

## Course Description

This course provides an in-depth introduction to systematic review and meta-analysis, with a focus on both theoretical concepts and practical applications. Students will begin by exploring the foundations of systematic reviews, including how to frame research questions and select relevant studies. As the course progresses, they will learn about effect size calculations, model selection, publication bias, and sensitivity analysis. Advanced topics such as network meta-analysis, multivariate meta-analysis, and Bayesian meta-analysis will also be covered. Throughout the course, students will use R software for analysis and apply these concepts through hands-on assignments and group projects.

## Course Prerequisites

Students are expected to have a basic knowledge of inferential statistics, linear regression, and ANOVA. Advanced mathematical knowledge (e.g., Calculus and Linear Algebra are NOT required). If you would like to review materials of the aforementioned topics, please see me early in the semester.

## Course Learning Outcomes

1. Students will conduct and present a synthesis of a set of outcomes, including a quantitative synthesis of effect sizes. Specifically, students will
  - a. Form research questions
  - b. Locate relevant studies (published and unpublished)
  - c. Identify and code pertinent study information, including potential moderator variables
  - d. Identify different types of study outcomes and select an effect-size metric to best represent those outcomes
  - e. Conduct appropriate data analyses, including but not limited to, homogeneity tests, overall effect-size tests, moderator models, and publication bias
  - f. Prepare a written report of the meta-analysis
2. Students will identify controversies and explain contradictory views about the major aspects of meta-analysis.

## Textbook and/or Resource Materials

### ***Required Texts***

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2021). *Introduction to meta-analysis* (2<sup>nd</sup> ed.). Wiley. ISBN 9781119558354

Cooper, H. (2017). *Research synthesis and meta-analysis* (5<sup>th</sup> ed.). Sage. ISBN 9781483331157

### ***Optional Texts***

Cooper, H. M., Hedges, L. V., & Valentine, J. (2019). *The handbook of research synthesis and meta-analysis* (3<sup>rd</sup> ed.). Russell Sage Foundation. ISBN 9780871540058

## Grading Policy

Assignment	Overall Grade Weight
Homework Set 1	10%
Homework Set 2	14%
Homework Set 3	14%
Homework Set 4	22%
Project Presentation	7%
Project	33%

### Letter Grading Scale

A = 90% – 100%

B = 80% – 89%

C = 70% – 79%

D = 60% – 69%

F < 60%

*Homework Sets:* There will be four Homework Sets throughout the semester. These assignments are directly related to readings and topics covered in class. All Homework Sets are intended to practice skills needed to complete your project. Several Homework Sets will provide practice using R to perform meta-analytic modeling techniques. Some Homework Sets will be explicitly related to your culminating project.

*Project:* This assignment will be a written report of the meta-analysis that you have worked on throughout the semester. The project will require the development of a coding sheet and search of computerized reference databases. Students are also expected to apply appropriate quantitative research synthesis methods to their data. The project is expected to be written in APA format. Further details on the project will be provided throughout the semester.

*Project Presentation:* Each student (or group) will complete a brief presentation related to their project. More details will be provided later in the semester.

## Additional Course Information Items

### Computer Software

This course requires two computer programs:

- \* Spreadsheet program
- \* R and RStudio

We will use the spreadsheet program for the early parts of the course, mainly for data collection, organization, and some data cleaning. Once we begin to use statistical computations and analyses, we will shift to a computer software called R. This is a powerful statistical software commonly used by meta-analysts. **As soon as possible**, download R to your personal and/or office computer, preferably immediately after our first class! **Both R and RStudio are free.**

Especially for first time users and those with less programming experience, I highly recommend RStudio as well. This is a companion program to R which is more user friendly.

\* R Download: <https://cran.r-project.org/mirrors.html>

\* R Studio Download: <https://www.rstudio.com/products/rstudio/download/>

I will embed examples within lectures and post all code for topics in Canvas modules. **If you ever need assistance with R, please let me know!**

### **Tentative Topics, Readings, and Due Dates**

\*\* HC = Cooper (2017) book

\*\* BHHR = Borenstein et al. (2021) book

\*\* Full APA references for individual papers are listed at the end of the syllabus

#### **Week 1**

**8/22/24**

##### **Topic(s)**

- Syllabus and Canvas
- Introduction to Systematic Review
- Introduction to Meta-Analysis
- Introduction to R

##### **Required Readings**

- HC p. 1-60

##### **Supplemental Readings**

- Glass (1976)

