Searching and Critical Appraisal of the Literature for Systematic Reviews

For the Health Sciences / Medical Librarian
Objectives

• Recognize key steps of a systematic review; identify opportunities for contributions from librarians to the systematic review process.
• Share strategies for developing and testing comprehensive searches; refine existing techniques to support high-quality, reproducible systematic reviews.
• Become familiar with aspects of the systematic review process other than searching the literature (e.g., screening for eligibility, critical appraisal and data extraction).
• Strengthen the confidence of librarians interested in collaborating in the design and execution of systematic review projects
• Identify resources for professional development in this area.
I am a project manager at the Vanderbilt Evidence-based Practice Center, primarily responsible for facilitating systematic reviews of medical and behavioral interventions. In my role, I am involved in the design and conduct of the review, as well as the retrieval and review of published and grey-sources of literature. With the assistance of staff scientists and analysts, I manage several steps of data extraction, appraisal, and synthesis of the findings to generate an evidence-based summary of primary literature for dissemination among stakeholders, funders, policy-makers, and healthcare providers. I previously worked as a protocol analyst to improve compliance of human subjects’ research proposals and ensure proper informed consent procedures for research participants. As a health sciences librarian, I conducted individual and group training sessions on navigating the medical literature and participated in various knowledge management projects. I enjoy all aspects of my current and prior experience and am happy to have the opportunity to offer in-depth and focused training on searching and critical appraisal of the literature for development of systematic reviews.
Outline

- 9:00-9:15 Course Overview and Objectives
- 9:15-9:45 Experience and Expectations (presenter and group)
- 9:45-10:30 Systematic Reviews: Process and Steps
- 10:30-10:45 Break
- 10:45-11:15 Screening for Eligibility: Overview and Tools
- 11:15-12:00 Screening for Eligibility: Group Exercise and Discussion
- 12:00-1:00 Lunch
- 1:00-1:30 Data Extraction: Process and Steps
- 1:30-2:15 Data Extraction: Group Exercise and Discussion
- 2:15-2:30 Break
- 2:30-3:00 Critical Appraisal: Overview and Tools
- 3:00-3:45 Critical Appraisal: Group Exercise and Discussion
- 3:45-4:00 Wrap Up: Resources and Q&A
Experience and Expectations

• Traditional training and education
  – Databases, searching, controlled vocabulary
  – Critical appraisal and synthesis of evidence

• Specialized training and professional collaboration
  – Clinical Informatics Consult Service; Order set literature support
  – Research protocol development
  – Guideline implementation

Current Role: Project Manager with the Vanderbilt Evidence Based Practice Center (EPC), funded by the Agency for Healthcare Research and Quality (AHRQ). EPC conducts systematic reviews of evidence for healthcare interventions and technologies.

What is your experience or interest in systematic reviews?
Systematic Review Process

• “a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review” (PRISMA statement, PLoS Med. 2009 Jul 21;6(7):e1000097. PMID: 19621072)

• May or may not include meta-analysis of results
Cochrane Consumer and Communications

http://cccrg.cochrane.org/what-are-systematic-reviews
Systematic Review Steps

- Develop Key Question(s)
- Establish the PICOTS
- Conduct a preliminary scan of the literature
- Identify key sources of evidence (published and grey)
- Test and develop search strategies
- Screen for eligibility
- Extract data (characteristics and outcomes)
- Appraise the quality (individual study bias and overall strength of the evidence)
- Incorporate into the report
Standards

• Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)
  – 27 item checklist for a systematic review or meta-analysis

• Institute of Medicine (IOM) Standards
IOM Standards 2.1 – 2.8

- Establish a team with appropriate expertise
- Manage bias and conflict of interest
- Ensure user and stakeholder input
- Formulate the topic
- Develop the protocol
- (public review of the protocol)
- Make the protocol publicly available
  – http://www.crd.york.ac.uk/PROSPERO/
2.6: Develop the Protocol

- Context and rationale
- Study screening and selection criteria
- Outcome measures, time points, interventions and comparison groups
- Search strategy
- Data extraction strategy
- Process for resolving disagreements
- Approach to critical appraisal of studies
- Method for evaluating the body of evidence
- Planned analyses
The Research Question

