

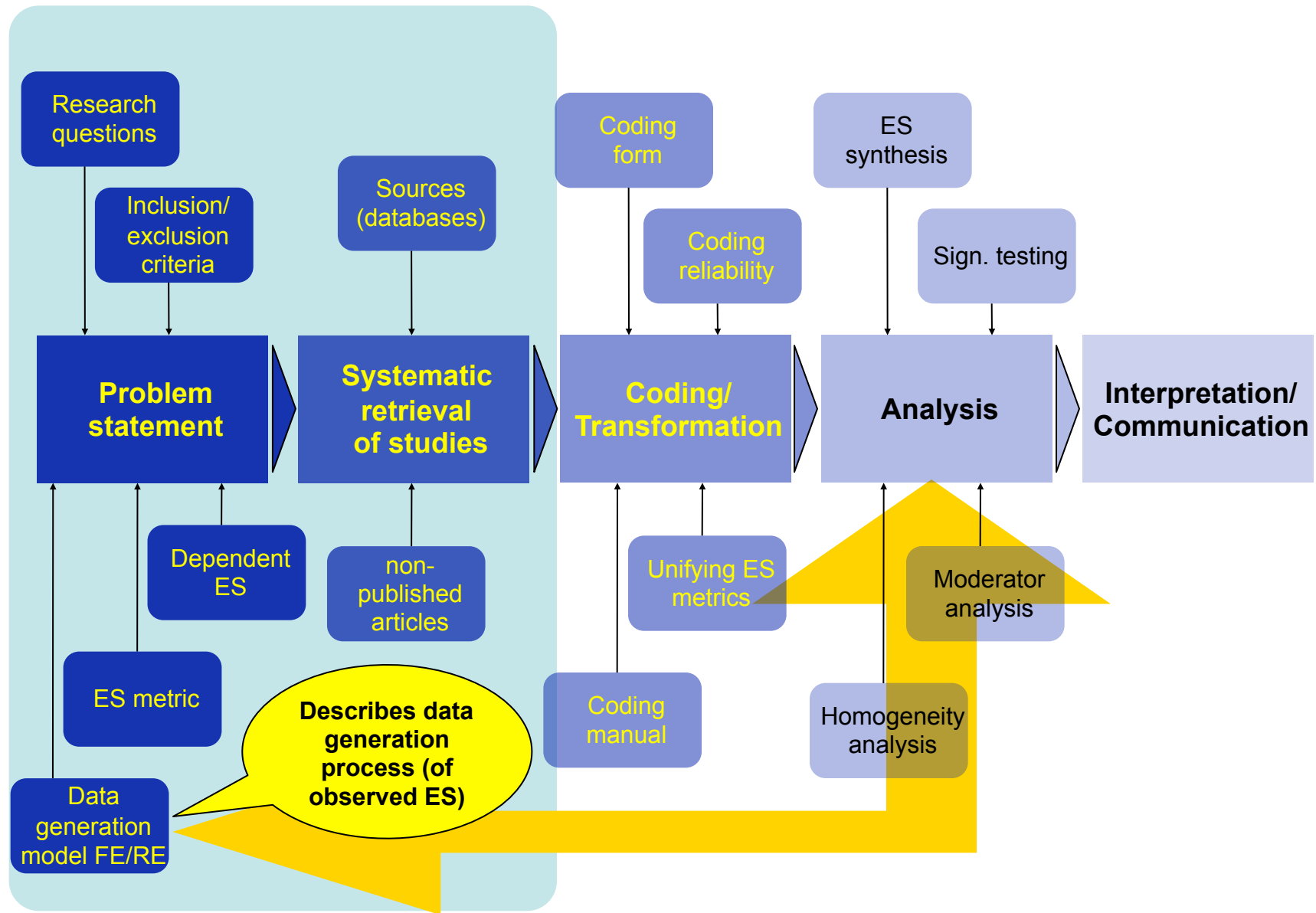
Meta-Analysis Workshop

Part 2: Problem Statement and Data Collection (Systematic Retrieval and Selection of Studies)

Michael Bošnjak

Free University of Bozen-Bolzano, School of Economics and Management

michael.bosnjak@unibz.it, www.bosnjak.eu



Agenda

- **Problem Statement**
- Systematic Retrieval of Studies
- Systematic Selection of Studies

Problem Statement: Discussion

- Where may initial ideas for performing a meta-analysis come from?
- Personal interest and background
- Theoretical routes: Theory testing/refinement
- Applied routes: Applied problems (self-detected, press-reports, etc.) , consumer needs/topics, political agenda topics, grant announcement topics
- Replication and extension of past research syntheses:
 - Mere replication of previous syntheses with new methodological tools, inclusion/exclusion criteria, etc.
 - Meta-meta-analysis
 - Cumulative meta-analyses: Updating/extending past meta-analyses

Problem Statement: Discussion

To what extent ...

... are meta-analytic problem definitions ***similar/identical*** to those of primary studies?

