations (e.g., diary data, ecological momentary assessment) and time-variant and time-invariant covariates. Other topics will include missing data techniques, improving the longitudinal component of randomized controlled trials, discontinuity regression models, power, and modeling approaches for non-continuously distributed outcome variables. The course involves hands-on projects in which students have the opportunity to analyze their own data, simulated data or data provided in class. Most of the examples in the lecture material are based on the software program Mplus, R, and SPSS Mixed Models but students are free to work in the software of their choice.

Course Format
Lectures in person

version 06/14/2022
Course Learning Outcomes/Objectives

The objective of this course is to provide students with the necessary knowledge to design state-of-the-art longitudinal (and related design) studies, conduct and interpret analyses using structural equation modeling and multilevel modeling approaches. This will be achieved from three angles: (1) comprehensive lectures that incorporate theory, design issues, and analytic procedures based on the most up-to-date methods (2) practice assignments that focus on three building blocks, (3) an individualized project that includes all stages from conceptualization, writing a proposal, conducting necessary main analyses, addressing missing data and statistical power, and writing and presenting the final report. I will provide lecture style presentations borrowing extensively from the readings, and therefore students are encouraged to immerse themselves in the readings on a weekly basis. By the end of the course, students should:

1. have developed a comprehensive knowledge of methods and concepts in longitudinal research.
2. be able to conduct longitudinal analyses including missing data analysis and power analyses.
3. be able to write an empirical research paper using longitudinal methods from start to finish.
4. be able to write competitive and novel pre-registered reports, proposed studies for their own graduate research, and proposals for training awards or project grants (e.g., CIHR, SSHRC).

Course Materials

Articles and chapters in pdf (see lecture schedule) will also be available through the library and linked on the course OWL website. Additional resources including software documents and data files will also be available in the OWL website.

Methods of Evaluation

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Due date</th>
<th>Value</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab1</td>
<td>Feb 14</td>
<td>15%</td>
<td>Latent Growth Modeling (SEM)</td>
</tr>
<tr>
<td>Lab2</td>
<td>Mar 7</td>
<td>15%</td>
<td>Diary data (MLM)</td>
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<tr>
<td>Lab3</td>
<td>Mar 21</td>
<td>15%</td>
<td>Cross-lagged panel methods mini proposal</td>
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<tr>
<td>Project proposal</td>
<td>Feb 28</td>
<td>15%</td>
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<tr>
<td>Project presentation</td>
<td>Mar 28 or Apr 4</td>
<td>15%</td>
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<tr>
<td>Project paper</td>
<td>Apr 11</td>
<td>25%</td>
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See further details below

55%: Individual research project

The individual project will consist of a study involving repeated measures data with at least three time points. Students can use (1) their own data, (2) secondary data sets, or (3) simulated data that could also be used for power analyses. Many students in past related courses have used either of these three sources successfully. Although strictly not longitudinal, I will accept projects that administer multiple stimuli in a given session as long as you incorporate a test for order effects (e.g., fatigue, learning).
The project should include a longitudinal analytic procedure consisting of either a multilevel modeling or structural equation modeling approach and include an investigation of the relation between two variables across time. There are many options that could satisfy those criteria (e.g., a randomized controlled trial with a longitudinal component, an investigation of developmental trajectories with the influence of time invariant or time varying covariates, a cross-lagged panel model using the most recent recommendations, or a traditional intensive longitudinal data project (e.g., daily-diary, ecological momentary assessment).

The following milestones have worked successfully in the past and will be used in the course to help students stay on track:

1. **Research idea (by Jan 31, no evaluation).** This is a preliminary step to have your project approved by the instructor. Ideally you will meet with me to describe the project, and we will fill out a form describing the structure of the data and sample size, a summary of the measures, and the proposed analytic procedure. The purpose of this step is to establish that your project is feasible.

2. **Research proposal (due Feb 28; 15%).** A three to four-page max description of your project outlining your objectives, hypotheses, research design, description of data, and description of variables/measures, and analytic procedure.

3. **Presentation (March 28 or April 4; 15%).** You will have 20 minutes (max) to do your presentation followed by a 5-10 min discussion. Two students will be assigned to comment and to ask questions first followed by questions from the rest of the class. You will be rated on the material in your slideshow (10%) as well your presentation itself (5%; ability to present and explain clearly). Your slides will be due the same day.

4. **Paper (due April 11, one week after the last class; 25%).** Your paper should generally be written as a manuscript for publication. Your introduction can be less elaborate than in publication manuscript but should include a section that describes the rationale, objectives and hypotheses and a brief review of the literature. As a guideline for length, previous projects have usually varied from 15-25 double spaced pages of main text, and you should include tables and or figures.

**45%: 3 lab/assignments.** You will have two weeks to complete an assignment (due at the beginning of class). These assignments will include data analysis, reporting, interpretation, discussion of results, and addressing specific questions. Late assignments include a 5% deduction per 24 hours, and assignments that are more than one week late will not be accepted for partial marks.

*Rules about working in groups.* I am supportive of students working in groups to conduct the analyses and discuss the assignments. However, you are required to write your own report with no duplication from your colleagues’ work. The assignments will often require you to choose a subset of variables, and to make decisions about plausible strategies.
Course Timeline
List of readings may be updated before start of the course. (***) refers to advanced material. I realize that this list is quite extensive, and some articles are quite advanced.

Jan 10. Overview of longitudinal research and various design issues


Jan 17. Missing data mechanisms and analysis


Woods, A., et al. (currently under review). Best practices for addressing missing data through multiple imputation.


Jan 24. Change scores, residualized scores, and latent change scores


**Jan 31. SEM approach (Auto regression, Latent Growth Modeling and Growth Mixture Modeling)**


**Feb 7. SEM approach continued (Longitudinal Measurement Invariance)**


**Feb 14. MLM approach (longitudinal, diary, EMA, event-contingent designs)**


**Feb 21. MLM approach continued**


**Feb 28. SEM II Cross-lagged panel designs with latent intercepts and structural residuals and other related methods**


**Mar 7. Continued**


**Mar 14. Mediation in longitudinal design**


Mar 21. Dynamic panel models (this is a fairly new advanced procedure)


Mar 28. Power Analysis


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Apr 4. PRESENTATIONS

Statement on Academic Offences
Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

Health/Wellness Services
Students who are in emotional/mental distress should refer to Mental Health@Western
http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

Accessible Education Western (AEW)
Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program.

Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education Western (AEW), a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AEW and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.