• A good systematic review is based on a well-formulated, answerable question

• The question guides the review by defining studies to include, the search strategy, the data to extract

• Questions are ideally structured on PICOTS model
Key Question Formulation

P: Population
I: Intervention
C: Comparator
O: Outcome
T: Timing
S: Setting
Potential Roles for Librarians in Systematic Review

• Construct and refine the literature search
• Assist in framing the key question(s)
• Gather background information
• Identify collaborators at the institution
• Participate in execution of the review (inclusion/exclusion, quality assessment, evidence extraction, section writing)
Standard 3.1 Systematic Search

- Work with a librarian
- Use a separate search strategy for each key question
- Search bibliographic databases (e.g. Medline)
- Search citation indexes (e.g. Web of Science)
- Search literature cited by eligible studies
- Update the search at specific intervals
- Search subject specific databases (e.g. PsycINFO)
Literature Searching

Preparation
• Scoping searches
• Selecting sources

Minimizing Reporting and Publication Bias
• Non-English language sources
• Ongoing Trials
• Regulatory/Grey Literature

Quality, Transparency and Reproducibility
• Evaluation of search strategies (e.g., peer review)
• Reporting
• Documentation

Search Mechanics
• Filters/hedges
• Terms and Keywords

Operators
Results Management
• De-duping
• Citation management

Alternative Approaches to Searching
• Handsearching
• Citation Tracking
• Google/Web searching

Context and Content-specific Strategies
• Qualitative study searching
• Searching for adverse/events
Initial Steps

Framing the question – reference interview skills

– Rationale
– Background
– Potential contribution to clinical decision making by clinicians and patients
– Is there enough relevant literature to merit a systematic review approach? Is there data amenable to including a meta-analytic component
– Is it likely to be a meaningful contribution to the literature? How would it complement any existing synthesis documents?

Extensive background reading
Initial Steps (cont.)

- Establish objectives and work plan:
  - Project scope
  - Key questions, objectives
  - Inclusion/exclusion criteria
- Create a timeline for completing the work of the review
- Designate deliverables along this timeline
- Assess the need for a search update
Databases

• PubMed (MEDLINE): Biomedical indexed and non-indexed literature
• Embase: European and Asian journals. EMTREE controlled vocabulary.
• Cochrane Library (Includes the Cochrane Central Register of Controlled Trials): Contains MEDLINE trials and studies trials from other, non-indexed sources; limited to randomized and non-randomized controlled trials. MeSH for MEDLINE records, but no other controlled vocabulary.
• Web of Science (Science Citation Index): Covers some journals missed by PubMed and Embase. Some meeting information. No controlled vocabulary.
• ClinicalTrials.gov: Registers trials that are recruiting and reports which have been completed.
Databases

These databases can be an effective complement to your search. They can be essential in their specialized topic areas.

- BIOSIS Previews: Primarily useful for biologists, it contains a lot of meetings and some medical journals. Controlled vocabulary is not suitable for medical searching.
- CINAHL: Nursing and other health related information; excellent source for issues in patient care. Well developed controlled vocabulary.
- PsycINFO: Cognitive and behavioral therapies are well covered. Controlled vocabulary.
- POPLINE: Reproduction and population issues. Simple, specialized controlled vocabulary.
- LILACS: Health science literature published by Latin American and Caribbean authors.
- African Index Medicus: index to African health literature and information sources.
- WHO Global Health Library: Search all WHO regional indexes
- Sociological Abstracts: The primary index for sociological literature. May be useful for community-related studies or interpersonal issues. Controlled vocabulary.
- 3ie Impact Evaluation Repository: Curated database for evidence on international development in low- and middle-income countries.
- EconLit: Covers social and medical interventions studied by economists.
Frame the Search

• Transform the key questions or the systematic review objectives into a literature search

• Brainstorm with team – search terms, population characteristics, diagnosis and intervention names or acronyms

• Assess components of the review scope and identify those that can be operationalized at the literature search level (e.g., concepts, study design, publication type)
Frame the Search (cont.)