... are meta-analytic problem definitions ***different / unique*** compared to those of primary studies?

Problem Statement: Conceptual Part

- Overall objective(s) of meta-analysis?
- Research questions
 - study-generated / synthesis generated
 - Conceptual and operational definitions of variables
 - Type of relationship(s):
 - descriptive, associational, causal
 - within versus between participant processes
 - simple/bivariate versus complex/multivariate
 - Moderator hypotheses (!)
- Inclusion/exclusion criteria (type of evidence, e.g. in terms of quality, outlet, time frame, cultural, linguistic, etc.)

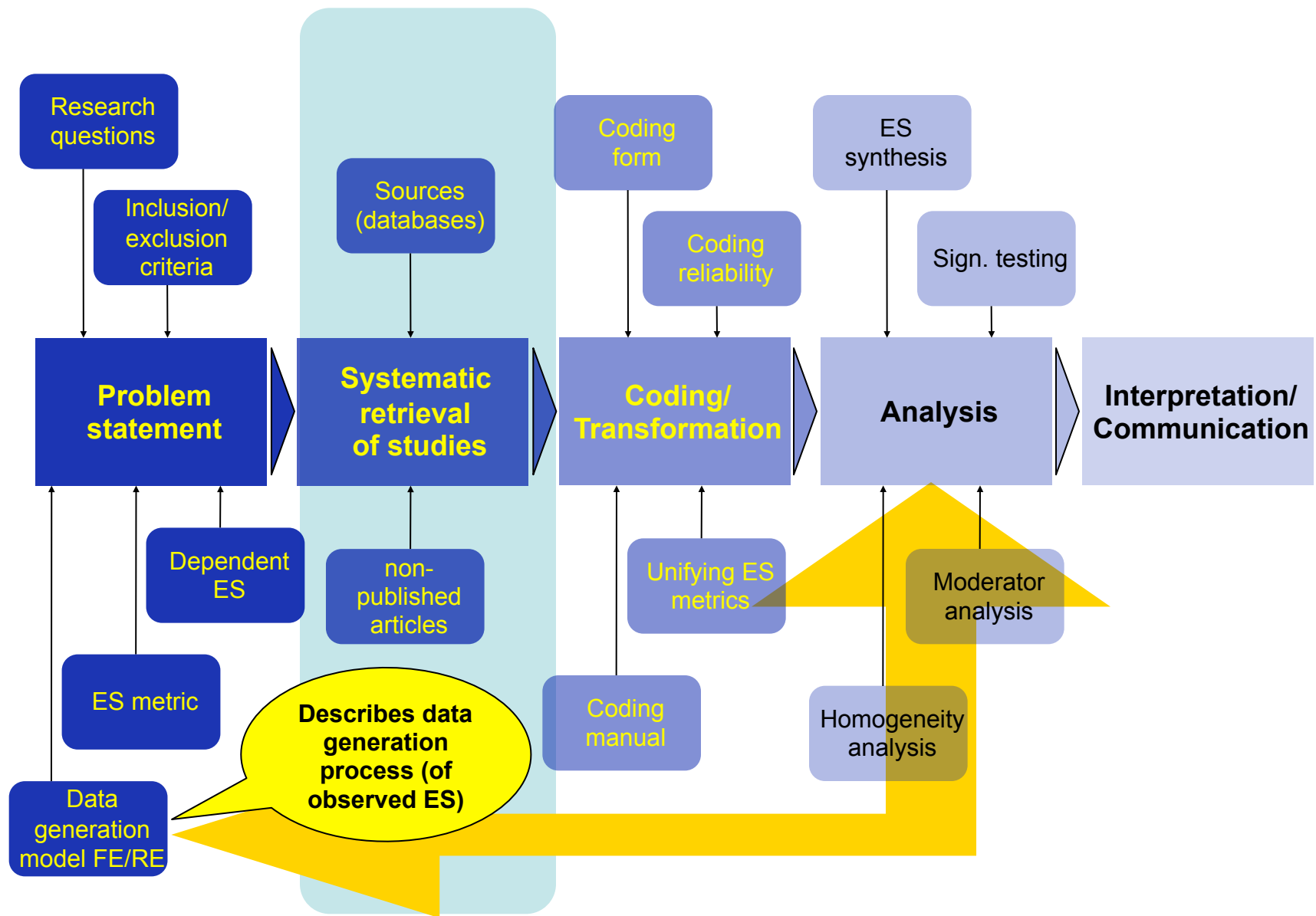
Problem Statement: Methodological Part

- Which ES metric to use (d , r , OR, RR, etc.)?
- Search strategy?
- Type of inference and selection of corresponding data generation and analysis model?
(fixed / random / mixed effects)
- Approach to test moderator hypotheses?
(partitioning, subgroup analysis: ANOVA approach, meta-regression)
- How to handle / deal with dependent ES?
- How to handle / deal with 'statistical fruit salad' (Bröderl, 2004), i.e. corrected/adjusted versus uncorrected/unadjusted ES?

