University of North Texas
College of Education
Department of Educational Psychology
EPSY 6800. Special topics
Meta-analysis

Course Description

Meta-analysis is a powerful set of statistical methods used to synthesize quantitative evidence collected from multiple sources, such as multiple studies on the same or similar (comparable) topic. This course introduces the stages of a research synthesis process, and the statistical methods used for conducting ***quantitative*** syntheses of social-scientific research. The focus of the course is on introducing the concepts and procedures. Students are encouraged to apply the concepts to their own research *beyond* the classroom.

Computational exercises use the **R statistical** computing environment. Major topics will include effect size calculations, pooling effect sizes, meta-regression, dependent effect sizes, selective reporting and publication bias analysis. In addition, we will discuss ongoing quantitative dilemmas in quantitative meta-analysis which might be good research topics.

Pre-requisites

EPSY 5210, EPSY 6010, EPSY 6210 (Multiple regression), or a course in linear regression, or equivalent graduate-level statistics upon approval of instructor.

This is an *advanced* quantitative methods graduate-level class. This course involves the steps in statistical techniques.

Mathematical/Statistical skills

- Students are required to have mastered fundamental statistics, including correlation and regression methods.
- Students who have experience with matrix algebra, multivariate data analysis and multilevel (hierarchical) modeling are preferred.

Computing Software

- This course will mainly use **R** computing software for implementing the methods discussed in class. There are other options for meta-analysis (e.g., CMA, Stata). However, the most advanced innovations to handle statistical issues have been continuously developed and implemented in R.
- There are lots of resources to learn R software.
- R: https://www.r-project.org/
- • RStudio: https://www.rstudio.com/
- • TryR code school: http://tryr.codeschool.com
- • YaRrr! The Pirate's Guide to R: http://nathanieldphillips.com/thepiratesguidetor/
- • Princeton R tutorials: http://data.princeton.edu/R/
- • D-Lab R training: https://github.com/dlab-berkeley/R-for-Data-Science
- https://aits.unt.edu/software/r

Safety Guidelines

If you do not feel well, please do not force yourself. Please let me know in advance if you cannot attend a class.

Instructor Contact Information

- Jihyun Lee, Ph.D.
- Office: Matthews Hall 322FB
- Email is the best way to get in contact with me: Jihyun.Lee@unt.edu (better than Canvas message!) I will make every effort to respond to email within *2 working days*.

- If cancelled/changed due to any reasons, the notification will be announced via Canvas.
- When requesting a meeting with a professor (or other busy person), it is courteous to ***list your full availability*** over a reasonable window of time. This allows the person you're trying to meet to pick a time that is convenient to their schedule (which is likely very busy and complicated), rather than forcing them to list their availability, write back to request yours, or forgo control of their schedule.

Materials

- [HRSMA] Cooper, H., Hedges, L. V., & Valentine, J. C. (Eds.). (2019). *The Handbook of Research Synthesis and Meta-Analysis*, 3rd Edition. Russell Sage Foundation.
- [OLI] Systematic Reviews and Meta-analysis by Open Learning Initiative https://oli.cmu.edu/courses/systematic-reviews-and-meta-analysis-o-f/Links to an external site.
- [R] Harrer, M., Cuijpers, P., Furukawa, T. A., & Ebert, D. D. (2021) Doing meta-analysis with R: A hands-on guide. Boca Raton, FL and London: Chapman & Hall/CRC Press. ISBN 978-0-367-61007-4. https://bookdown.org/MathiasHarrer/Doing_Meta_Analysis_in_R/Links to an external site.

Additional Recommended Resources

- Cooper, H. (2015). Research Synthesis and Meta-Analysis: A Step-by-Step Approach. SAGE Publications.
  - This is an excellent guide through the full process of conducting a research synthesis, although it is light on the statistical details.
- Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2011). Introduction to Meta-Analysis. John Wiley & Sons.
  - This book covers basic meta-analysis methods at an introductory level suitable for students without prior statistical training. It includes many worked, numerical examples.
- Lipsey, M. W., & Wilson, D. B. (2001). Practical meta-analysis. SAGE Publications.
  - This is an older guide to conducting a systematic review and research synthesis. It includes lots of great pragmatic advice, but is short (at times even misguided) about the statistical details.
- Higgins, J.P.T., & Green, S. (Eds). (2009). The Cochrane Handbook for Systematic Review of Interventions. Chichester (UK): John Wiley & Sons.
  - Online version at https://training.cochrane.org/cochrane-handbook-systematic-reviews-interventions. This handbook defines the methods used in systematic reviews and meta-

analyses of healthcare interventions conducted under the auspices of the Cochrane Collaboration.