• Find additional terms by browsing relevant items
• Select appropriate databases and other resources
• Assess non or not yet indexed literature
• Decide if the search should include a gray literature component
  – Currently funded research
  – White papers
  – FDA documentation
  – Conference papers
Exclusions at the Search Level

- Language and species limits; publication date
- Publication types unlikely to include primary data
  - Letters
  - Case reports
  - Comments
  - Practice guidelines
  - Consumer health literature
  - Etc.
# PubMed Search Tags & Field Qualifiers

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<thead>
<tr>
<th>FIELD NAME</th>
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<tbody>
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<td>First listed author’s institutional affiliation</td>
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<td>[CN]</td>
<td>Corporate names as authors</td>
</tr>
<tr>
<td>EC/RN Number</td>
<td>[RN]</td>
<td>CAS Registry Number or Enzyme Commission Number</td>
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<tr>
<td>Entrez Date</td>
<td>[EDAT]</td>
<td>Date citation was added to database</td>
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<td>[TA]</td>
<td>Title of journal</td>
</tr>
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<td>Language of the article (not the abstract)</td>
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<td>[MAJR]</td>
<td>Main topic of an article</td>
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<td>MeSH Subheading</td>
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<tr>
<td>MeSH Term</td>
<td>[MH]</td>
<td>MeSH Term</td>
</tr>
<tr>
<td>Personal Name as Subject</td>
<td>[PS]</td>
<td>Person as the subject of an article, not as an author</td>
</tr>
<tr>
<td>Publication Type</td>
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<td>Format of an article (letter, clinical trial, etc) rather than content</td>
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<td>Subject and citation subsets</td>
</tr>
<tr>
<td>Substance Name</td>
<td>[NM]</td>
<td>Chemical and substance names discussed in an article</td>
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<td>Text Word</td>
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<td>Textual fields of PubMed records</td>
</tr>
<tr>
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<td>Article title</td>
</tr>
<tr>
<td>Title or Abstract</td>
<td>[TIAB]</td>
<td>Words in an article title or an abstract</td>
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Test the Search

- Vet against a quasi “gold standard” pool of citations
- Identify “false drops” and rework the strategy to eliminate
  - Acronyms avoidable
  - Making use of hierarchical vocabulary
- Peer review the search
  - Library colleagues, team members, and expert panel members
Activity: Develop Search

• Draft the terms that will be used in the search
• Transform the key questions or the systematic review objectives into a literature search
• Use PICOTS to guide the drafting of terms.
• Diagnosis and intervention names or acronyms
• Assess components of the review scope and identify those that can be operationalized at the literature search level (e.g., concepts, study design, publication type)
# Grey Literature and Source of Regulatory Information

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<td><strong>Regulatory Info:</strong></td>
<td><strong>Trial Registries:</strong></td>
<td><strong>Abstracts and Conferences</strong></td>
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<td>• Drugs@FDA</td>
<td>• ClinicalTrials.gov</td>
<td>• Conference Papers Index</td>
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<td>• Devices@FDA</td>
<td>• Current Controlled Trials</td>
<td>• Scopus</td>
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<td>• Health Canada</td>
<td>• Clinical Study Results</td>
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<td>• Authorized Medicines for EU</td>
<td>• WHO Clinical Trials</td>
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<td>CDER Archives</td>
<td>Center Watch</td>
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<td>Dockets Management</td>
<td>IFPMC Clinical Trial Results Portal</td>
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<td>Drug Information Portal</td>
<td>GlaxoSmithKline Results</td>
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<td>MedWatch</td>
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<td><strong>[Gov Docs]</strong></td>
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<td>BMC Meetings</td>
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<tr>
<td>• RePORTER</td>
<td></td>
<td>NLM Gateway - meetings</td>
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<tr>
<td>• HSRPROJ</td>
<td></td>
<td>Papers and Proceedings First</td>
</tr>
<tr>
<td>• AHRQ GOLD</td>
<td></td>
<td>Suggestions (DIRLINE)</td>
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<tr>
<td><strong>[Misc.]</strong></td>
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<tr>
<td>• NY Academy of Medicine</td>
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<td>• OpenSIGLE</td>
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<td>• OAIster</td>
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<tr>
<td>• Other</td>
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The comparative recall of Google Scholar versus PubMed in identical searches for biomedical systematic reviews: a review of searches used in systematic reviews

Wichor M Bramer¹, Dean Giustini², Blanca MR Kramer³ and PF Anderson⁴

Abstract

Background: The usefulness of Google Scholar (GS) as a bibliographic database for biomedical systematic review (SR) searching is a subject of current interest and debate in research circles. Recent research has suggested GS might even be used alone in SR searching. This assertion is challenged here by testing whether GS can locate all studies included in 21 previously published SRs. Second, it examines the recall of GS, taking into account the maximum number of items that can be viewed, and tests whether more complete searches created by an information specialist will improve recall compared to the searches used in the 21 published SRs.

