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# Guide aims

This guide is aimed at students undertaking a literature search, it follows the resource ‘Formulating a research question and structuring a literature search’.

The guide will help you develop literature search strategies for resources in your discipline.

Prior to using this guide, it is worth reading the guide ‘[Formulating a research question and structuring a literature search](https://edshare.gla.ac.uk/38/)’; this will familiarise you with several tools used to structure a literature search, such as PICO (for evidence-based medicine) and SPIDER (for qualitative or mixed methods).

This guide is predominantly aimed at searching within library databases, such as Medline or BIOSIS Previews, although some functionality is also supported in databases like PubMed and internet search engines.

# Introduction

Without considering how best to structure a search, and where best to find relevant results, you may find *something* on the research topic but the process might not be very efficient or effective.

When putting in a couple of words with a gap between them you'll find lots of irrelevant information that can also be biased, inaccurate and of low academic quality

When typing in the whole essay question as a phrase you will find something but you'll more likely find nothing

So how do you balance these two result problems to find relevant, high quality information without having to sift through irrelevant results? Start by structuring your search using PICO or a similar alternative, then follow this guide to improve your search.

The following search example is adapted from:

McLeonard, C. 2017. Are adult cats fed on wet maintenance diets less at risk of developing chronic kidney disease compared to adult cats fed on dry maintenance diets? *Veterinary Evidence*, 2(4). <https://dx.doi.org/10.18849/ve.v2i4.130>.

# Boolean logic

Boolean logic (AND, OR and NOT) is used to increase the sensitivity (broadening) or specificity (focussing) of a search.

* OR increases the sensitivity of a search and is generally used to search for different synonyms

kidney
failure

renal
failure

* AND increases the specificity of a search and is used to combine search concepts

kidney
failure

cats

* NOT excludes concepts

humans

animals

# Boolean logic applied to PICO

The PICO example used in the guide ‘Formulating a research question and structuring a literature search’ is illustrated below. The synonyms for the search concepts are joined with OR and the concepts themselves are joined with AND.

|  |  |
| --- | --- |
| PICO | Search concepts |
| **P**opulation / problem | cat OR cats OR feline OR felines OR queen OR tom |
|  | AND |
| **P**opulation / problem | chronic renal failure OR chronic renal disease OR chronic renal insufficiency OR chronic kidney insufficiency OR chronic kidney failure OR chronic kidney disease |
|  | AND |
| **I**ntervention / indicator | diet OR food OR maintenance diet OR maintenance diets |
| **C**omparator / control | - |
| **O**utcome | - |

Below is the search illustrated as a Venn diagram

feline
concepts

chronic
kidney
disease
concepts

diet
concepts

Retrieved
literature

# Developing a search strategy

The ‘effect of diet on chronic renal failure risk in cats’ search can be undertaken in one of two ways. Firstly with brackets to separate each element of the search, or as three separate searches joined together with AND:

((cat OR cats OR feline OR felines OR queen OR tom) AND (chronic renal failure OR chronic renal disease OR chronic renal insufficiency OR chronic kidney insufficiency OR chronic kidney failure OR chronic kidney disease) AND (diet OR food OR maintenance diet OR maintenance diets))

OR

1. cat OR cats OR feline OR felines OR queen OR tom
2. chronic renal failure OR chronic renal disease OR chronic renal insufficiency OR chronic kidney insufficiency OR chronic kidney failure OR chronic kidney disease
3. diet OR food OR maintenance diet OR maintenance diets
4. 1 AND 2 AND 3

# Advanced search syntax

In addition to using Boolean logic, there some additional techniques that can be used to increase the sensitivity and specificity of a search.

**Phrase searching** for specificity e.g. “health care professionals”

Speech marks can be used to group two or more words together, else some databases will search the words independently of each other. Using speech marks will search for those words, as spelt, and in the order written.

NOTE: phrase searching is fairly universal in library databases and internet searching

**Proximity** for sensitivity, e.g. ((health care or healthcare) adj3 professionals)

Searching for “health care professionals” [using speech marks] will not retrieve articles where authors have used ‘healthcare professionals’ or ‘professionals working in healthcare’. Proximity searching can be used to find words within a set number of words from each other. The above example used on databases on the Ovid platform will retrieve the word ‘professionals’ next to, in any order, and up to two words in between ‘health care’ or ‘healthcare’. On the Ovid platform, the number 3 can be substituted for any number between 1 and 99.

NOTE: the proximity operator differs on each database platform. Some platforms use ‘N3’ or ‘Near/3’ for the same function. Always refer to the database help text for advice.

**Truncation** for sensitivity, e.g. toxic\*

A \* or $ symbol can be used to retrieve suffix variations of the word indicated. In the above example, the word ‘toxic’ will be retrieved along with the words ‘toxical’, ‘toxicant’, ‘toxicate’, ‘toxication’, ‘toxicity’, etc.