- Online resources from the Campbell Collaboration: https://campbellcollaboration.org/research-resources/training-courses.html
- Research Synthesis Methods is an interdisciplinary journal sponsored by the Society for Research Synthesis Methodology. It is a leading outlet for new methodological developments related to research synthesis and meta-analysis.

- *Additional reading list will be provided throughout the course.*

(Tentative) Topics

- There will also be assigned readings posted one week in advance on the course website. The expectation for this course is that you come to class prepared. This means you read the assigned materials before class.

1. Introduction: systematic review, research synthesis, and meta-analysis
2. Problem formulation
3. Systematic search
4. Coding the literature
5. Effect size calculations
    a. Standardized mean difference
    b. Binary outcomes: odds ratios, response ratios
    c. Correlations
    d. Conversion between the effect sizes
6. Basic synthesis (pooling the effect sizes)
    a. Fixed effects models
    b. Random effects models
7. Interpreting effect size magnitude
8. Interpreting heterogeneity across the studies
9. Explaining heterogeneity
10. Meta-regression
11. Selective reporting and publication bias
12. Methodological issues
    a. Handling dependent effect sizes within study
    b. Missing covariate data in meta-regression
13. Reporting standards and criticism

Structure

1. **Before-class**
    - *Reading, homework, other activities (discussion board)*
2. ***During class***
    - Lecture
    - In-class activities
3. **After-class**

- Review materials/quizzes/assignments

Evaluation

1. **Discussions & class participation** (15%)
2. **Problem sets/Homework assignments** (65%)

- Conceptual quizzes/activities
- Compute statistics or analyze data using R.

3. **Article critique** (20%)

- Critique of a published meta-analysis study. (There might be a presentation session.)
- An outline will be provided later.

Grading

Your assignments will be averaged according to the percentages (weights) shown. Depending on the length and complexity, each assignment will have different weights on scores.
For each grade for assignments, you have one week to (schedule to) discuss about your scores and a potential chance to be changed (up or down). Failing to contact Dr. Lee within the one-week window may not be accepted. The exact timeline for each one will be notified in class / Canvas.

Total Points/Grading Scale = 100%

$A \geq 90$
$90 > B \geq 80$
$80 > C \geq 70$
$70 > D \geq 60$
$60 > F$

******Any student caught cheating will receive an "F" for the course. ******

Attendance: Students who attend class, of course, tend to be better prepared for assignments.

Legal: This course material is for your use only and cannot be distributed without explicit written consent by Dr. Jihyun Lee. There is no other expressed or implied license given.

Recordings: It is prohibited to record the lecture without permission for the purpose of accommodations only. The recordings should not be shared in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

ChatGPT and AI: Students can explore innovative tools and technologies to enhance their learning experience. However, relying solely on AI-generated content can hinder the development of critical thinking, research, and originality that are essential to your academic growth. Similar to how reproducing information from websites or alternate sources without providing appropriate credit constitutes plagiarism, the act of utilizing AI-generated content without proper acknowledgment or comprehension

similarly qualifies as plagiarism. Students must refrain from presenting AI-generated content as personally crafted original material.

Student Academic Support Services

- Code of Student Conduct: provides Code of Student Conduct along with other useful links
- Office of Disability Access: exists to prevent discrimination based on disability and to help students reach a higher level of independence
- Counseling and Testing Services: provides counseling services to the UNT community, as well as testing services; such as admissions testing, computer-based testing, career testing, and other tests
- UNT Libraries
- UNT Learning Center: provides a variety of services, including tutoring, to enhance the student academic experience
- UNT Writing Center: offers free writing tutoring to all UNT students, undergraduate and graduate, including online tutoring
- Succeed at UNT: information regarding how to be a successful student at UNT

GENERAL UNT POLICIES

Academic Integrity Policy

Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. [Insert specific sanction or academic penalty for specific academic integrity violation.

ADA Policy

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

Emergency Notification & Procedures

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like

chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.

Retention of Student Records

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Blackboard online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. The Code of Student Conduct can be found at deanofstudents.unt.edu/conduct.

Access to Information - Eagle Connect

Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail: eagleconnect.unt.edu/

Student Evaluation Administration Dates

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 [insert administration dates] of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website at http://spot.unt.edu/ or email spot@unt.edu.

Sexual Assault Prevention

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT's Survivor Advocates can assist a student who has been

impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.