Methods: The authors identified 21 biomedical SRs that had used GS and PubMed as information sources and reported their use of identical, reproducible search strategies in both databases. These search strategies were rerun in GS and PubMed, and analyzed as to their coverage and recall. Efforts were made to improve searches that underperformed in each database.

Results: GS overall coverage was higher than PubMed (98% versus 91%) and overall recall is higher in GS. 80% of the references included in the 21 SRs were retrieved by the original searches in GS versus 69% in PubMed. Only 7.2% of the included references could be used as they were listed among the first 1,000 hits (the maximum number shown). Practical precision (the number of included references retrieved in the first 1,000, divided by 1,000) was on average 1.9%, which is only slightly lower than in other published SRs. Improving searches with the lowest recall resulted in an increase in recall from 43% to 66% in GS and, in PubMed, from 60% to 85%.

Conclusions: Although its coverage and precision are acceptable, GS, because of its incomplete recall, should not be used as a single source in SR searching. A specialized, curated medical database such as PubMed provides experienced searchers with tools and functionality that help improve recall, and numerous options in order to optimize precision. Searches for SRs should be performed by experienced searchers creating searches that maximize recall for as many databases as deemed necessary by the search expert.

Keywords: Bibliographic databases, Information retrieval, Systematic reviews, Methodology, Literature searching, Reproducibility
Websites and Search Engines

Search engine searches may be transparent if reported appropriately, but are not reproducible.

Algorithms for the retrieval of information changes over time and by user (e.g., Google tracking by IP to display results by user preference)

To avoid tailored retrieval, use StartPage™ or DuckDuckGo

Table 2 The usefulness of transparent web search reporting in relation to the reproducibility of search results

<table>
<thead>
<tr>
<th>Name</th>
<th>Websites</th>
<th>Search engines</th>
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<tr>
<td>URL</td>
<td>Essential information for reproducing search.</td>
<td>Essential information for reproducing search.</td>
</tr>
<tr>
<td>Dates searched</td>
<td>Useful information but searching at a later date may retrieve entirely different results rather than updating the original results (see results below).</td>
<td>Useful information but searching at a later date may retrieve entirely different results rather than updating the original results (see results below).</td>
</tr>
<tr>
<td>Search terms</td>
<td>Essential information for reproducing search.</td>
<td>Essential information for reproducing search.</td>
</tr>
<tr>
<td>Results</td>
<td>Useful information but results may change due to changes to web page content or removal of online documents, such as PDFs or spreadsheets.</td>
<td>Useful information but results may change due to search engine algorithm changes or personalised results.</td>
</tr>
</tbody>
</table>

Search Strategy Review Tool

- Elements with enough evidence to support their use in the peer review of electronic search strategies are:
  - conceptualization of research question
  - spelling errors and wrong line numbers
  - translation of search strategy to different databases
  - missed subject headings
  - missed natural language search terms
  - spelling variants and truncation
  - irrelevant subject headings
  - irrelevant natural language terms
  - search limits.

Prepare Results for Review

• Document strategies and retrieval from each database
• Include dates and sources of databases
• Export results to reference management software
• Eliminate duplicates and note the final number for screening
• Plan for search update
Document Search Methods

• Write up techniques for selecting terms, databases, and use of limits
• Documenting and reporting search methods in a way that is thorough, complete, accurate, and replicable
• Throughout the search process - Useful to document terms, databases, etc. tested and discarded due to lack of utility
Reporting

- No validated scales were found for the assessment of the electronic search strategy - 26 un-validated scales were identified, including 9 scales looking at the conduct or reporting of the entire search (not just the electronic component).

- No clear consensus regarding optimum reporting of systematic review search methods, although there is a trend toward mandating more complete reporting.

