

Statistical Analysis of Psychological Experiments (Psych 710) Spring 2017

Lecture: Tuesday and Thursday 9:30-10:45 am, Room 101 (Brogden)

Labs: Friday 9:00 - 11:00 am (section 301, room 228) or 1:00 - 3:00 pm (section 302, room 228)

Professor:

Markus Brauer

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Office hours: Wed 10:45-11:45

Room 417 (Psychology)

Teaching Assistants:

Mitchell Campbell

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Adrienne Wood

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Office Hours: Tue 2:00-3:00, or by appt

Room: 392 (Psychology)

Martin Zettersten

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Office hours: Thu 11:00-12:00, or by appt

Room: 618 (Psychology)

Objectives: The goal of this class is to familiarize you with statistical data analysis procedures that build upon and extend the general linear model. We will start out with the analysis of dichotomous within-subject variables (i.e., repeated measures). We will then extend this framework to linear mixed-effects models and the analysis of continuous within-subject variables. We will end this series with the analyses of designs that require both by-subject and by-item random effects. Another big topic we will cover is the analysis of categorical independent variables with three or more level (contrast analysis, both between and within-subjects). We will talk about both a priori contrasts and post-hoc comparisons. The course also covers several minor topics, such as exploratory factor analysis, missing data, power analysis, logistic regression, and the analysis of fMRI data. We will be using the statistics software R. Please know that extensive work outside the classroom is required in order to succeed in this class. We want to encourage you to participate actively in the class, both the lecture and the lab session.

Course Requirements and Grades: Course requirements include regular attendance, active participation in class discussion, and completion of all homework assignments and tests. Exams will compose 80% of your grade. There will be two closed book exams completed in class to assess conceptual knowledge. There will also be three open-book, take-home exams to evaluate application of concepts to brief statistical problems. Lab/homework assignments will comprise the remaining 20% of your grade. The homework assignments will involve hands-on application of the material.

In-class Exams Date/Time: (1) Tue, March 7, 9:30-10:45 am
(2) Thu, May 4, 9:30-10:45 am

Take-home Exams Date/Time: (1) assigned Fri, Feb. 17, at 4 pm; due Wed, Feb. 22, at 8 am
(2) assigned Fri, March 31, at 4 pm; due Wed, Apr. 5, at 8 am
(3) assigned Fri, May 5, at 4 pm, due Wed, May 10, at 8 am

Course Email List: psych710-1-s17@lists.wisc.edu

Course Website: www.learnuw.wisc.edu

Required Text: Judd, C.M., McClelland, G. H., & Ryan, C. (2009). *Data Analysis: A Model-Comparison Approach*. 2nd Edition. New York, US: Routledge. ISBN: 9780805833881.

Additional Required Readings: Additional required readings will be provided as pdfs on the Lecture Outline and Materials page on the course website. These readings are password protected. Password: GLM. The readings are pulled from various texts and primary sources. Supplemental readings and recommended reference texts are also provided on the course website and the end of this document.

Required Software: This course will contain a significant applied component. As such, access to statistical analysis software is required. In the context of this course, we will rely heavily on R (<http://www.r-project.org/>). R is freely available and is rapidly become the standard for statistical analysis in many disciplines. Although the goal of this course is NOT to teach you how to use R, you will become quite familiar with this computational platform during the course.

Course Schedule: This schedule is provisional so that we may adjust our rate of progress as necessary to ensure maximal mastery of the material. See course website for the most up to date version of the assigned readings and topics.

WEEK	DAY	DATE	UNIT #	TOPIC
1	Tuesday	17-Jan	20	Review
	Thursday	19-Jan	21	Power and power analysis
	Friday	20-Jan		Repetition: 3-way int., mediation, graphing 3-way; Power
2	Tuesday	24-Jan	22	Repeated measures
	Thursday	26-Jan	22	Repeated measures
	Friday	27-Jan		Power, Repeated measures
3	Tuesday	31-Jan	22	Repeated measures
	Thursday	2-Feb	23	Repeated measures; Design issues; ANCOVA approach,
	Friday	3-Feb		Repeated measures
4	Tuesday	7-Feb	23	Repeated measures; Design issues; ANCOVA approach, integration
	Thursday	8-Feb	24	Linear mixed effects models
	Friday	10-Feb		ANCOVA approach (and data frame manipulation)
5	Tuesday	14-Feb	24	Linear mixed effects models
	Thursday	16-Feb	24	Linear mixed effects models
	Friday	17-Feb		Linear mixed effects models