##### **Assignment Due: Pre Course Survey (Qualtrics)**

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#### **Week 2**

**8/29/24**

##### **Topic(s)**

- Framing the Question
- Deciding Inclusion & Exclusion Criteria
- Searching the Literature
- Coding Sheets

##### **Required Readings**

- HC p. 61-188 (Week 2 AND Week 3)

##### **Supplemental Readings**

- APA Working Group (2008)
- Feeley (2020)
- Higgins et al. (2011)
- McGuinness and Higgins (online first)

**Assignment Due: None****Week 3****9/5/24****Topic(s)**

- Documenting Search Results
- Assessing and Minimizing the Risk of Bias
- Reporting Systematic Reviews

**Required Readings**

- HC p. 61-188 (**Week 2 AND Week 3**)

**Supplemental Readings**

- APA Working Group (2008)
- Feeley (2020)
- Higgins et al. (2011)
- McGuiness and Higgins (online first)

**Assignment Due: None**

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**Week 4****9/12/24****Topic(s)**

- Effect Sizes in Observational Designs
- Effect Sizes in Experimental Designs
- Effect Size Correlation

**Required Readings**

- BHHR p. 17-47
- Kraft (2020)

**Supplemental Readings**

- Hedges (2008)
- Sullivan and Feinn (2012)

**Assignment Due: Homework Set 1**

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**Week 5****9/19/24****Topic(s)**

- Fixed-Effect and Random-Effects Model
- Between-Study Heterogeneity

**Required Readings**

- BHHR p. 59-158

**Supplemental Readings**

- Anzures-Cabrera and Higgins (2010)
  - Hedges and Vevea (1998)
  - Higgins, Thompson, Deeks, and Altman (2003)
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**Assignment Due: None**

**Week 6**

**9/26/24**

**Topic(s)**

- Outlying and Influential Studies
- Sensitivity Analysis
- Forest Plot and Diagnostic Tools

**Required Readings**

- Viechtbauer and Cheung (2010)

**Supplemental Readings**

- Copas and Shi (2000)

**Assignment Due: None**

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**Week 7**

**10/3/24**

**Topic(s)**

- Publication Bias
- Funnel plot and Egger's Regression Test
- Cumulative Meta-analysis

**Required Readings**

- BHR p. 313-331
- Lau, Schmid, and Chalmers (1995)

**Supplemental Readings**

- Muellerleile and Mullen (2006)
- Sutton, Song, Gilbody, and Abrams (2000)

**Assignment Due: Homework Set 2**

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**Week 8**

**10/10/24**

**Topic(s)**

- Moderator Analysis: Subgroup Analysis
- Moderator Analysis: Meta-regression

**Required Readings**

- BHR p. 161-195

**Supplemental Readings**

- Rubio-Aparicio et al. (2017)

**Assignment Due: None**

**Week 9****10/17/24****Topic(s)**

- Reporting Meta-analyses
- Reproducibility of Meta-Analyses

**Required Readings**

- BHRH p. 197-212
- Thompson and Higgins (2002)

**Supplemental Readings**

- Tipton, Pustejovsky, and Ahmadi (2019)
- Viechtbauer, Lopez-Lopez, Sanchez-Meca, and Marin-Martinez (2015)

**Assignment Due: Homework Set 3**

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**Week 10****10/24/24****Topic(s)**

- Network Meta-analysis

**Required Readings**

- BHRH p. 407-412
- HC p. 261-317
- Rouse, Chaimani, and Li (2017)

**Supplemental Readings**

- Moher et al. (2015)

**Assignment Due: None**

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**Week 11****10/31/24****Topic(s)**

- Multivariate Meta-analysis

**Required Readings**

- BHRH p. 253-283
- Becker (2000)

**Supplemental Readings**

- Hedges, Tipton, and Johnson (2010)
- Raudenbush, Becker, and Kalaian (1988)

**Assignment Due: None**

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**Week 12****11/7/24****Topic(s)**

- Bayesian Meta-analysis

**Required Readings**

- Thompson and Semma (2020)

**Supplemental Readings**

- Schmid (2001)
- Sutton and Abrams (2001)

**Assignment Due: Homework Set 4**

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**Week 13****11/14/24****Topic(s) [None]****Assignment Due: Project Presentation**

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**Week 14****11/21/24****Topic(s) [None]****Assignment Due: Project Presentation**

**Project Due: December 4<sup>th</sup>, 2024 @ 11:59pm CST**

### References

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