
Getting started with your systematic or scoping review

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An electronic version of this guide can be found at <https://osf.io/nsthf/>

Steps in conducting a systematic or scoping review

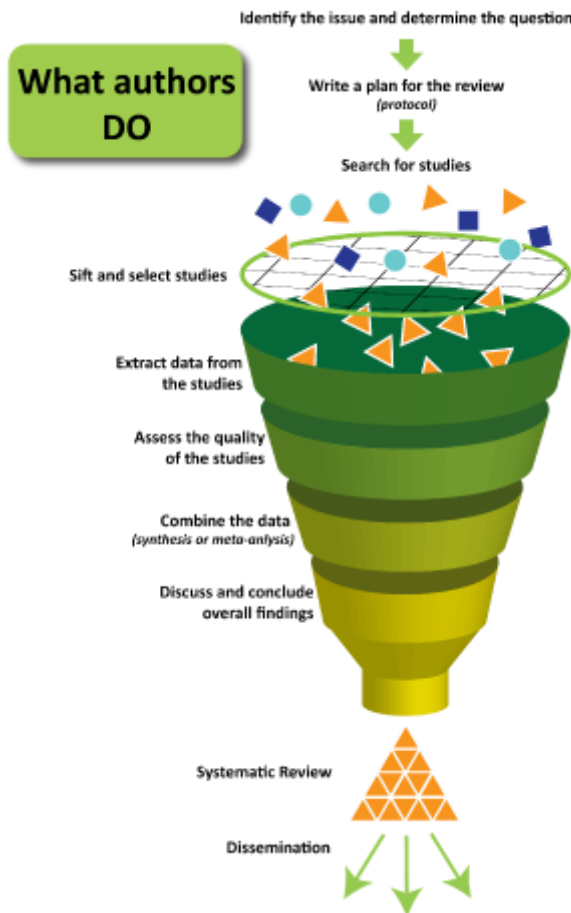


Image from the [Centre for Health Communication and Participation](#)

Defining your research topic

Before beginning your search, it is important to know what you are searching for. One common way to break down a research question is the PICO format:

	Example 1	Example 2	Your Topic
(P)opulation	Post-menopausal women	Adults with disabilities	
(I)ntervention	Hormone replacement therapy	Interventions to promote physical activity	
(C)omparison	No hormone replacement therapy	N/A	
(O)utcome	risk of breast cancer	Any	

Write out your research question:

What studies "count"?

Before you conduct your searches, it is important to clarify in as much detail as possible what kinds of articles will be included in your review and which ones won't. Clarifying ahead of time will save a lot of headache later on during the process; don't skip this step!

	Inclusion criteria	Exclusion criteria
Population(s) <i>types/characteristics of participants; ages of participants; health conditions of participants; etc</i>		
Intervention(s) <i>Types/characteristics of interventions; do articles which only have your target intervention as a part of the study "count"?; etc</i>		
Comparison(s)		
Outcome(s) <i>Which specific outcome measures "count"? Which ones don't? What about qualitative evidence?</i>		
Study designs <i>Which study types "count"? Which ones don't?</i>		
Date or language criteria		

What type of review are you conducting?

	Literature Review	Scoping Review	Systematic Review
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Pre-registration (before the review starts)	N/A	optional	Must register research plan on PROSPERO ¹ or another online repository Optional to publish a full protocol paper
Guidelines	N/A	Arskey & O'Malley framework ²	Reporting checklist: PRISMA ³ Guidance for conducting a review: CRD ⁴ or institution-specific if affiliated with an organisation such as Cochrane, JBI, Campbell
Research question	topic-based	"What is known about...?" (focuses on breadth of studies in a particular area)	"What is the effectiveness of...?" (focuses on answering a specific research question)
Searching	often is not systematic or exhaustive	systematic searches of multiple databases and grey literature/supplementary searching	systematic searches of multiple databases and grey literature/supplementary searching
Critical Appraisal	N/A	optional	required
Synthesis	narrative	narrative/tabular	narrative/tabular, sometimes accompanied by a meta-analysis

Choose databases

There are many subject databases, and which ones you search will depend on your search question. Every database has a slightly different *scope* and includes different journals. Some common databases include:

General biomedical databases	MEDLINE (can be accessed through PubMed or Ovid interfaces) Embase Cochrane Library
General science databases	Web of Science
Nursing/allied health databases	AMED (Allied Health and Complementary Medicine) CINAHL (Cumulative Index to Nursing and Allied Health Literature) OTseeker (Occupational Therapy)* PEDro (Physiotherapy Evidence Database)*
Psychology	PsycINFO
Education	ERIC (Educational Resources Information Center) Education Abstracts

* database freely available online (all others available through University of Plymouth)

There are many more databases that are discipline-specific. To access any of the databases above or view a full list of available databases, navigate to the library guide titled "A-Z databases"

(<http://plymouth.libguides.com/c.php?g=48969>). You may need to log in with your university credentials to access.

¹ PROSPERO International prospective register of systematic reviews <https://www.crd.york.ac.uk/prosperto/>

² Arksey H, O'Malley L. Scoping studies: towards a methodological framework. International journal of social research methodology. 2005 Feb 1;8(1):19-32. <https://doi.org/10.1080/1364557032000119616>

³ PRISMA checklist: <http://www.prisma-statement.org/PRISMAStatement/Checklist.aspx>

⁴ Centre for Review and Dissemination (CRD) guidance for undertaking reviews in health care http://www.york.ac.uk/inst/crd/index_guidance.htm

Which database(s) are relevant for your project?

☐ _____	☐ _____
☐ _____	☐ _____
☐ _____	☐ _____

Supplementary searching

Formal reviews aim to be comprehensive – that is, to find every paper that is relevant to the research question.

Database searches may miss relevant articles to your topic, so it is important to conduct supplementary searches.

Supplementary searches are particularly useful when non-published material (such as white papers or government reports) may add value to your review.

What supplementary searching will you conduct for your project?

- | | |
|---|--|
| ☐ Search the reference lists of included citations (backwards citation chaining) | ☐ Handsearch of relevant think tank, association, or other organisational websites. |
| ☐ Search for any citations which have cited your included citations (forwards citation chaining) | ☐ Search of clinical trials registries (e.g. clinicaltrials.gov, WHO International Clinical Trials Registry Platform) |
| ☐ Targeted searches of Google and/or Google Scholar | ☐ Ask experts in the subject area for recommendations of relevant research articles |
| ☐ Search for relevant conference proceedings | ☐ Search for relevant theses or dissertations |

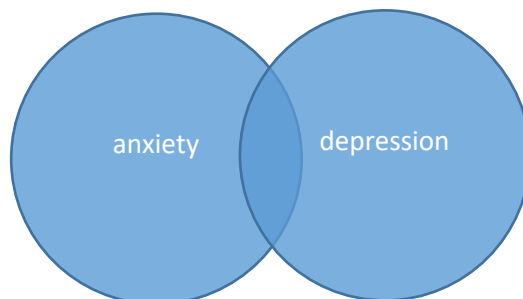
Boolean operators

There are two main boolean operators. These special words allow you to construct searches that will return more precise results.

AND

OR

OR



Using **OR** always returns **mORE** results than either term alone!

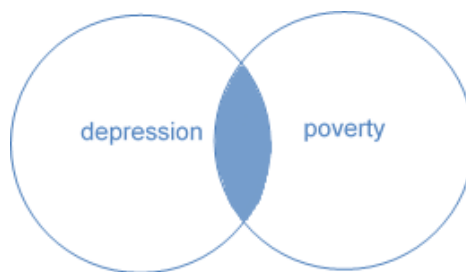
anxiety **OR** depression

Searching using **OR** returns *any* results that contain *any* of the search terms. In the diagram above, a citation containing the word anxiety but not the word depression would still be returned in your results.

OR is used for closely aligned or synonymous terms.

Search terms	Results
anxiety	179,934
depression	320,518
anxiety OR depression	433,517 (mORE results)

AND



Using **AND** always returns *less* results than either term alone!

depression **AND** poverty

Searching using **AND** *only* returns results where both are in the citation. In the diagram above, a citation containing the word depression but not the word poverty would *not* be returned in your results.

AND is used to combine *different* concepts in your strategy.