For reporting Websites, include:
- Name
- URL
- Dates searched
- Search terms (including any specific sections searched)
- Results

For reporting of a search engine search, include:
- Name
- Dates searched
- Search terms
- How the results were selected

- Algorithms for the retrieval of information changes over time and by user (e.g., Google tracking by IP to display results by user preference) To avoid tailored retrieval, use StartPage™ or DuckDuckGo
- Search engine searches may be transparent if reported appropriately, but are not reproducible.

See:
Documenting the Literature Review Methods

**Literature Search and Retrieval Process**

**Databases.** We employed search strategies provided in Appendix A to retrieve research on the treatment of autism spectrum disorders, including Asperger syndrome and Pervasive Developmental Disorder, Not-Otherwise-Specified. Our primary literature search employed three databases: MEDLINE® via the PubMed interface, PsycINFO (psychology and psychiatry literature), and the Education Resources Information Center (ERIC), searched from 1980 to the present. We also hand-searched the reference lists of all included articles to identify additional studies for review.

**Grey literature.** The AHRQ Scientific Resource Center also searched for information on the two medications specifically approved for treating irritability in ASDs (risperidone and aripiprazole) in resources including the websites of the US Food and Drug Administration and Health Canada and clinical trials registries such as ClinicalTrials.gov. We gave manufacturers of these medications as well as of hyperbaric oxygen chambers an opportunity to provide additional information.

**Search terms.** Controlled vocabulary terms served as the foundation of our search in each database, complemented by additional keyword phrases to represent ASDs in the clinical and educational literature. We also employed indexing terms when possible within each of the databases to exclude undesired publication types (e.g., reviews, case reports, news), items from non-peer-reviewed journals, and items published in languages other than English.

Our searches were executed between May 2009 and May 2010. Appendix A provides our search terms and the yield from each database.
Break

• After the break – abstract and full-text review
  small group exercises
Standard 3.3 Screening and Selection

• Use prespecified criteria
• Consider appropriate study designs
• Use double, independent review
• May use title and abstract screening before full text
Study Eligibility Criteria

• Determine which studies will be included in the analysis
• Function the same in systematic reviews as in primary research
• Should reflect the analytic framework and key questions
• Are powerful tools for widening or narrowing the scope of a review
• Provide information to determine whether reviews can be compared or combined
Screening for Eligibility: Tools

- Free or subscription web-based services
- Paper and pencil
- Desktop Software or Office Application
- For small or single reviews, consider paper and pencil plus a reference management product.
Screening Steps: Abstract Review

• Initial pass at determining whether an item is eligible for inclusion in the systematic review
• Two people review each item independently and decide:
  – Yes, include – item moves to full-text review
  – No, exclude – item is excluded and the reason for exclusion is noted
  – Unclear – abstract doesn’t include enough information, item moves to full-text review
Screening Steps: Full-text Review

• Final step in determining inclusion/exclusion
  – Two people review with adjudication by 3rd party for any disagreements
  – Yes – item meets inclusion criteria and is included in the systematic review
  – No—item fails to meet one or more of the inclusion criteria and is excluded from the systematic review, with reason(s) for exclusion noted
Screening: Practice and Discussion

• Use this time to complete paper-based screening forms
• Compare with others
• Discuss
Break for lunch

- After lunch: discussion of evidence extraction and small group exercise
Standard 3.5 Data Collection

• At least 2 researchers, working independently, to extract/check data
• Have a documented procedure for handling discrepancies
• Link publications from the same study (salami science)
• Use standard forms and be sure the pilot test them
Data Extraction: Process and Steps

• Develop a table or spreadsheet to record key characteristics and outcomes

• Completed tables can be used to organize, compare, and characterize the included studies

• Data tables provide information for text and summary tables in the report
Data Extraction: Exercise

• What elements of the study need to be recorded?
• What will the units of measurement be?
• How will the comparison groups be identified?
• Who determines the study design?
• How was the outcome measured?
• When was the outcome reported?
• What was the duration of intervention?
• What was the length of follow-up?
• Etc. This list can go on and on....
• Many characteristics are important across review topics. Some need to be established and prioritized before data extraction. Other issues emerge during data extraction.
Evidence tables