6	Tuesday	21-Feb	25	Case Analysis in Repeated Measures and LMEMs
	Thursday	23-Feb	26	Categorical variables w/ > 2 levels
	Friday	24-Feb		LMEMs, Case Analysis in RMs and LMEMs
7	Tuesday	28-Feb	26	Categorical variables w/ > 2 levels
	Thursday	2-Mar	26	Categorical variables w/ > 2 levels
	Friday	3-Mar		Categorical variables w/ > 2 levels, Review
8	Tuesday	7-Mar		In-class exam 1
	Thursday	9-Mar	27	Planned and Unplanned Multiple Comparisons
	Friday	10-Mar		Cat. vars w/ > 2 levels, Planned and Unpl. Mult. Comps
9	Tuesday	14-Mar	27	Planned and Unplanned Multiple Comparisons
	Thursday	16-Mar	28	Exploratory factor analysis
	Friday	17-Mar		Planned and Unpl. Mult. Comps, Graphing, EFA
	Tuesday	21-Mar		No lecture
	Thursday	23-Mar		No lecture
	Friday	24-Mar		No lab
10	Tuesday	28-Mar	29	Models with by-item random effects
	Thursday	30-Mar	29	Models with by-item random effects
	Friday	31-Mar		LMEMs (repetition), Models with by-item random effects
11	Tuesday	4-Apr	29	Models with by-item random effects
	Thursday	6-Apr	29	Models with by-item random effects
	Friday	7-Apr		Models with by-item random effects, repetition
12	Tuesday	11-Apr	30	Missing data
	Thursday	13-Apr	31	The analysis of neuroscience data
	Friday	14-Apr		Missing data, Analysis of neuroscience data
13	Tuesday	18-Apr	32	Signal detection theory
	Thursday	20-Apr	32	Signal detection theory
	Friday	21-Apr		Signal detection theory
14	Tuesday	25-Apr	33	Generalized linear models
	Thursday	27-Apr	33	Generalized linear models
	Friday	28-Apr		Generalized linear models
15	Tuesday	2-May		Review Session
	Thursday	4-May		In-class exam 2
	Friday	5-May		Review all data analysis techniques

Recommended Texts for Data Analysis and Research Methodology:

- Abelson, R. P. (1995). *Statistics as Principled Argument*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Aiken, L. S., & West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Newbury Park, CA.: Sage.
- Chambers, J (2008). *Software for Data Analysis: Programming with R*. New York: Springer Science Business Media.
- Cook, T. D., & Campbell, D. T. (1979). *Quasi-Experimentation - Design and Analysis Issues for Field Settings*. Boston, MA: Houghton Mifflin Company.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences* (3rd. Ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- Dalgaard, P. (2008) *Introductory Statistics with R* (2nd edition). New York: Springer Science Business Media.
- Fox, J. (2008). *Applied Regression, Generalized Linear Models, and Related Methods*, Second Edition. Sage Publications.
- Fox, J., & Weisberg, S. (2010). *An R Companion to Applied Regression* (2nd Edition). Sage Publications.
- Hoyle, R. H., Harris, M. J., & Judd, C. M. (2006). *Research Methods in Social Relations*. Belmont, CA, US: Allyn & Bacon.
- Judd, C. M., & Kenny, D. A. (1981). *Estimating the Effects of Social Interventions*. New York, NY: Cambridge University Press.
- Kutner, M., Nachtsheim, C., & Neter, J (2004). *Applied Linear Regression Models*, Fourth edition, McGraw-Hill.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models. Applications and Data Analysis Methods* (2nd ed.). Newbury Park, CA: Sage.
- Reis, H. T., & Judd, C. M. (2014). *Handbook of Research Methods in Social and Personality Social Psychology* (2nd ed.). New York, NY: Cambridge University Press.
- Snijders, T. A. B., & Bosker, R. J. (2012). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling* (2nd ed.). London, UK: Sage Publishers.
- Tabachnick, B. G., & Fidell, L. S. (2006). *Using Multivariate Statistics* (5th edition). New York, NY: Harper Collins.

Ethics of Being a Student in the Department of Psychology:

The members of the faculty of the Department of Psychology at UW-Madison uphold the highest ethical standards of teaching and research. They expect their students to uphold the same standards of ethical conduct. By registering for this course, you are implicitly agreeing to conduct yourself with the utmost integrity throughout the semester.

In the Department of Psychology, acts of academic misconduct are taken very seriously. Such acts diminish the educational experience for all involved – students who commit the acts, classmates who would never consider engaging in such behaviors, and instructors. Academic misconduct includes, but is not limited to, cheating on assignments and exams, stealing exams, sabotaging the work of classmates, submitting fraudulent data, plagiarizing the work of classmates or published and/or online sources, acquiring previously written papers and submitting them (altered or unaltered) for course assignments, collaborating with classmates when such collaboration is not authorized, and assisting fellow students in acts of misconduct. Students who have knowledge that classmates have engaged in academic misconduct should report this to the instructor.

Instructional Accommodation Statement:

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility.

Students are expected to inform their instructor of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. The instructor will work either directly with the student or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations, as part of a student's educational record is confidential and protected under FERPA.

Complaints:

Occasionally, a student may have a complaint about a TA or course instructor. If that happens, you should feel free to discuss the matter directly with the TA or instructor. If the complaint is about the TA and you do not feel comfortable discussing it with him or her, you should discuss it with the course instructor. If the complaint is about the instructor and you do not feel comfortable discussing it with him or her, make an appointment to speak to the Department Chair, Professor H. Hill Goldsmith (chair@psych.wisc.edu).

If your complaint has to do with sexual harassment, you may also take your complaint to Dr. Linnea Burk, Clinical Associate Professor and Director, Psychology Research and Training Clinic, Room 315 Psychology (262-9079; burk@wisc.edu).

If you believe the TA or course instructor has discriminated against you because of your religion, race, gender, sexual orientation, or ethnic background, you also may take your complaint to the Office of Equity and Diversity, Room 179-A Bascom Hall (www.oed.wisc.edu)

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