
LITERATURE SEARCHING: A PRIMER

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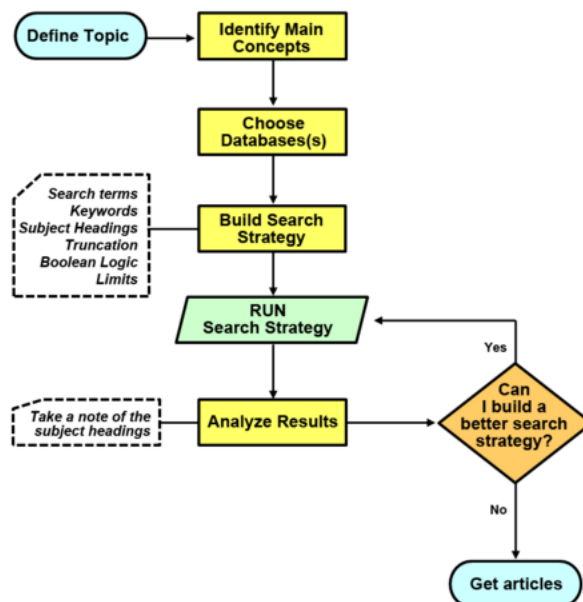


Image © University of British Columbia Library

Defining your research topic

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

(P)opulation	(I)ntervention	(C)omparison	(O)utcome
People with common mental health disorders who smoke	Group psychotherapy	Usual care	Lead to smoking cessation
Women patients with breast cancer	Chemotherapy	Surgery	Reduce mortality
Post-menopausal women	Hormone replacement therapy	No hormone replacement therapy	Reduce risk of breast cancer

Try structuring your topic using this format:

"In [population], does [intervention] vs [comparison] affect [outcome]?"

For example:

(P) **(I)**
 "In post-menopausal women, does hormone replacement therapy vs no hormone replacement therapy reduce the risk of breast cancer?"
(C) **(O)**



Uh-oh! Does your topic not conform to the PICO format? Maybe you're interested in looking at the prevalence of an illness, or qualitative research, or improving a hospital discharge process... Simply split your research question into the most important 2-3 concepts, and carry on...

Try it:

(P)opulation	(I)ntervention	(C)omparison	(O)utcome

Write out your research question:

Choose databases

There are many medical 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:

Medline	Run by the National Library of Medicine, Medline is one of the biggest and most well organised databases in medicine. Medline can be accessed through the PubMed or OvidSP interfaces.
Embase	Another large biomedical database with a more European focus
Cochrane Library	includes a database of Cochrane systematic reviews, a register of controlled trials, as well as several other small databases
CINAHL	Nursing and allied health database
PsycINFO	Psychology database
AMED	Allied health and complementary medicine database
OTSeeker	Occupational health
PEDRO	Physiotherapy
HMIC	Health management literature (including grey literature)

There are many more databases that are discipline-specific. Discuss with your information specialist if there are other databases that are relevant to your research question, or look at your discipline's library guide for a list of subject-specific database ideas

(<http://plymouth.libguides.com/c.php?g=133078> or <http://as.exeter.ac.uk/library/subjectguides/>).

To access subscription databases at Plymouth University, navigate to the library guide titled "A-Z databases" (<http://plymouth.libguides.com/c.php?g=48969> or <http://lib.exeter.ac.uk/search~S6/g>). Click the database name, then log in with your university credentials.

Which database(s) are relevant for your project?

- | | |
|---|--------------------------------|
| <input type="checkbox"/> Medline (OvidSP or PubMed interface) | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Embase | <input type="checkbox"/> _____ |
| <input type="checkbox"/> CINAHL | <input type="checkbox"/> _____ |
| <input type="checkbox"/> PsycINFO | <input type="checkbox"/> _____ |
| <input type="checkbox"/> _____ | <input type="checkbox"/> _____ |

Boolean operators

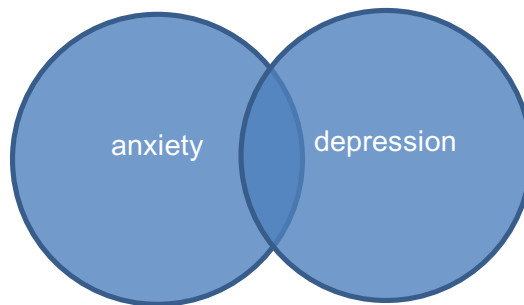
There are three boolean operators. These special words allow you to construct searches that will return more precise results.