### MEDICAL Evidence Table ((510#704#892#1051#564#539#108#838#691#))

<table>
<thead>
<tr>
<th>Study Description</th>
<th>Intervention</th>
<th>Inclusion/Exclusion Criteria/Population</th>
<th>Baseline Measures</th>
<th>Outcomes</th>
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<tr>
<td><strong>Author:</strong></td>
<td></td>
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</tr>
<tr>
<td>Aman et al., 2005</td>
<td>RCT intervention (8 weeks):</td>
<td>Children weighing 20-45 kg; Initial dose of 0.5 mg at bedtime; increased to 0.5 mg twice daily on day 4; gradually increased in 0.5 mg increments to a maximum of 2.5 mg/day (1.0 mg AM, 1.5 mg bedtime) by day 29.</td>
<td>VABS-Communication, mean±SD: G1: 45.0±16.7, G2: 42.0±14.3</td>
<td>Overall ratings: Global Rating of Severity, mean±SD: NR</td>
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<tr>
<td>McDougall et al., 2005</td>
<td>Children weighing ≥ 45 kg; slightly accelerated dose schedule, with maximal dose of 1.5 mg AM and 2.0 mg bedtime</td>
<td></td>
<td>VABS-Socialization, mean±SD: G1: 49.1±16.6, G2: 47.4±10.1</td>
<td>Rate of positive response (≥25% improvement on Irritability subscale and rating of much improved or very much improved on CGI scale) during RCT, n (%) G1: 34 (69), G2: 6 (12), P &lt; 0.001</td>
</tr>
<tr>
<td>Arnold et al., 2003; RUPP, 2002; Williams et al., 2006; Anderson et al., 2006; Martin et al., 2004; Aman et al., 2008, RUPP, 2005</td>
<td>Children weighing &lt; 20 kg; initial dose 25 mg/day</td>
<td></td>
<td>VABS-Daily living, mean±SD: G1: 40.8±21.0, G2: 34.0±15.6</td>
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<tr>
<td>Country:</td>
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<td>US</td>
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<td>Practice setting:</td>
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<tr>
<td>Funding:</td>
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<tr>
<td>NIMH, NIH, Korczak Foundation, International Center for Children's Mental Health</td>
<td>Scheduled dose increased could be delayed due to AEs or marked improvement at lower dose; dose reductions to manage side effects allowed at any time; no dose</td>
<td></td>
<td>VABS-Maladaptive behavior, part 1, mean±SD: G1: 24.89±6.91, G2: 25.22±5.72</td>
<td>CGI improvement ratings at end of extension phase, n (%) Very much improved: 17 (33.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>Much improved: 29 (56.9)</td>
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Refresher Study Designs

• Experimental designs
• Randomized controlled trial
  – Randomized crossover trial
  – Multiple baseline design

• Observational designs
• Prospective cohort study
• Retrospective cohort study
• Case series
Break

• After the break: quality appraisal
Standard 3.6 Critical Appraisal

• Assess the risk of bias
• Assess applicability
Appraisal: Tools and Steps

• Quality/risk of bias of individual studies is appraisal of the methodologic rigor and transparency of reporting\(^1\)
• Desirable to use a tool that was designed for the type of literature you are using and has been tested for reliability and credibility
• Cochrane (RCTs), RTI Item Bank (various), Ottawa Newcastle (NRCTs), Minimum Quality Criteria Set (MQCS) (Quality Improvement Interventions)
• Strength of the evidence is an appraisal of methodologic quality across multiple studies for a given intervention, comparison or outcome
• Authors/methodologists assess individual domains to assess degree of confidence that the findings are “true”

\(^1\) Reporting standards and guidelines are not equivalent to appraisal tools
Risk of Bias

• The extent to which a single study’s design and conduct will protect against all bias in the estimate of effect
• The risk that the study results reflect bias in study design or execution in addition to the true effect
• Sometimes referred to as “quality” but the definition of quality varies
• Includes explicit assessment of elements of study design and conduct

Bias is any trend in the collection, analysis, interpretation, publication or review of data that can lead to conclusions that are systematically different from the truth.
(A Dictionary of Epidemiology, Last, 2001)
Quality Assessment: Exercise

