ABSTRACT: Creating and implementing a good search strategy is an essential part of conducting a systematic review. In this article, we review the background, rationale, and mechanics of constructing strategies suitable for a review on interventions for stuttering, with particular attention to planning and executing replicable searches within a variety of electronic databases. We also describe other pertinent parts of an overall search strategy (including handsearching of journals and approaches to relevant experts and professional bodies within speech therapy) and emphasize the importance of careful documentation and clear reporting.

KEY WORDS: information retrieval, systematic review, search strategy

Know where to find the information and how to use it—
That’s the secret of success.
—Albert Einstein

Information Retrieval: Where’s Your Evidence?

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The previous article introduced the process of formulating a problem statement to guide the development of a systematic review. This article is intended to serve as a very practical introduction to the technical matters surrounding your overall search strategy—the term that authors of systematic reviews use to describe their plans for identifying and retrieving information that is pertinent to their work.

At its most basic, a search strategy can be a list of search terms that are used when searching electronic databases. A final search strategy in a published protocol or review, however, should properly include information on the entire process for acquiring literature relevant to a systematic review. At the outset of the information retrieval process, it is important to indicate the restrictions that you have determined to put on your searching efforts. For example, you may have decided, if searching on a new drug or therapy procedure, to restrict your searches to the years following its development; or, you may wish to restrict yourself to studies presented within the English language. The purpose of a search strategy is to serve as a guide in planning and recording your work and in assessing how useful your review is to a particular clinical or policy question.

THE GOOD NEWS

The search strategy is a serious and crucial endeavor that may determine the quality of the conclusions that are drawn from the data. The good news is that there has never been a better time to retrieve studies for a systematic review—and there have been much worse ones. It is no accident that the drive for evidence-based medicine has gone hand in hand with the technology to find the evidence to synthesize existing research.

In the 1970s and 1980s, years before the majority of library catalogs and databases went online, systematic reviews were published, but the process of literature searching was much more time consuming. The typical search strategy involved tedious paper chases through printed catalogs like Index Medicus and later, CD-ROM searches with limited functionality. Early electronic database searches could still be inferior to that of specialized registers (Dickersin, Hewitt, Mutch, Chalmers & Chalmers 1985). In the 1990s, as databases proliferated and improved, studies remained hard to find due to poor indexing, particularly in terms of the key words used to
It is a basic tenet that ideas rarely exist in isolation and arguments are best presented against a context of work that has gone before. In your courses, you may have found that your instructors had done most or all of the work of background literature searching for you by preparing reading lists for the class. In some courses, you may have undertaken your own independent searches to produce stand-alone “literature reviews” as part of longer assignments. For these, you may have become skilled in searching for certain types of literature (e.g., journal articles, book chapters) from a variety of sources (e.g., library catalogs, electronic journals, web sites).

No matter how diligent your efforts were, it is unlikely that you have ever been asked to demonstrate the precise way you went about searching for literature in any detailed way. In contrast, with any systematic review, informed readers expect (just as your math teacher did) that you show your work at every stage. At first, this may seem a strange and tedious exercise, but it is not an empty one. Searching is a science. It is the seriousness with which studies are sought and the meticulousness with which the process is documented that are among the most distinctive characteristics of the “systematic review.”

The research skills that this issue sets out to demonstrate to you will be of little use if you fail to locate the very studies needed to answer the review question. Bluntly speaking, you cannot assess what you have not found, and the cost of missing relevant studies can be high. A poor search strategy, or a good search strategy poorly applied, can have serious repercussions for the review’s analysis and conclusions. Missing a single appropriate study that should be in your review can alter the results significantly if the study contains a great many participants or has a striking effect size. A study with a small number of participants can decrease your readers’ confidence in a systematic review’s implicit claim to be an accurate and up-to-date summary of research. Finally, in the case of systematic reviews that are planned to be updated periodically (as are those that are registered within the Campbell or Cochrane Collaborations), a poor search strategy re-implemented years later can multiply the mistakes that occurred at its inception. The failure to store detailed information on the implementation of a good strategy can mean having to rerun searches from scratch, which is an inefficient use of time and resources.

So our advice is always practical: Be thorough, be methodical, and keep brief but accurate records of the process at all times. Keeping good notes of the methodological implementation of your search strategy such as recording the terms and sources you used, as well as the dates you used them, and keeping a close eye on the number of citations identified in each source, is essential.

**FIRST PRINCIPLE: SHOW YOUR WORK!**

It is a basic tenet that ideas rarely exist in isolation and arguments are best presented against a context of work that has gone before. In your courses, you may have found that...
**Question 1:** How long will it take to develop and implement my search strategy, and at what point during the review process should I undertake each step?

We recommend that you try to design the electronic portion of your search strategy as the first step. In the Campbell and Cochrane Collaborations, reviewers are required to develop an approved protocol before starting the review. The protocol lays out the basic background to the problem and specifically describes the methodology, including information retrieval, that will be used to conduct the review. This early consideration of the method and sources of information retrieval will provide you with a more complete body of research to review than if you search without a plan.