AND

OR

NOT

OR



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

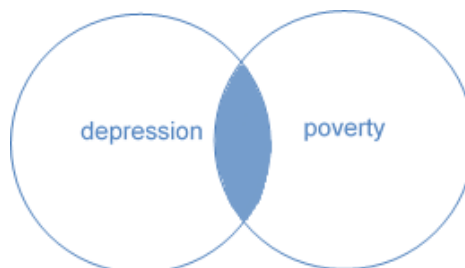
anxiety **OR** depression

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 (m OR e results)

AND



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

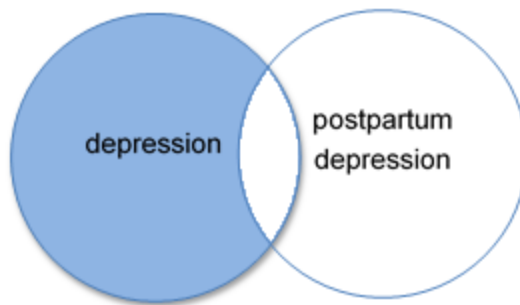
depression **AND** poverty

Searching using **AND** *only* returns results where both terms 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
depression	320,518
poverty	156,325
depression AND poverty	8,521 (less results)

NOT



depression **NOT** postpartum depression

Searching using **NOT** will only return results that contain the first term, but not the second one. In the diagram above, a citation containing the term depression would be returned, unless the phrase "postpartum depression" was used.

Use caution with the NOT operator! Sometimes relevant papers can be excluded by accident. Consider, for example, a paper that states, "this paper will not discuss postpartum depression..."; using **NOT** would exclude this paper even though it may be relevant.

NOT is a tool commonly used for *building* searches, and is not often used in the final strategy. By manipulating the search results in different ways, it can be easier to see patterns and build a more effective search strategy.

Search terms	Results
depression	320,518
postpartum depression	2,486
depression NOT postpartum depression	318,032 (less results)

Structuring your search

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:

"In women who smoke, does a brief counselling program (vs. no counselling program) lead to decreased rates of smoking?"

Here are some examples of synonyms for each concept:

Women (concept 1)	Smoking (concept 2)	Counselling Program (concept 3)
woman women girl female	smoking smoker cigarette e-cigarette tobacco nicotine	counselling psychotherapy life coach

Next, use **OR** to separate the different terms within each concept and add parenthesis around each concept:

Women (concept 1)	Smoking (concept 2)	Counselling Program (concept 3)
(woman OR women OR girl OR female)	(smoking OR smoker OR cigarette OR e-cigarette OR tobacco OR nicotine)	(counselling OR psychotherapy OR life coach)

Finally, use **AND** to separate each major concept:

Women (concept 1)		Smoking (concept 2)		Counselling Program (concept 3)
(woman OR women OR girl OR female)	AND	(smoking OR smoker OR cigarette OR e- cigarette OR tobacco OR nicotine)	AND	(counselling OR psychotherapy OR life coach)

Here's our initial strategy:

(woman OR women OR girl OR female) **AND** (smoking OR smoker OR cigarette OR e-cigarette OR tobacco OR nicotine) **AND** (counselling OR psychotherapy OR life coach)

Truncation and wildcards

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

Some databases also allow **wildcards**, generally using a question mark (?). Wildcards allow you to search for zero, one or more characters in the middle of a word.

smok*	*cigarette	wom*n	behavio?r
smoke smoking smoker smokers smoked	cigarette e-cigarette	woman women	behavior behaviour



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

PubMed only allows truncation at the end of a word, and does not allow wildcards. We can revise our search from above for PubMed like this:

(women OR woman OR girl* OR female*) **AND** (smok* OR cigarette OR e-cigarette OR tobacco OR nicotine) **AND** (counsel* OR psychotherap* OR life coach*)

Applying field codes

By default, PubMed will look for each of the keywords above in any fields. This includes the title and abstract, but also author-supplied keywords, the journal title, author affiliations... everything!

The most common searching fields are the title and abstract of a citation, because these contain the most relevant text.