Search terms	Results	terms
depression	320,518	poverty
poverty	156,325	
depression AND poverty	8,521 (less results)	

Gathering search terms

Now it's time to put together all the pieces. For each of your major concepts, try to think about the different terms or synonyms that might be used in the literature.

Consider the following research question:

"What is known about interventions promoting physical activity in adults with disability?"

Here are some examples of synonyms for each concept:

Adults with disability (concept 1)	Physical activity interventions (concept 2)	(concept 3)
Disability / disabled Visually impaired / impairment Hearing impaired / impairment Down's syndrome (etc...)	Physical activity Exercise Fitness Sports Yoga (etc...)	(For some questions, it may not be necessary to search for every concept! For this question, searching for concepts 1 and 2 might return a feasible number of results to screen, so start with this and add additional concepts later if needed)

What are some synonyms for each concept in your research question?

(concept 1)		(concept 2)		(concept 3)
	AND		AND	

Important note: Building a search strategy is an *iterative* process. After brainstorming some terms, start playing around with them in a database such as PubMed. Do the results seem relevant? Are there important articles that you are already aware of that weren't picked up by your search? What terms can you add in that would pick up these key papers? What terms might be adding a high number of irrelevant results? Can you remove them? Repeat this process until your draft strategy returns a high number of relevant results and minimises the number of irrelevant results as best as possible.

Adding database-specific syntax

Each database has its own syntax that is used to tell the database where to search for the term.

Searching the title and abstract of a citation

	EBSCO databases (e.g. CINAHL, AMED)	ProQuest databases (e.g. PyscINFO)	Ovid databases (e.g. Ovid MEDLINE, Embase)
Title and Abstract	TI (search term) OR AB (search term)	TI (search term) OR AB (search term)	search term. ti,ab

Truncation

Most databases allow **truncation**, generally using an asterisk (*). Truncation allows you to search for several different word endings, beginnings, or alternative spellings, at the same time, without writing them all out.

visual* impair*	disab*	wom*n	behavio*r
visually impaired visual impairment	disability disabled disablement	woman women	behavior behaviour

Caution! Not all databases use the same symbols, and some databases do not support the use of truncation at the beginning of a word or in the middle of a word. Be sure to test the terms to make sure they return the results you expect, or read the database documentation.

Adding Subject Headings

So far, we have structured a search using free text terms that can be found by searching an article's title or abstract.

It's not possible to come up with every single phrase and word variation for every concept. Well-structured searches use **subject headings** to retrieve more relevant results.

Subject headings are chosen from a list, rather than generated by the searcher. Experts compile these lists of terms and apply them to citations based on the subject of the article.

Note: every single database has its own subject heading list! You will need to separately search for and add subject headings to your strategy, database by database.

To find relevant subject headings:

1. Search the list of subject headings directly. Most databases will have a tab or button that says "subject headings" or "thesaurus" (or a similar phrase), which will direct you to a searchable list.
2. Look for articles in the database that are relevant to your topic, and check to see what terms have been applied to the article – some of them may be relevant to your search as well.

Subject headings are hierarchical

Choose the narrowest subject heading that still makes sense for your topic, and be sure to search for any narrower terms that are also relevant.

Subject heading syntax

	EBSCO databases (e.g. CINAHL)	ProQuest databases	Ovid databases (e.g. Embase)	PubMed
Subject heading syntax	<i>In CINAHL:</i> MH (subject heading) <i>In most others:</i> SU (subject heading)	SU (subject heading)	subject heading/	"subject heading"[mesh]

Putting your final search together

Once you have gathered your search terms and subject headings, it's time to start structuring your search. It's best practice to run your search with one item on each line, like the one below.

This formal search strategy uses Ovid MEDLINE syntax

Search concept 1	#	Searches	Results	Explanation
	1	osteoarthritis, knee/	17446	Subject headings are chosen from a list created by the database. In Ovid MEDLINE, subject headings are denoted by the "slash" symbol.
	2	(knee adj2 osteoarthritis).ti,ab,kw	8772	Adj# will search for terms within x number of one another in Ovid MEDLINE. This line will capture the phrases "knee osteoarthritis" and "osteoarthritis of the knee" in the title and abstract fields. Most databases have this function, but the syntax will vary.
	3	1 or 2	19933	Use OR to include any article that is picked up by searches on lines 1 or 2.