Agenda

- Problem Statement
- **Systematic Retrieval of Studies**
- Systematic Selection of Studies

Systematic Retrieval of Studies



Literature Search: Relevance

- Identification of relevant studies is 'the most fundamental challenge'
(Chalmers, Dickersin, & Chalmers, 1992; McManus, et al. 1998; Petticrew & Roberts, 2006)
- **GIGO**: "...if the sample of studies retrieved for a review is biased, then the validity of the results...no matter how systematic and thorough in other respects, is suspect."
(Rothstein, Sutton, & Borenstein, 2005)

Literature Search: Multimodal, Dialectic

- Electronic search
 - Bibliographic databases
 - Internet resources
- Manual search
- Use of informal networks



Literature Search: Electronic

- Bibliographic databases
 - Psychology: PsycINFO, PubMed (MEDLINE), Psychology: A SAGE Full-Text Collection, Criminology: A SAGE Full-Text Collection, Ageline
 - Sociology: Sociological Abstracts, Contemporary Women's Issues, Sociology: A SAGE Full-Text Collection
 - Education: ERIC, British Education Index, Australian Education Index, Chinese ERIC, Education: A SAGE Full-Text Collection
 - Multidisciplinary: Academic Search Premier, ProQuest Dissertations and Theses, Social Sciences Index, Web of Science
- Internet sources

Literature Search: Manual

- Print editions of journals
- Reference lists (snow balling)
- Bibliographies
- Conference proceedings

Literature Search: Informal

- Contact with researchers in field
- (Organizational) Listservs
- Program developers
- Colleagues

Literature Search: Recursive/Dialectic

- Preliminary Searches

- Supports beginning steps of review: Refinement of research question(s) and definition of key concepts
- Use of standard reference tools and broad searches to identify review articles and key primary studies

- Main Searches

- Identification of primary studies through searches of online databases, internet, printed indices, branching, hand searches, informal channels of communication

Main Search

- Selection of Information Retrieval Tools:
 - Scope of search: Which fields should be searched?
 - Availability of indexing tools: Which tools are accessible from the home institution? Are there others who can perform searches for us?
 - Format of indexing tools: In what format are these tools (e.g., online, print, web-based)?
 - Date: How far back does the indexing go for each tool?
 - Language: What is the language of the material indexed? How can non-English material be located?
 - Unpublished work: How can dissertations and other 'grey literature' be accessed?

Electronic Search: Guiding Questions

- What are the key concepts to be searched?
- **How are these represented in each discipline?**
 - ‘blind spots’ due to different terminologies between disciplines -> THESAURUS, informal communication with experts from other fields
 - Example:
 - ‘measurement error’ in Psychology (classical test theory): Unsystematic error
 - ‘measurement error’ in Survey Research: Systematic (design artifacts) AND unsystematic
- What are their related terms?
- How are these key concepts represented in the controlled vocabulary within each database to be searched?

Sample: Problem Statement & Hypotheses (Lozar Manfreda et. al, 2008)

Two main research questions are addressed. First, are response rates for web surveys actually lower than for other survey modes? Second, what is the impact of moderators influencing the magnitude of such potential differences? Accordingly, the first research hypothesis is:

H1: Response rates for web surveys are lower than response rates for other survey modes.

H2: Moderators that vary the response rates differences between compared modes are: (a) the type of mode to which web surveys are compared; (b) whether or not subjects are from a panel; (c) the type of target population; (d) the type of research sponsor; (e) the year of study; and (f–h) the implementation procedures used (mode of survey invitation, incentives, number of contacts).

Sample: Eligibility Criteria, Search/Selection Plan

Eligibility criteria and literature search

In general, we sought to maximise internal validity by isolating the impact of the survey mode from other causes on the response rate difference of interest. Accordingly, only those studies meeting the following criteria were included.

1. One of the survey modes used should be a web-based survey (i.e. a survey where a survey questionnaire on the web was used to gather responses from respondents).
2. The web-based survey should be compared to data from one or more other survey modes (e.g. email survey, mail survey, telephone survey, face-to-face survey, fax survey).
3. Data on response rates from the web and the other survey mode(s) should be available.
4. A split-sample experimental design must have been employed with subjects from the same population being randomly assigned to different modes.
5. Subjects should have remained in the mode they were randomly assigned to. In other words, studies where subjects were permitted to switch modes were not eligible for inclusion; or, for those studies where subjects were assigned to another mode in the following phases of the survey process, only the results up to this change are taken into account.
6. The implementation of the compared modes should be as similar as possible, with the only difference being in the mode used for answering the survey questionnaire. For example, comparisons where unequal incentives were used were excluded.

The last three criteria in particular – the random assignment of subjects to modes, the retention within this mode, and comparable implementation procedures – are crucial to isolate the impact of the survey mode from other factors.