Field	PubMed syntax	Ovid Medline syntax
Title	"keyword"[ti]	keyword.ti
Title and abstract	"keyword"[tiab]	keyword.ti,ab

Adding Subject Headings

So far, we have structured a search using free text terms (or keywords). Our strategy will retrieve articles where these words are included in the citation information (such as title and 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.

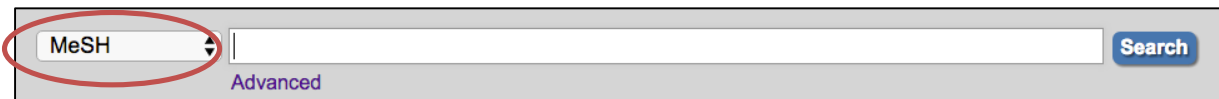
Subject headings are chosen from a list, rather than generated by the searcher. Experts compile these lists of terms and apply them to citations based on the subject of the article.

To find relevant subject headings:

1. Try conducting a keyword search in PubMed or another database. Then, look at the subject headings applied to the article. Some of these might be good candidates to add to your search.

In PubMed, subject headings can be found by navigating to an article page, then clicking the dropdown bar that starts "Publication types...". If there are no subject headings, this means that the article has not yet been indexed.

2. Search the Medical Subject Heading (or MeSH) database for relevant subject headings. In the dropdown menu in PubMed, select "MeSH". Remember: when searching the MeSH database, you're searching for subject headings, not citations!



Subject headings are heirarchical:



Choose the narrowest subject heading that still makes sense for your topic. By default, PubMed will also search for any narrower terms, too.

Subject heading syntax

PubMed syntax	Ovid Medline syntax
"subject heading"[mesh]	subject heading/

After applying subject headings and field codes, our revised PubMed search now looks something like this:

(women[tiab] OR woman[tiab] OR girl*[tiab] OR female*[tiab] OR women[mesh]) **AND** (smok*[tiab] OR cigarette[tiab] OR e-cigarette[tiab] OR tobacco[tiab] OR nicotine[tiab] OR smoking[mesh] OR tobacco use disorder[mesh]) **AND** (counsel*[tiab] OR psychotherap*[tiab] OR life coach*[tiab] OR counselling[mesh] OR behaviour therapy[mesh])

Try it:

Write out 2-3 major concepts from your research question, and brainstorm different synonyms for each. Don't forget to think about which words can be truncated and what fields you want to search (such as title and abstract)

Then, in the bottom half, add relevant subject headings for each concept.

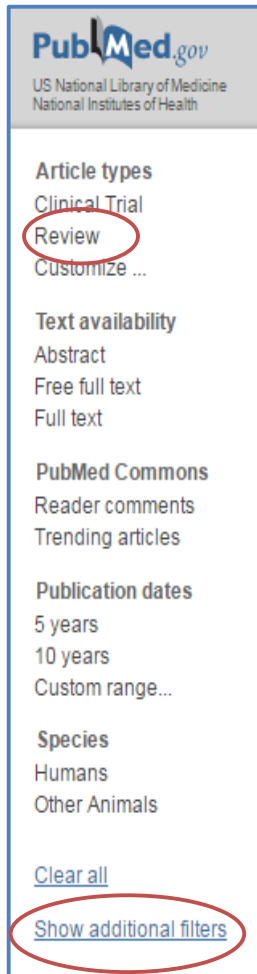
(concept 1)		(concept 2)		(concept 3)
OR	AND	OR	AND	OR

Executing your search

Now, take your search from the previous page and put it into a database like PubMed. (<http://www.ncbi.nlm.nih.gov/pubmed>). Do the results look reasonable? If not, try adding or removing search terms.



Limiting your search



Click "customize" to select additional options for the filter, such as "systematic review"

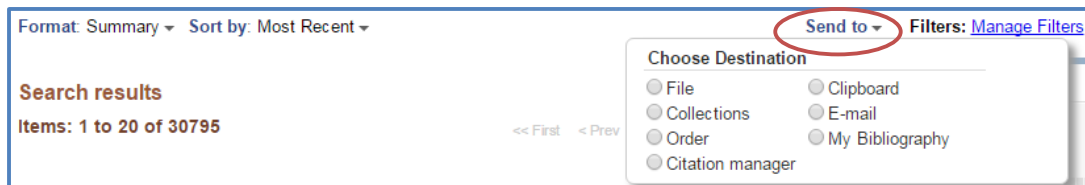
Most databases contain **limiters**, which allow you to further reduce the number of results to manageable numbers. In most interfaces, limiters will be located on a left-hand sidebar.