Search concept 2	All MeSH Categories
	Diseases Category
	Female Urogenital Diseases and Pregnancy Complications
	Pregnancy Complications
	Abortion, Spontaneous
	Abortion, Habitual +
	Abortion, Incomplete
	Abortion, Missed
	Abortion, Septic
	Abortion, Threatened
	Abortion, Veterinary
	Embryo Loss

4	exp exercise therapy/	44851	Exp means that the database should search for any narrower terms in the subject heading hierarchy. In some databases, this shorthand doesn't exist, and you will need to write out all narrower terms manually.
5	exercis*.ti,ab,kw	236379	In Ovid MEDLINE, use the asterisk symbol to truncate words or phrases. This line will capture terms such as "exercise", "exercises", and "exercising".
6	physical activity.ti,ab,kw	88623	
7	4 or 5 or 6	326439	Use OR to include any article that is picked up by the searches on lines 4, 5, or 6.
8	3 and 7	1810	Use AND to combine your search concepts together. Only articles that contain a search term related to concept 1 AND a search term related to concept 2 will be returned.

Download results

Every major database allows users to download the results of their search. It is very important to finalise your search strategy before downloading your results. After this point, you will not be able to make any changes to your search.

Downloading full search results

	EBSCO databases (e.g. CINAHL, AMED)	ProQuest databases (e.g. PsycINFO)	Ovid databases (e.g. Ovid MEDLINE, Embase)	PubMed
How to download citations	Select the "share" button, then "export results"	Use checkbox to select all items on the page, then "save"	Select the checkbox "all", then click "export"	In the top right-hand corner of search results column, click "send to", then "citation manager"

The most common citation management systems are EndNote (available to staff at University of Plymouth for free), Mendeley (free), Zotero (free), and RefWorks (subscription-based). EndNote is generally thought to be the best citation management system for systematic reviews, but any commonly used software will work.

Reporting the search

Record-keeping

At the same time that you download your search results, it is important to carefully record the following information for *each database searched* and keep it in a safe place:

- ☐ The date that you conducted the search
- ☐ The person conducting the search
- ☐ The full name of the database (e.g. PsycINFO) and interface (e.g. ProQuest) for each search

- In Ovid MEDLINE, be sure to record the exact database being used (e.g. Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations 1946 to present)
- The full search strategy used, exactly as conducted in the database, with the number of citations retrieved by each line. It is useful to copy-paste directly from the database itself for your records.
- Any additional limiters used (e.g. a date limit)
- The number of citations downloaded for screening (which should correspond to the number of citations on the last line of the search strategy)

De-duplicating your results

After all citations have been downloaded from all database searches, it is important to de-duplicate the citations before screening – otherwise, you may waste time and energy screening some citations multiple times! Most citation management systems allow for automatic or semi-automatic de-duplication of citations.

Be sure to record the number of citations downloaded from all sources before and after de-duplication. Both of these numbers are required for reporting your final results.

Screening your results

Screening

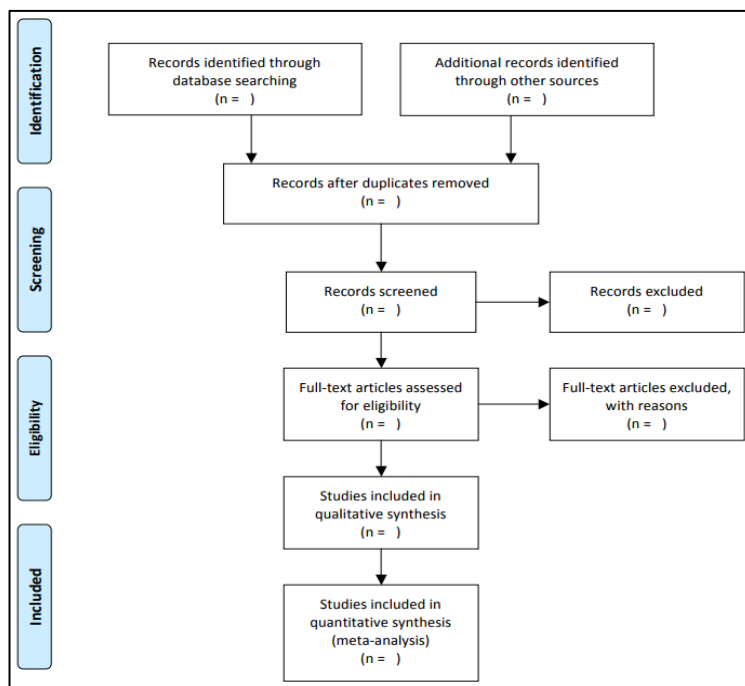
It is best practice to screen all citations by two people independently (i.e. without knowing one another's screening decisions), with a third person available to resolve any screening disputes. The easiest way to screen citations is using the free, web-based software Rayyan, available at rayyan.qcri.org.

