

# COMM 801: Advanced Research Methods in Communication

Autumn 2008: "Statistical Moderation and Mediation Analysis"  
JR 342 MW 4:30 to 6:18

Dr. Andrew F. Hayes  
Office: Derby 3068  
phone: 688-3027

email: hayes.338@osu.edu  
office hours: MW 11-12

## Course Description

This is a doctoral-level data analysis workshop focused on the application of principles of linear modeling to exploring questions about mediated (i.e., indirect) and moderated (i.e., interaction) effects. We will spend about half of the course talking about estimating, testing, and probing interactions in linear models, and the other half about partitioning effects into direct and indirect components and how to quantify and test hypotheses about indirect effects. Toward the end, we will integrate moderation and mediation by discussing and how to conceptualize and test for conditional indirect effects ("moderated mediation") and whether moderated effects are mediated (mediated moderation). Computer applications will focus on SPSS, but we will discuss the use of other software at various points when appropriate. It is assumed that you have taken a course in multiple regression and done well or are otherwise comfortable with the basic principles of multiple regression analysis.

## Readings

- (1) Jaccard, J., & Turrisi, R. (2003). *Interaction effects in multiple regression* (2<sup>nd</sup> Ed). Thousand Oaks, CA: Sage Publications.
- (2) MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. Mahwah, NJ: Lawrence Erlbaum Associates
- (3) Various readings available in PDF form on CARMEN:
  - Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.
  - Bauer, D. J., & Curran, P. J. (2005). Probing interactions in fixed and multilevel regression: Inferential and graphical techniques. *Multivariate Behavioral Research*, 40, 373-400.
  - Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology*, 51, 115-134.
  - Hayes, A. F. (2005). *Statistical methods for communication science*. Mahwah, NJ: Lawrence Erlbaum Associates

Hayes, A. F., Glynn, C. J., & Huges, M. E. (2008). Cautions in the interpretation of coefficients and hypothesis tests in linear models with interactions. *Manuscript submitted for publication*.

Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*, 599-610.

Kromrey, J. D., & Foster-Johnson, L. (1998). Mean centering in moderated multiple regression: Much ado about nothing. *Educational and Psychological Measurement, 58*, 42-67.

MacKinnon, D. P., Krull, J. L., & Lockwood, C. M. (2000). Equivalence of the mediation, confounding, and suppression effect. *Prevention Science, 1*, 173-181.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7*, 83-104.

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression models, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437-448.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers, 36*, 717-731.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research, 42*, 185-227.

Preacher, K. J., & Hayes, A. F. (2008a). Contemporary approaches to assessing mediation in communication research. In A. F. Hayes, M. D. Slater, & L. B. Snyder (Eds.). *The Sage sourcebook of advanced data analysis methods for communication research* (p. 13-54). Thousand Oaks, CA: Sage Publications.

Preacher, K. J., & Hayes, A. F. (2008b). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879-891.

## Evaluation

Your grade will be calculated based on a weighting of two scores ranging between 0 and 100, using the weighting below. Grading scale: 92+ = A; 89-91: A-; 82-88 = B+; 75-81 = B; 70-74 = B-; 65-69 = C+; 60-64 = C; 50-59 = C-; 45-49 = D+; 40-45 = D; <40 = E. I do not “curve” my grading. Everyone could receive an A, although history shows that about 1/3rd of students in my advanced classes get an A or A-, one half receive a B+ or B, and the rest get a B- or less.

### Data Analysis Project

Most of your grade will be based on a data analysis project that you complete using either your own data or data available to you through an advisor or through a public archive. This

assignment is detailed on a separate handout. The paper is due on the day the registrar has scheduled the final exam, which is Monday Dec 8<sup>th</sup> at 3:30PM. There is no midterm or final examination in this class. You are also expected to give a brief presentation (5-7 minutes) on your project during the last week of class. Your project will be graded on a scale from 0 to 100. This project is worth 75% of your grade. The project must be completed independently, without consulting with other students when it is being prepared. If I am suspicious that you have violated this rule, I will turn all relevant material to the Committee on Academic Misconduct for investigation.

### Exercises

At various times throughout the quarter you will be given exercises to complete outside of class. Although these exercises will often be quite challenging, typically there will be a clear right or wrong answer. The purpose of these exercises is to make sure you are comfortable with the mechanics of the methods of analysis discussed in this class and how to interpret. Your answers are not formally graded, and an answer sheet will be provided when the exercise is turned in. Your responses will be assigned a holistic numerical rating of quality from 0 to 5, with 5 being the highest and 0 reserved for an assignment not turned in at all. To achieve a 5, your responses must be clear and mostly correct and presented in a professional manner fitting of a graduate student attending a major research university who can read, write legibly and in good English, and type. These exercises are, in combination, worth 25% of your course grade based on the percentage of total “points” (the sum of your ratings over all exercises) earned. Although I do not forbid students from working together on exercises, as there is some benefit to learning together, I do expect students to turn in their own independently-written responses to the assignments. However, I advise students to work independently as much as possible, as I have found that students who collaborate on assignments often don’t appreciate how much they have come to rely on others, and this makes it very difficult to complete the data analysis project satisfactorily.