Sample: Search Procedure

Primary studies of interest were identified through a comprehensive literature search. The sources for collecting cases were:

- a search through bibliography entries on the *WebSM* site at <http://www.websm.org> (a website dedicated to the methodology of web surveys, whose bibliography database includes more than 2000 entries – Lozar Manfreda & Vehovar 2006)
- a search using keywords¹ in online literature databases (*ScienceDirect* at <http://www.sciencedirect.com>, *ISI Web of Knowledge* at <http://isiwebofknowledge.com>, *Directory of Open Access Journals* at <http://www.doaj.org/>, *EBSCOhost* at <http://search.ebscohost.com/>, *Emerald* at <http://www.emeraldinsight.com/>, *Ingenta select* at <http://www.ingentaselect.com/>, *LookSmart's FindArticles* at <http://articles.findarticles.com>, *The Internet Public Library* at <http://www.ipl.org/div/serials/>, *Kluwer Online Journals* at <http://journals.kluweronline.com/>, *Proquest* at <http://www.umi.com/proquest>)
- a review of papers in relevant journals in the survey methodology field for the 1995–2005 period
- a call for papers in online discussion lists relevant to survey methodologists (*Elmar*, *German Online Research discussion list*, *SRMSNET list*, *Aoir*)
- a call for papers on the *WebSM* site at <http://www.websm.org>
- a search of the references of collected papers (references of each bibliographical unit obtained using the above means were checked in order to find additional relevant studies).



How to improve?

¹ Very general keywords were used in order not to miss any study using a web survey. Thus 'web survey', 'internet survey', 'online survey', 'web-based survey', 'internet-based survey', 'electronic survey' were all used. The authors of this paper then selected the mode-comparison studies out of the listed hits by checking the papers' abstracts.