Before commencing screening, first ensure that the inclusion and exclusion criteria for your decisions is fully understood by everyone on the team. It may be useful to go through a few articles together first, or screen a small test set, to make sure everyone is on the same page.

Screening should be conducted in two waves. In the first, all citations are independently checked by two people based on the title and abstract of the citation. In the second, all citations considered to be relevant or possibly relevant from the first wave are independently checked by two people based on the full text of the paper.

PRISMA flow diagram

There is an expectation that any scoping review or systematic review will present the number of citations downloaded and screened using a PRISMA flow diagram. Be sure that you are collecting the numbers required for reporting throughout the research project – otherwise, it



PRISMA flow diagram

can be difficult to recreate them later on. The PRISMA template can be found at <http://www.prisma-statement.org>.

After the searches

Data extraction

After you have conducted screening to determine which studies will be included in your review, you will need to extract data from each of the studies using the same process for each. This will make it easier to synthesise the information. One of the easiest ways to conduct data extraction is to create a "form" in Google Drive (or another survey tool) with standardised questions. After filling out the form electronically, all the data will be automatically collated into a spreadsheet.

The data extraction form should include *any* information that you might need during the synthesis portion of the review so that you will not need to go back and look at the original papers after this step. Your form might include things like:

- Study information (type of publication, geographic location of study, aim/objectives of the study)
- Participant information (any participant characteristics such as gender, age, race, socioeconomic status, disease characteristics, co-morbidities)
- Intervention characteristics (setting, any other relevant characteristics such as length of intervention, description of intervention, who provided the intervention)
- Outcome data (what outcomes were reported, how they were measured, length of follow-up)

Risk of bias/critical appraisal

In a systematic review, the methodological rigor of every included study should be assessed using a validated tool. Not all studies are conducted equally, so looking at the quality of the reporting and the methods used can help us to better interpret the results. The tool or tools used to assess study quality will depend which types of studies are included in the review. Some commonly used tools include:

- Cochrane Risk of Bias tool (for randomised controlled trials only)
- Effective Public Health Practice Project Quality Assessment Tool (for quantitative studies)
- Critical Appraisal Skills Programme (a variety of checklists for different study designs)

Synthesis

If your data is sufficiently homogeneous, you may be able to conduct a meta-analysis. Whether you conduct a statistical analysis or not, you will need to synthesise your results in the text to bring together the findings and draw conclusions based on the body of evidence. Most findings can be summarised narratively, or through tables and graphs. Qualitative data can also be summarised thematically or by construct.

Reporting guidelines

To ensure that your review is high quality, it is good practice to follow a reporting guideline to ensure all steps are followed and reported correctly. Many reviews follow the PRISMA checklist, and some journals may also require it to be submitted as an appendix alongside any publications. The PRISMA checklist can be found at <http://prisma->

statement.org/prismastatement/Checklist.aspx. Reviews affiliated with organisations such as Cochrane, JBI, or Campbell may require that authors follow their own institutional guidelines.

For more information

Booth A, Sutton A, Papaioannou D. Systematic approaches to a successful literature review. 2nd ed. Sage; 2016.

Available through University of Plymouth Library.

Centre for Reviews and Dissemination. CRD's guidance for undertaking reviews in health care. 2009.

http://www.york.ac.uk/inst/crd/index_guidance.htm

John Hopkins University. Introduction to Systematic Reviews and Meta-Analysis [free online course].

<https://www.coursera.org/learn/systematic-review>