## **Policies and Miscellaneous**

### Late or Absent Exercises or Final Project

**Unless otherwise notified, exercises are due by the beginning of class on the date due.** An assignment will not be accepted more than two days after the due date. The only exceptions to these rules are tragic, extraordinary, and totally unforeseen personal circumstances that are convincingly **documented** no later than 24 hours after the due date. A failure to turn in the final project on time will result in a penalty of 5 points off your project grade for each 12 hours the project is late.

### Attendance

There is no formal attendance policy for this course. However, you are expected to attend always. If I believe attendance is slipping, I reserve the right to create an attendance policy. Not attending class is a very, very bad idea, as much material will be presented only during lecture.

### Academic Misconduct

All students at Ohio State University are bound by the Code of Student Conduct (see [http://studentaffairs.osu.edu/resource\\_csc.asp](http://studentaffairs.osu.edu/resource_csc.asp)). Violations of this code in this class, especially pertaining to 3335-23-04 Section A on Academic Misconduct, will be aggressively prosecuted through the procedures the university has set up to deal with violations of the Code. If I believe you have violated the Student Code, your case will be referred to the Committee on Academic

Misconduct (see <http://oaa.osu.edu/coam/home.html>). Make sure that you understand the Code of Student Conduct, and familiarize yourself with “Ten Suggestions for Preserving Academic Integrity” available online at <http://oaa.osu.edu/coam/ten-suggestions.html>. The standard penalty given to a graduate student found guilty in violation of 3335-23-04 Section A is failure in the course and suspension from the university. In the School of Communication, a graduate student found in violation of the Code of Student Conduct will likely also have his or her funding revoked permanently. Repeat offenses and especially egregious violations of the Code can and often do result in dismissal from the University.

### Tentative Nature of this Syllabus

This syllabus represents a contract in the works. Events that transpire over the quarter may, in rare circumstances, require me to modify the administration of this course and therefore the syllabus. In the event I need to modify the syllabus, I will announce the modification in class and on CARMEN. Ultimately, it is your responsibility to keep up with any such modifications and be aware of current policies, deadlines, etc.

### Students with Special Needs

If you need an accommodation based on the impact of a disability, you should contact me to arrange an appointment as soon as possible. At the appointment we can discuss the course format, anticipate your needs and explore potential accommodations. I rely on the Office for Disability Services for assistance in verifying the need for accommodations and developing accommodation strategies. If you have not previously contacted the Office for Disability Services, I encourage you to do so.

## **Schedule of Lectures and Readings**

A schedule of lecture topics and corresponding reading is below. You are encouraged to read everything more than once and/or to read ahead to enhance your learning and retention. I strongly discourage you waiting to start the reading until after we've covered the material in class. I provide this rough outline so that you can sequence your reading to be consistent with the order of material presented during lectures.

### **UNIT 1: BASIC CONCEPTS**

1A: Overview of course and concepts; Distinguishing between “Moderation” and “Mediation”

Baron & Kenny (1986); Holmbeck (1997); Frazier, Tix, & Barron (2004)  
*Read one, skim the others*

1B: Regression Overview

Jaccard & Turrisi (2005), p. 1-16; Hayes (2005), Ch 13, Ch 14 (pp. 399-402)

### **UNIT 2: INTERACTIONS IN MULTIPLE REGRESSION**

2A: 2 X 2 Design: Main Effects, Conditional/Simple Effects, Interaction  
Representation as a Linear Model

Readings: Hayes (2005), Chapter 16, p. 428-451.

2B: Quantitative By Quantitative IV Interactions

Jaccard & Turrisi (2003), pp. 16-32

2C: Visualizing and Probing Interactions

Bauer & Curran (2005), through page 387; Preacher, Curran, & Bauer (2006)

2D: Dichotomous By Quantitative IV Interaction

Jaccard & Turrisi (2003), pp. 32-39; Hayes (2005), pp. 451-458;  
Hayes (2005), p. 468

2E: Multicategorical By Quantitative IV Interaction

Jaccard & Turrisi (2003), pp. 39-43; Hayes (2005), pp. 461-465

2F: Scaling choices and its effects

Kromrey & Foster-Johnson, 1998; Hayes (2005), p. 465-467; Hayes, Glynn, & Hude (2008)

2G: Higher-order Interactions (pending time)

Jaccard & Turrisi (2003), pp. 43-60.

### **UNIT 3: MEDIATION**

3A: The Simple Mediation Model

MacKinnon (2008), p. 1-86; Preacher & Hayes (2004); Preacher & Hayes (2008a), p. 13-27; MacKinnon, Lockwood, Hoffman, West, & Sheets (2002); MacKinnon, Krull, & Lockwood (2000)

3B: Multiple Mediators

MacKinnon, Ch 5; Preacher & Hayes (2008a), p. 27-31; Preacher & Hayes (2008b)

3C: Alternative Software

### **UNIT 4: COMBINING MODERATION AND MEDIATION**

4A: Moderated Mediation

MacKinnon et al. Chapter 10; Preacher, Rucker, and Hayes (2007); Hayes (2008a), p. 31-33

4B: Mediated Moderation; Can a Mediator be a Moderator? (pending time)

4C: Thanksgiving Week: Project Consultations

**UNIT 5: CLASS REPORTS**

**Project papers due: Monday December 8<sup>th</sup> at 3:30PM in Derby 3068**