Click "show additional filters" for more filters, such as a language filter or a study participant age filter.

Download results

Every major database allows users to download the results of their search. In PubMed, click the "send to" dropdown menu for downloading options. You can either download all the search results, or use the check boxes next to each citation name to download a few.

- Choose "citation manager" to export to a program such as EndNote, Zotero, or Mendeley.
- Choose "clipboard" to add citations to a virtual space for downloading later. This option is good for selecting a few articles at a time and running several different search variations. However, use caution! The clipboard will reset every 24 hours.



Sample PubMed Search

Read the search from BOTTOM to TOP!

#	Searches	Results	Explanation
#13	(#3 AND #7 AND #10) Filters: Review; Aged: 65+ years	16	Add study type (review) filter
#12	(#3 AND #7 AND #10) Filters: Aged: 65+ years	488	Add age of study participant filter
#11	(#3 AND #7 AND #10)	721	Combine three main concepts with AND
#10	(#8 OR #9)	635691	Combine pain searches with OR
#9	"pain"[tiab]	493956	
#8	"pain"[mesh]	337318	
#7	(#4 OR #5 OR #6)	177249	Combine exercise searches with OR
#6	"exercise movement techniques"[mesh]	6275	
#5	"exercise therapy"[mesh]	37801	
#4	"exercise"[mesh]	146260	
#3	(#1 OR #2)	16054	Combine osteoarthritis searches with OR
#2	"knee osteoarthritis"[tiab]	6922	Title and Abstract search = [tiab]
#1	"osteoarthritis, knee"[mesh]	13808	Subject heading search = [mesh]

Tips:

Click "advanced" under the search bar to access this line-by-line search interface.

Using quotes around terms is a good idea – otherwise, PubMed will use "automatic term mapping" and might interpret your search differently than you intended!

journal article in PubMed interface

Format: Abstract

Full text links



Clin Rehabil. 2016 Jan;30(1):36-52. doi: 10.1177/0269215515570098. Epub 2015 Feb 17.

Effects of exercise therapy on walking ability in individuals with knee osteoarthritis: a systematic review and meta-analysis of randomised controlled trials.

Tanaka R¹, Ozawa J², Kito N², Moriyama H³.

Author information

Abstract

OBJECTIVE: To examine the effect of **exercise therapy** on the **walking ability** of individuals with knee osteoarthritis.

DATA SOURCES: Randomised clinical trials (RCTs) were identified by searching through PubMed, Cochrane Central Register of Controlled Trials, Physiotherapy Evidence Database, and Cumulative Index to Nursing and Allied Health Literature. All literature published to October 2014 were included in the search.

REVIEW METHODS: Data were collected from RCTs that compared the **effects** of **exercise therapy** on **walking ability** with the **effects** of no intervention or psychoeducational intervention in participants with knee osteoarthritis. The outcome data on the total distance walked (6-minute walk test); the amount of time spent **walking** (the time to walk arbitrary distances); and gait velocity were obtained and analysed. Standardized mean differences (SMDs) and 95% confidence intervals (CIs) were calculated.

RESULTS: Twenty-eight RCTs were identified. Meta-analysis provided very-low-quality evidence that **exercise therapy** increased the total distance walked in the 6-minute walk test, in comparison with the **effects** of the control interventions (SMD = 0.44, 95% CI 0.27 to 0.60). Meta-analysis also provided low- or moderate-quality evidence that the amount of time spent **walking** and gait velocity were improved more by **exercise therapy** than by the control interventions (the amount of time spent **walking**: SMD = -0.50, 95% CI -0.70 to -0.30; gait velocity: SMD = 1.78, 95% CI 0.98 to 2.58).

CONCLUSION: In individuals with knee osteoarthritis, **exercise therapy** can improve the amount of time spent **walking**, gait velocity, and maybe the total distance walked.