NOTE: the \* symbol is fairly universal in library databases and internet searching

**Optional/Wildcards** for sensitivity, e.g. dyspn?ea or wom#n

Some databases will allow the use of a ? or # to substitute zero or one characters. In the Ovid platform, a ? will retrieve zero or one character, useful for retrieving British and American spelling variations, such as dyspnoea (British) and dyspnea (American). The # on Ovid is a mandated one character, e.g. wom#n will retrieve women and woman.

NOTE: the wildcard operator differs on each database platform. Always refer to the database help text for advice.

There are many more advanced searching syntax available. Those covered tend to be the most frequently used. Always refer to the database help text for advice when constructing a search strategy.

# Subject headings

Subject headings (also called Thesaurus terms or Controlled vocabulary) are standardised terms used to retrieve database records where authors have described or spelt the same concept in different ways. They are applied by indexers at the point where records are uploaded to a database.

Using subject headings, as well as textword terms, will make your search more sensitive (broad).



MeSH (Medical Subject Headings) are one of the better known thesauri. MeSH terms are used on Medline records in PubMed. View the [PubMed Tutorial: Understanding the Vocabulary](https://www.nlm.nih.gov/bsd/disted/meshtutorial/introduction/)

The below screenshot is from a search undertaken on Ovid MEDLINE® 1946 to February Week 4 2018 conducted on 5 March 2018.



A search for the subject heading Cats retrieves 131,639 results.

A search for ‘cat or cats or feline or felines or queen or tom’ in the title and abstract fields retrieves 136,378 results.

When either the subject heading or the textwords are used, a total of 181,301 results are retrieved – far more sensitive (broader) than searching either the subject heading or textwords alone. This sensitivity in a search strategy is essential when conducting a rigorous search and a mandatory element of systematic review searches.

# Search filters

Many databases have pre-defined filters to narrow results to systematic reviews, diagnosis, and prognosis articles, amongst many others. PubMed, for example, has a number of [pre-populated search filters](https://www.nlm.nih.gov/bsd/pubmed_subsets.html). These filters may provide a guide to the literature, but when conducting a systematic or similar review, tested and appraised search filters should be used.

For rigorous searches, the [InterTASC Information Specialists' Sub-Group Search Filter Resource](https://sites.google.com/a/york.ac.uk/issg-search-filters-resource/home) should be consulted.

Further advice on search filters can be found in the [Cochrane Handbook for Systematic Reviews of Interventions](http://training.cochrane.org/handbook), Part 2: 6.4.11 [Handbook version 5.1].

# Annotated search

As an illustration, here is an annotated Ovid Medline search from Elsner B, Kugler J, Pohl M, Mehrholz J. Transcranial direct current stimulation (tDCS) for improving aphasia in patients with aphasia after stroke. Cochrane Database of Systematic Reviews 2015, Issue 5. Art. No.: CD009760. DOI: [10.1002/14651858.CD009760.pub3](http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD009760.pub3/full).

1. exp aphasia/
2. language disorders/ or speech disorders/ or anomia/
3. speech-language pathology/ or exp "rehabilitation of speech and language disorders"/

**[Lines 1-3 are the subject headings for the population concepts]**

1. (aphasi$ or dysphasi$ or anomia or anomic).tw.
2. ((speech or language or linguistic) adj5 (disorder$ or impair$ or problem$ or dysfunction)).tw.
3. ((speech or language or linguistic) adj5 (therap$ or train$ or rehabilitat$ or treat$ or remediat$ or intervention$ or pathol$)).tw.

**[Lines 4-6 are the textwords for the population concepts]**

1. or/1-6

**[Line 7 is the population group]**

1. Electric Stimulation Therapy/
2. Electric Stimulation/
3. Electrodes/

**[Lines 8-10 are the subject headings for the intervention concepts]**

1. (transcranial adj5 direct current adj5 stimulation).tw.
2. (transcranial adj5 DC adj5 stimulation).tw.
3. (transcranial adj5 electric$ adj5 stimulation).tw.
4. (tDCS or A-tDCS or C-tDCS or S-tDCS or electrode$ or anode or anodes or anodal or cathode or cathodes or cathodal).tw.

**[Line 11-14 are the textwords for the intervention concepts]**

1. or/8-14

**[Line 15 is the intervention group]**

1. 7 and 15

**[Line 16 is the combined population and intervention groups]**

1. exp animals/ not humans.sh.

**[Line 17 is a basic animal/human subject heading filter]**

1. 16 not 17

**[Line 18 is the combined population and intervention groups, limited to human studies]**

# Credits

#### Author credit

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