• Use this time to assess study quality using the Cochrane Risk of Bias Tool
• Compare findings with others
• Discuss
Strength of Evidence

• Study Limitations
• Directness:
  – Degree to which evidence links interventions directly to health outcomes
• Consistency:
  – Degree to which included studies have the same direction or magnitude of effect
• Precision:
  – Degree of certainty surrounding an estimate of effect with respect to a given outcome
• Reporting bias:
  – Includes study publication bias, selective outcomes reporting bias and selective analysis reporting bias
Strength of Evidence

Optional Domains

• Dose-response association
  – Pattern of a larger effect with greater exposure

• Plausible confounding that would decrease observed effect
  – Likelihood that observed effect is large enough that it cannot have occurred solely as a result of bias from potential confounding factors

• Strength of association (magnitude of effect)
  – For use in observational studies where plausible confounders may work in the opposite direction of the observed effect
GRADE

• Another systematic approach, intended to lead more explicitly to guideline development than the EPC approach but very similar
• Includes applicability (generalizability) as part of directness rather than as a separate entity
• Assesses strength of recommendations rather than strength of evidence
  – A strong recommendation is one in which based on the available evidence, clinicians are very certain that benefits do, or do not, outweigh risks and burdens.
• Includes the same components as SOE
• GRADEpro software is available online to help with this process
Standards 5.1 to 5.3

• Prepare final report using a structured format
  – See PRISMA guidelines for details
• Include a results section, organized by key question
• Discussion section should include
  – Summary of the evidence
  – Strengths and limitations of the systematic review
  – Conclusions for each key question
  – Gaps in evidence
  – Future research needs
Final report

• Final report may be organized by Key Questions, the study quality, outcomes and/or study populations.
• Report should include a methods and results section. Include explicit description of the strategies.
• Report the exact retrieval and disposition of the papers in the findings.
• Summarize and characterize the overall or subsets of the literature using the data extraction tables.
• Synthesize the outcomes in the context of the quality and limitations of the existing literature base for the topic.
• Augment findings if possible using quantitative approaches (consult a biostatistician)
Literature Flow

Document:
- Key questions and operationalization of elements
- Search terms, databases, strategies
- Search output
- Inclusion/exclusion criteria and operationalization (e.g., 80% adolescents)
- Disposition of studies (exclusion reasons)
- Data extraction elements
- Synthesis assumptions
- Research gaps
Authorship

• Discuss potential for authorship lead investigator/author at start of project.
  – What constitutes a substantive contribution to the preparation of a systematic review?
• ICJME recommends: “Authorship credit should be based on 1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. Authors should meet conditions 1, 2, and 3.”
  – (http://www.icmje.org/ethical_1author.html)
Acknowledgments

• Other option: Contributors listed in acknowledgments

• ICJME: "Examples of those who might be acknowledged include a person who provided purely technical help, writing assistance, or a department chairperson who provided only general support.”
Summary of Successful Systematic Review

• Choose important, well-focused question
• Refine components of question (people, exposure, control group, outcomes)
• Set clear, workable inclusion criteria
• Plan sensible and thorough search strategy
• Use multiple overlapping sources of data
• Ensure that clinical and methodological expertise and support are available
• Follow available guidance for methods and document each step clearly
• Adhere to guidance for structuring the manuscript for publication
Conclusions

• Valuable opportunity to apply and further develop skills in searching, critical appraisal and synthesis of the literature
  – Important mechanism for continuing to extend the training of our professionals
• Rich collaboration with clinicians, researchers, and other colleagues
• Expanding the role of librarians in the systematic review process beyond the literature search level
• Improving visibility of advanced roles for librarians at our institution and beyond
Additional Resources

• Vanderbilt EPC project page (http://medicineandpublichealth.vanderbilt.edu.CENTER.php?userid=1043409&id=45167991)
• AHRQ methods guide (http://www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?productid=318&pageaction=displayproduct)
• Cochrane handbook (http://www.cochrane.org/training/cochrane-handbook)
• 1997 Cook paper, Ann Intern Med (http://www.annals.org/content/126/5/376.full)
• Grey literature webinar series (http://www.academyhealth.org/Training/ResourceDetail.cfm?itemnumber=6670)