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KEYWORDS: **Exercise**; knee osteoarthritis; meta-analysis; systematic review; **walking**

PMID: 25691583 DOI: [10.1177/0269215515570098](https://doi.org/10.1177/0269215515570098)

[PubMed - indexed for MEDLINE]

Publication Types, MeSH Terms

Publication Types

[Meta-Analysis](#)

[Research Support, Non-U.S. Gov't](#)

[Review](#)

MeSH Terms

[Acceleration*](#)

[Aged](#)

[Disability Evaluation](#)

[Exercise Therapy/methods*](#)

[Female](#)

[Gait/physiology](#)

[Humans](#)

[Male](#)

[Middle Aged](#)

[Osteoarthritis, Knee/diagnosis*](#)

[Osteoarthritis, Knee/rehabilitation*](#)

[Prognosis](#)

[Randomized Controlled Trials as Topic](#)

[Severity of Illness Index](#)

[Treatment Outcome](#)

[Walking/physiology*](#)

**Medical Subject Headings
(MeSH)**

LinkOut - more resources

Full Text Sources

[Atypon - PDF](#)

[ClinicalKey](#)

[Ovid Technologies, Inc.](#)

PubMed Commons

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Sample Ovid Medline Search

Database(s): **Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present**

Search Strategy:

#	Searches	Results	Explanation
1	osteoarthritis, knee/	17541	Subject headings are chosen from a list and denoted by a slash (/)
2	(knee adj2 osteoarthritis).ti,ab.	8764	Adj# will search for terms within x number of one another. For example, this line will search for "knee osteoarthritis" and "osteoarthritis of the knee"
3	1 or 2	19827	Use OR to include any article that is captured by either of the above lines. OR = mORe.
4	exp exercise/	168844	Exp means that the database should search for any <i>narrower</i> terms in the subject heading hierarchy.
5	exp exercise therapy/	44812	
6	exp exercise movement techniques/	7247	
7	4 or 5 or 6	204441	
8	exp pain/	376423	
9	pain.ti,ab.	536841	
10	8 or 9	694984	
11	3 and 7 and 10	954	Use AND to combine all your major concepts
12	limit 11 to (english language and "all aged (65 and over)" and "review")	20	Use limiters to further narrow your results


Tips:

- PubMed is a freely available database (though the articles themselves are not free!). However, to access Ovid Medline, you will need to log in with your university credentials.
- While PubMed automatically includes narrower terms in the subject heading hierarchy, in Ovid you will need to use "exp" (short for "explode")

journal article in Ovid interface

[Search](#) [Journals](#) [Multimedia](#) [My Workspace](#) [EBP Tools](#) [Mobile](#)

[< Back to Search Results](#)

1 of 1 Results  Keep Selected

Unique Identifier: 25691583

Record Owner: From MEDLINE, a database of the U.S. National Library of Medicine.

Status: MEDLINE

Authors: [Tanaka R](#); [Ozawa J](#); [Kito N](#); [Moriyama H](#).

Authors Full Name: Tanaka, Ryo; Ozawa, Junya; Kito, Nobuhiro; Moriyama, Hideki.

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Ozawa, Junya. Department of Rehabilitation, Faculty of Rehabilitation, Hiroshima International University, Japan.
Kito, Nobuhiro. Department of Rehabilitation, Faculty of Rehabilitation, Hiroshima International University, Japan.
Moriyama, Hideki. Department of Rehabilitation Science, Graduate School of Health Sciences, Kobe University, Japan.

Title: **Effects of exercise therapy on walking ability in individuals with knee osteoarthritis:** a systematic review and meta-analysis of randomised controlled trials. [Review]

Source: Clinical Rehabilitation. 30(1):36-52, 2016 Jan.

Abbreviated Source: Clin Rehabil. 30(1):36-52, 2016 Jan.

NLM Journal Name: Clinical rehabilitation

Publishing Model: Journal available in: Print-Electronic
Citation processed from: Internet

NLM Journal Code: cr7, 8802181

ISO Journal

Abbreviation: Clin Rehabil

Journal Subset: Index Medicus

Country of

Publication: England

MeSH Subject

Headings:

[*Acceleration](#)
[Aged](#)
[Disability Evaluation](#)
[*Exercise Therapy / mt \[Methods\]](#)
[Female](#)
[Gait / ph \[Physiology\]](#)
[Humans](#)
[Male](#)
[Middle Aged](#)
[*Osteoarthritis, Knee / di \[Diagnosis\]](#)
[*Osteoarthritis, Knee / rh \[Rehabilitation\]](#)
[Prognosis](#)
[Randomized Controlled Trials as Topic](#)
[Severity of Illness Index](#)
[Treatment Outcome](#)
[*Walking / ph \[Physiology\]](#)

Keyword Heading: [Exercise](#)
[knee osteoarthritis](#)

Tools

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[External Resolver](#)

 [+ My Projects](#)

 [+ Annotate](#)

**Medical Subject Headings
(MeSH)**

meta-analysis
systematic review
walking

Abstract: **OBJECTIVE:** To examine the effect of exercise therapy on the walking ability of individuals with knee osteoarthritis.