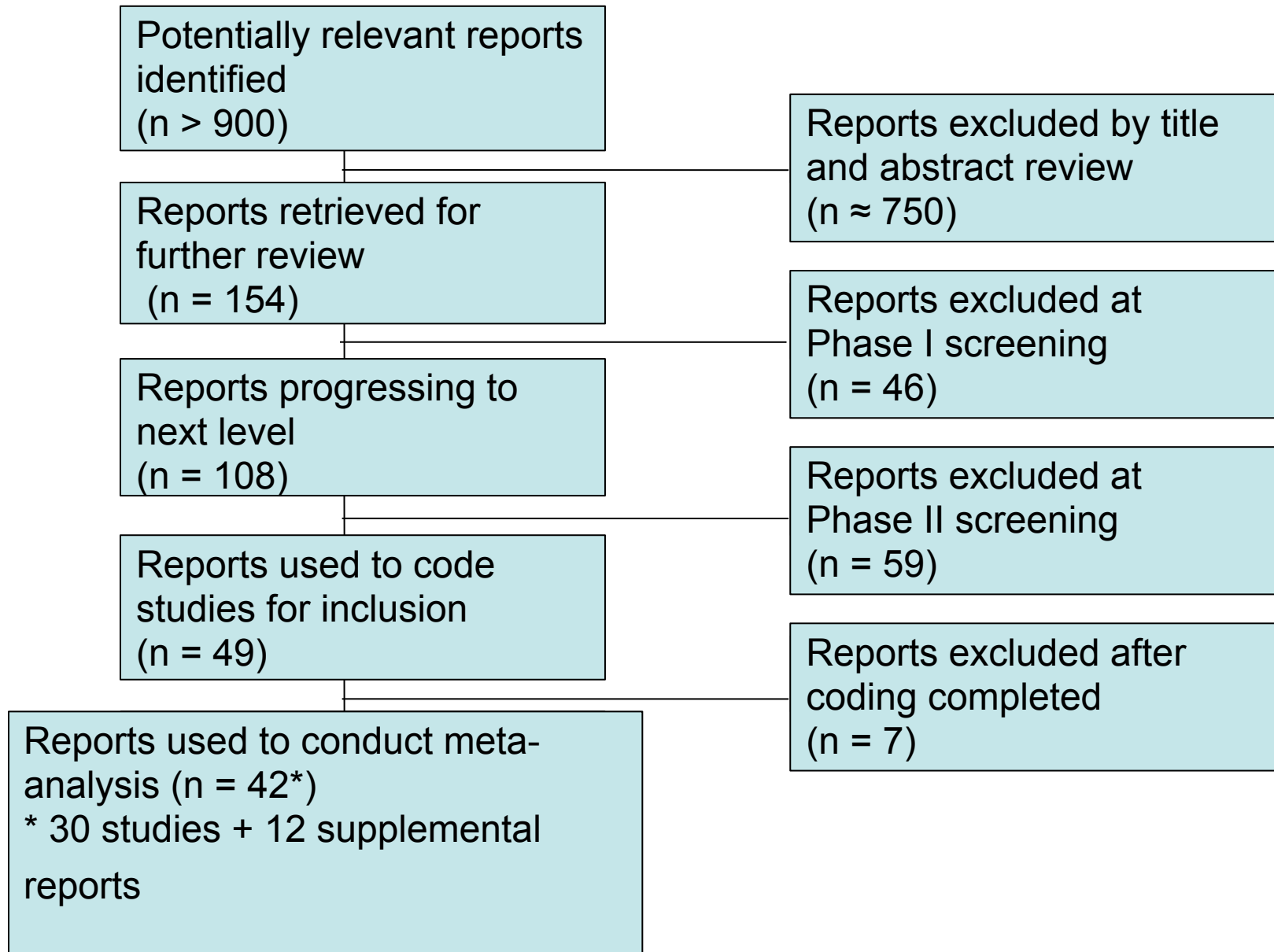
Main Search: More Decisions

Construction of the Search Statements
(as a non-trivial task):

- What terms should be searched as Descriptors or as “free text”?
- What Boolean operators should be used?
- Where should truncation characters be used?
 - Content expert knowledge required
- What limiting features are available to narrow results?
 - Derive from eligibility criteria
- What time period should be searched?
 - Derive from eligibility criteria

Managing the Results

- Import results into a bibliographic management software:
 - RefWorks
 - Reference Manager
 - EndNotes
 - Papers
- Add codes for searches and notes to the records
- Label each search and document decision taken
- **Compile a document with the original search strategies**
- Generate a bibliography of primary studies used in the review
- Document selection process: 'Attrition' table(s) and/or flowcharts



Important Points

- 'Shoestring-budget information retrieval' is likely to introduce bias, and should be avoided!
- The information retrieval stage is the foundation upon which the systematic review rests.
- It is not a 'one-shot' effort.
- It requires expertise in planning and implementation.
- Bibliographic software is required.
- Others must be able to replicate the search.
- **Clear documentation is essential.**

Example: FUB Search: Your Research (Interests)

The screenshot shows the Metalib library interface of the Free University of Bozen - Bolzano. The page is designed for users to search across various online databases. The top navigation bar includes links to Sitemap, Staff, and Sign In. The main search area is prominently displayed with a search box and a 'Search' button. The 'DATABASE LIST' section provides an alphabetical list of all databases available through the University Library. The 'DATABASES BY SUBJECT' section lists all databases available through the University Library by subject. The 'SFX' section provides a direct link from an article citation in a database to the full text of that article. The 'TRIALS' section provides trials and new online resources. The right sidebar contains a 'WELCOME' section with links to ABOUT THE LIBRARY, LIBRARY SERVICES, RESEARCH TOOLS, INFORMATION LITERACY, and FAQ. Below this is a 'BOB' section with a 'Need Help? Ask BoB!' button. Further down is an 'ONLINE RESOURCES' section with links to Databases, Journals, E-books, Refworks, and Turnitin. At the bottom of the sidebar is a 'QUICKLINKS' section with links to Library Account, Interlibrary Loan, Suggestions, Other Library Catalogues, SMS, New Additions, and Mailing List. The bottom right corner features a 'ONLINE DICTIONARIES' section with a red banner.

<http://www.unibz.it/en/library/welcome/Metalib.html>

Agenda

- Problem Statement
- Systematic Retrieval of Studies
- **Systematic Selection of Studies**

Systematic Selection of Studies I

- The process by which one chooses studies for inclusion in a systematic review.
- Accomplished by instituting **specific and detailed inclusion and exclusion criteria!**
- Eligibility criteria:
 - Provide readers with an idea of the research domain of interest
 - Aid the systematic reviewer in applying consistent and objective standards throughout the selection process
 - Clearly circumscribe the review

Systematic Selection of Studies II

- Publication types
- Study design
- Population
- Intervention
- Outcomes
- Measures

Publication Types

- Identify the types of reports to be included
- Determine any geographic or linguistic limitations
- e.g., “Studies eligible for this review may be published or unpublished reports (e.g., dissertations theses, government reports, school district reports, etc.) of school-based interventions conducted in any country and reported in any language.”
(Lavenberg, 2007)

Study Design

- Specify the research designs to be included
- Also identify the research designs to be excluded
- Address the rationale for inclusion and exclusion
 - Consider theoretical framework
 - Consider available evidence

Population

- Indicate the desired target population
- Stipulate any required characteristics
- Distinguish characteristics that would make the target population ineligible
- e.g., “Studies of interventions that target children and youth who are enrolled in kindergarten through grade 12 (or the international equivalents) at public, private, parochial, or alternative schools and are between the ages of 4 and 20 years will be included in this review. Persons identified as attending ‘preschool’ or ‘college’ will not be included, even if they are within the acceptable age range.”

Intervention

- Describe the characteristics of the intervention
- Provide definitions
- Give a few examples of what would be included and what would be excluded

Outcomes

- Indicate outcome variables of interest
- e.g., “At least one quantitative measure of aggressive behavior must be reported in each study....[citations to literature here]... Therefore, both physical and verbal aggressive behaviors will be considered acceptable outcomes.”