DATA SOURCES: Randomised clinical trials (RCTs) were identified by searching through PubMed, Cochrane Central Register of Controlled Trials, Physiotherapy Evidence Database, and Cumulative Index to Nursing and Allied Health Literature. All literature published to October 2014 were included in the search.

REVIEW METHODS: Data were collected from RCTs that compared the effects of exercise therapy on walking ability with the effects of no intervention or psychoeducational intervention in participants with knee osteoarthritis. The outcome data on the total distance walked (6-minute walk test); the amount of time spent walking (the time to walk arbitrary distances); and gait velocity were obtained and analysed. Standardized mean differences (SMDs) and 95% confidence intervals (CIs) were calculated.

RESULTS: Twenty-eight RCTs were identified. Meta-analysis provided very-low-quality evidence that exercise therapy increased the total distance walked in the 6-minute walk test, in comparison with the effects of the control interventions (SMD = 0.44, 95% CI 0.27 to 0.60). Meta-analysis also provided low- or moderate-quality evidence that the amount of time spent walking and gait velocity were improved more by exercise therapy than by the control interventions (the amount of time spent walking: SMD = -0.50, 95% CI -0.70 to -0.30; gait velocity: SMD = 1.78, 95% CI 0.98 to 2.58).

CONCLUSION: In individuals with knee osteoarthritis, exercise therapy can improve the amount of time spent walking, gait velocity, and maybe the total distance walked.

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ISSN Electronic: 1477-0873
ISSN Linking: 0269-2155
Publisher Item Identifier: 0269215515570098
Digital Object Identifier: <https://dx-doi-org.plymouth.idm.oclc.org/10.1177/02692...>
Publication Type: Journal Article. Meta-Analysis. Research Support, Non-U.S. Gov't. Review.
Article Identifier: 25691583 [pubmed]
0269215515570098 [pii]
10.1177/0269215515570098 [doi]
Publication Status: ppublish
Publication History Status: 2014/03/26 [received]
2014/12/28 [accepted]
Language: English
Electronic Date of Publication: 20150217
Date of Publication: 2016 Jan
Date Created: 20151215
Entrez Date: 2015/02/19 06:00
MeSH Date: 2016/09/20 06:00
Create Date: 2015/02/19 06:00
Year of Publication: 2016
Entry Date: 20160919
Revision Date: 20151215
Update Date: 20161215

Sample Cochrane Library Search

Database(s): **Cochrane Library (Wiley)**

Search Strategy:

#	Searches	Results	Explanation
1	[mh ^"osteoarthritis, knee"]	2220	Search for Medical Subject Headings (MeSH) in brackets preceded by "mh". The up carrot symbol (^) means "no explode" – no subject headings lower in the tree hierarchy will be searched.
2	(knee near/2 osteoarthritis)	4087	Near/# will search for adjacent terms within # words of one another in either direction (eg "knee osteoarthritis", and "osteoarthritis of the knee" will both be retrieved)
3	#1 or #2	4087	Boolean operator OR to combine similar concepts.
4	[mh exercise]	18173	
5	[mh "exercise therapy"]	10022	
6	[mh "exercise movement techniques"]	1655	
7	#4 or #5 or #6	25298	
8	[mh pain]	37067	
9	pain:ti,ab	80427	Free text searching using a colon (:) and two letter field codes
10	#8 or #9	90244	
11	#3 and #7 and #10	352	Boolean operator AND to combine our three main concepts.

Tips:

- Cochrane Library is a freely available database. Access from <http://onlinelibrary.wiley.com/cochranelibrary/search/advanced>.
- Cochrane Library uses MeSH (or Medical Subject Headings), just like PubMed and Ovid Medline, though the search syntax is different from both.