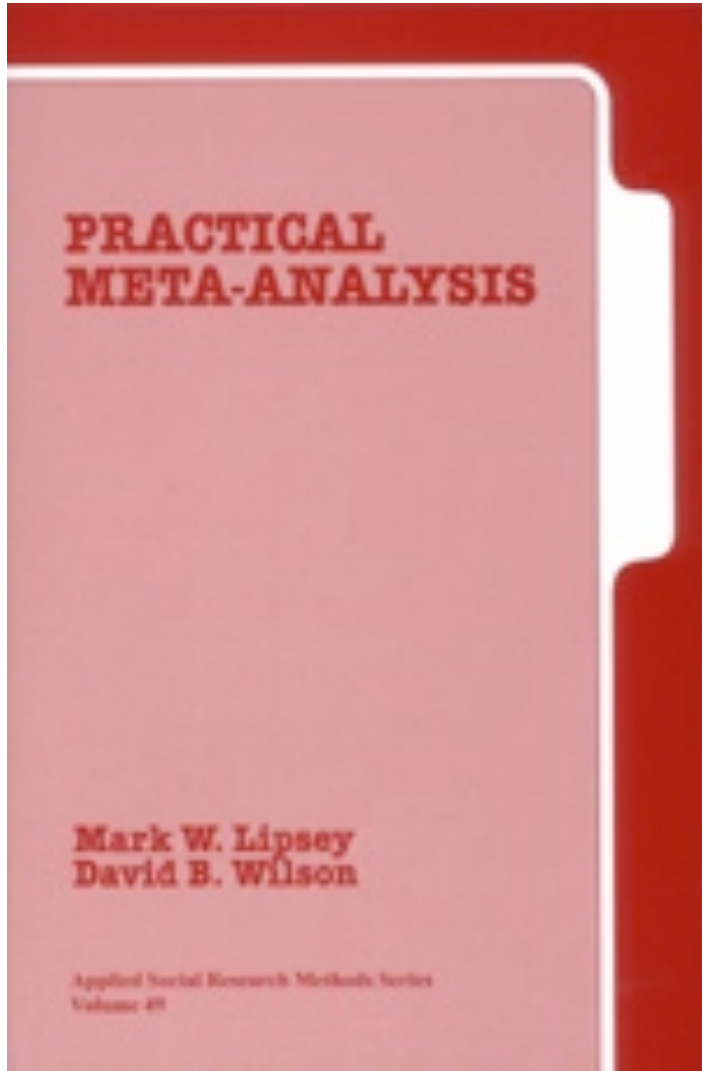
Measures

- Address acceptable measures
- e.g., “Standardized measures of aggressive behavior (e.g., Child Behavior Checklist – Teacher Report Form....) and unstandardized measures with adequate face validity (e.g., local administrative records...) will both be considered acceptable forms of reporting aggressive behavior. Measures reported in the Buros Institute of Mental Measures Yearbook... will be considered standardized measures; all others will be considered unstandardized measures.”

Important Points

- The inclusion and exclusion criteria define the systematic review / meta-analysis.
- These criteria are directly related to the Research Question(s) and to the Information Retrieval stage of a systematic review / meta-analysis.
- Specificity is paramount.

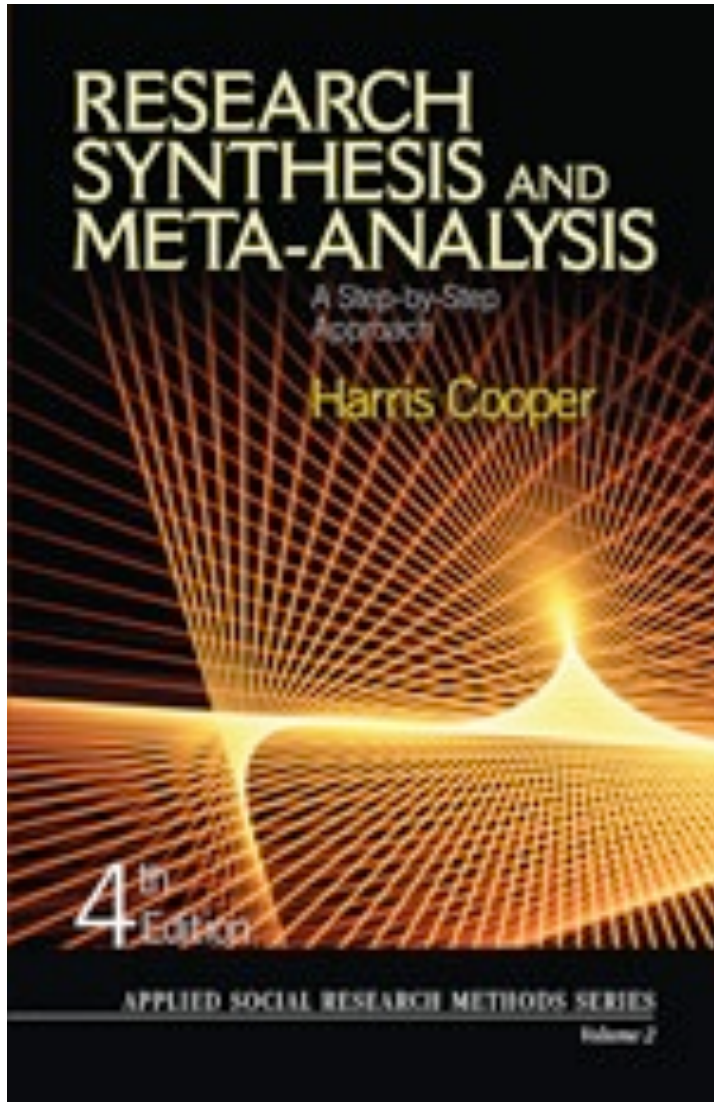
Lipsey & Wilson (2001)



Lipsey, M.W., & Wilson, D.B.(2001). *Practical Meta-analysis*. Thousand Oaks: Sage.

- Chapter 2: Problem Specification and Study Retrieval

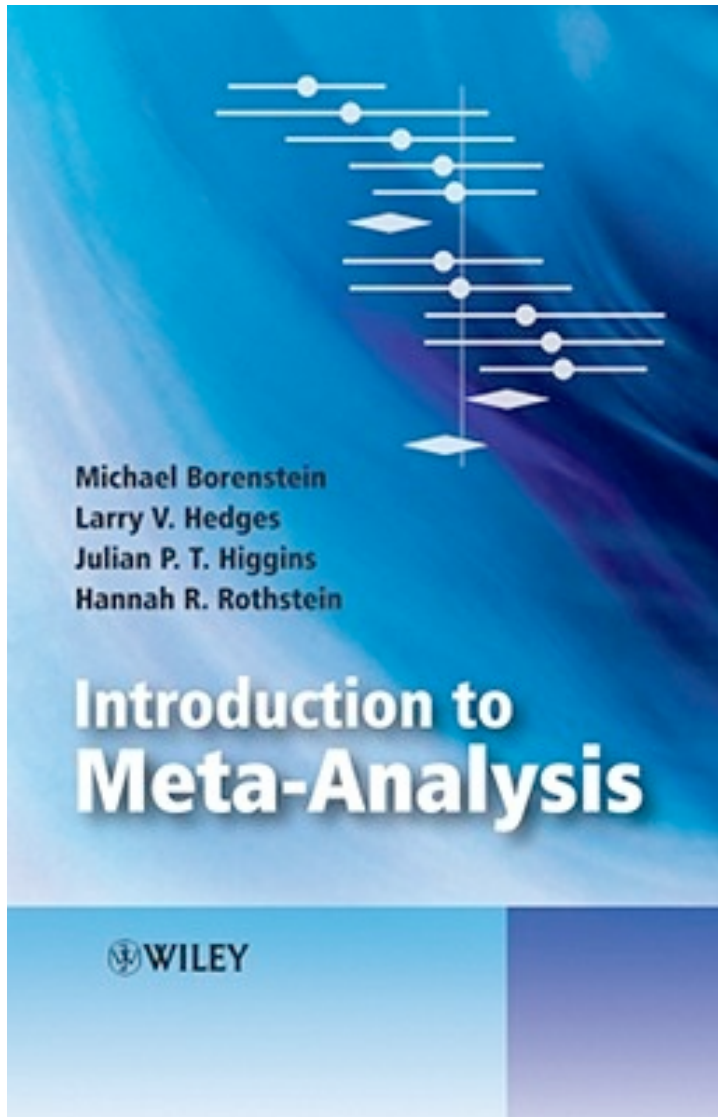
Cooper (2010)



Cooper, H. (2010). *Research Synthesis and Meta-Analysis: A Step-by-Step Approach*. Thousand Oaks, CA: Sage.

- Chapter 2: Step 1: Formulating the Problem
- Chapter 3: Step 2: Searching the Literature

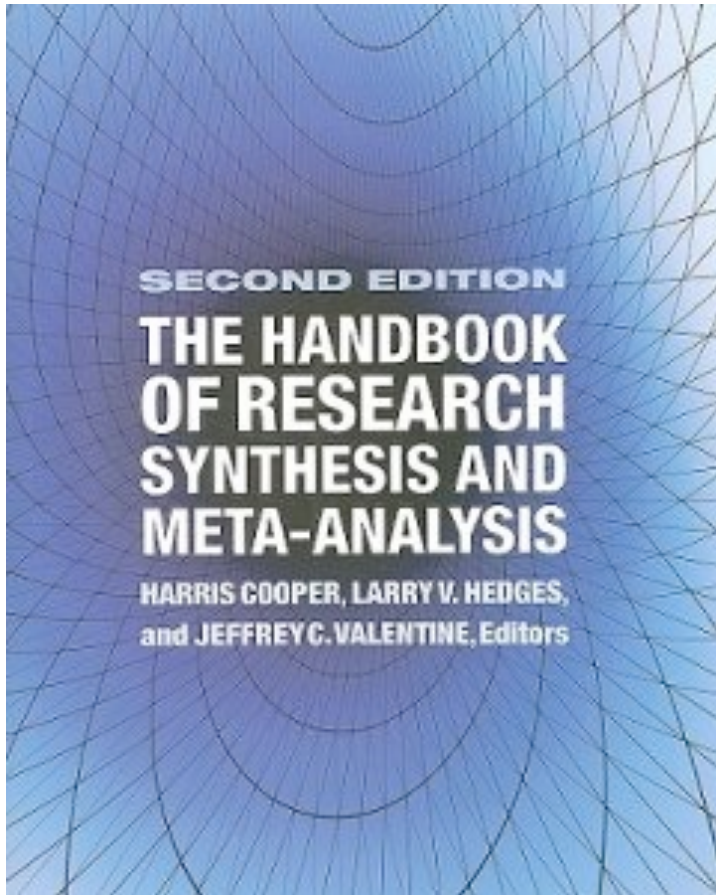
Borenstein et al. (2009)



Borenstein, M., Hedges, L.V., Higgins, J.P.T, & Rothstein, H.R. (2009). *Introduction to Meta-Analysis*. Chichester, UK: Wiley.

- Does not contain specific chapters on problem statement/ literature search/ selection of studies, because meta-analysis defined by quantitative/ analytic part (i.e., does not cover systematic review methods).

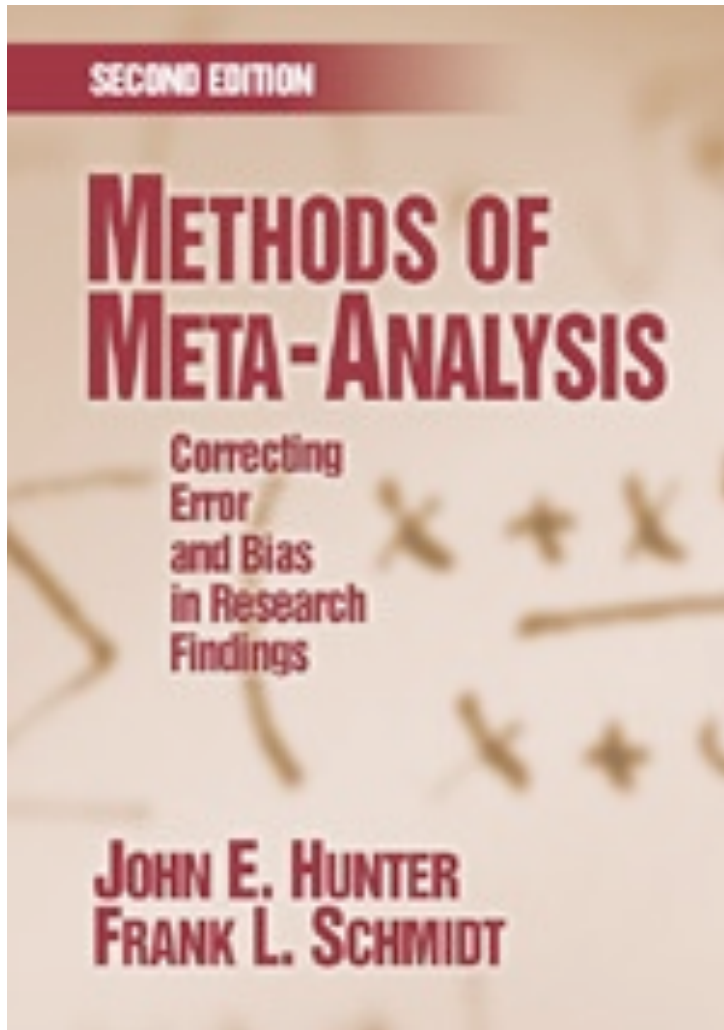
Cooper, Hedges & Valentine (2009)



Cooper, H., Hedges, L.V., & Valentine, J.C. (Eds.) (2009). *Handbook of Research Synthesis (2nd ed.)*. New York: Russell Sage Foundation.

- Part II: Formulating the problem
 - Chapter 2: Hypotheses and problems in research synthesis (Cooper)
 - Chapter 3: Statistical considerations (Hedges)
- Part III: Searching the literature
 - Chapter 4: Scientific communication and literature retrieval (White)
 - Chapter 5: Using reference databases (Reed/Baxter)
 - Chapter 6: Gray literature (Rothstein, Hopewell)

Hunter & Schmidt (2004)



Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.)*. Thousand Oaks, CA: Sage.

- Chapter 12: Locating, Evaluating, Selecting, and Coding Studies
- Very condensed, does primarily refer to other sources (see above)
- NOT sufficient to get an understanding of the topics and procedures involved