The next step in your planning will likely involve decisions about what criteria must be met in order for a study to be included in the review. We are aware that methodological purists are likely to insist that you do not examine the results of your searches before you set the inclusion criteria in order to avoid bias toward or against characteristics of studies that you know exist already. Nevertheless, it is permissible, even advisable, to begin laying the groundwork for your searches as early as possible so as to build “waiting time” into the process. We suggest that you discuss with your local librarian as soon as your research question is defined which databases and information retrieval resources are available. Next, develop any contingency plans for getting access to desirable data sources for the review. This may include interlibrary loan, purchasing documents, or making individual contacts with researchers. Always have a copy of one or two review articles or textbooks in your research area so that the librarian can work with you to identify the most common generic terms for the area and interventions you wish to review. The librarian may advise you on ways of mapping the terms onto the individual taxonomies for the databases you will be searching. You may also at this point decide that you wish to take advantage of searching sessions offered at your institution, including those aimed at teaching the use of reference manager software such as EndNote®, Reference Manager® (www.refman.com), or ProCite® (www.procite.com), as well as make use of free self-teaching materials developed by various database providers (Virtual Training Suites, www.vts.rdn.ac.uk; Ovid On-line Tutorial, www.mclibrary.duke.edu/training/ovid/instructions).

Once the basic skills for searching are mastered, running electronic searches and downloading their results into text files can be a relatively simple task. Sifting through the results of these searches can take considerably more time, however, and may be best spread across sessions until you reach your first “cut” of studies for which you may need to acquire hard copy.

It is an obvious point, but often overlooked in the information retrieval process, that most electronic databases provide bibliographic information such as the title, source and date of publication, and abstract for a given document but not the whole article. Therefore, literature searching online is primarily about creating a draft bibliography—not a stack of papers to read immediately. Other sources for information retrieval should be made as soon as your research question is defined and the initial studies are identified. These other sources include personal contacts with professional organizations, recognized spokespersons in the field, and authors of known studies and publications.

**Question 2:** What electronic databases will be most relevant to a systematic review on all treatments for stuttering?

Because the illustration paper for this volume is a systematic review of interventions for individuals who stutter (Herder, Howard, Nye, & Vanyrckeghem, 2006), we conducted an information retrieval exercise for the topic by electronically searching the eight medical and educational databases identified in Table 1.

It is important to remember that although the scope of these databases differs, most overlap somewhat. This means that many of the records you might find in one database will also be found in other databases, albeit indexed slightly differently, and therefore, the initial totals of records you retrieve may seem deceptively high.

**Question 3:** What terms should I use when searching these databases, and how should I combine them?

**Search Terms**

The rules for any electronic search strategy are the same.

- Clearly define the question. For a systematic review investigating treatment effectiveness, this can usually be formulated as: Does intervention (A) work for condition (B) in population/setting (C)?
- Separate out the concepts and key terms for A, B, and C, if possible. If you are unable to combine more than one concept, then expect higher returns in the search; for example, searching stuttering intervention for children will yield fewer references than will searching stuttering or treatments for children alone. Concentrating your work in this way depends on whether the search strategy is broad or focused.
- Think of the words that researchers have used in different contexts over time, between countries, and in different clinical or research disciplines. For example, the synonyms for the term therapy might include treatment, intervention, program, and instruction.
- Draw up a plan to combine those search terms to maximize both sensitivity and precision (accurately capturing all literature in the area).
- Consider using limits or filters where available or appropriate. These are terms that will restrict the identification to specific types of citations (e.g., journal articles in English, humans). These filters can
be as simple as check boxes or as complicated as separate, prefabricated searches designed to capture a particular methodology of study such as the RCT. Following the advice above and assuming that the question to be reviewed has to do with “interventions for improving stuttering,” we separated these five search strategy rules for a more detailed summary of their use in information retrieval.

**Interventions.** Interventions used for stuttering can range from behavioral treatments (e.g., Lidcombe method), to electronic devices (e.g., those used in altered auditory feedback), to drug treatments, to psychoanalysis and more. Because the initial searches are “scoping” ones, not focussed on any particular intervention, we do not build a complex strategy that might limit our results to a single intervention. We concentrate first on locating synonyms used in the literature for stuttering to help us locate articles in the area. In our illustration, we accomplished this by perusing established literature on the topic (Bloodstein 1995; Saltuklaroglu, & Kalinowski, 2005; Kalinowski, Guntupalli, Stuart, & Saltuklaroglu, 2004) and by seeking help from sources like the “scope notes” in MEDLINE to ensure consistency of keywords. Figure 1 shows the results of a search in MEDLINE to find a scope note to help us ensure that the database matches our conception of the term.

Table 1. Primary databases used in information retrieval.

<table>
<thead>
<tr>
<th>Database</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTRAL</td>
<td>An integral part of the Cochrane Library, CENTRAL is the largest single register of controlled trials within health care. The register provides citations (rather than full texts) of nearly half a million reports of trials identified by contributors to the Cochrane Collaboration. Trials are identified from many sources, including searches of bibliographic databases, handsearches of many hundreds of journals and conference proceedings, and searches of other trial registers.</td>
</tr>
<tr>
<td>CINAHL</td>
<td>(Cumulative Index to Nursing &amp; Allied Health). The CINAHL database provides coverage of literature related to nursing and professions allied to health, including occupational therapy, physical therapy, and so forth. In total, more than 1,200 journals are regularly indexed; online abstracts are available for more than 800 of these titles.</td>
</tr>
<tr>
<td>C2-SPECTR</td>
<td>A registry of more than 13,000 randomized and possibly randomized trials in education, social work and welfare, and criminal justice.</td>
</tr>
<tr>
<td>EMBASE</td>
<td>The EMBASE service provides access to the bibliographic Excerpta Medica database and covers more than 3,000 international journals from 110 countries. Subject fields are largely biomedical in nature. Data go back to 1980 and are updated monthly.</td>
</tr>
<tr>
<td>ERIC</td>
<td>A database of journal and nonjournal literature in the field of education from 1966 to the present. Many citations have not just abstracts, but full texts as well. ERIC is the database equivalent of the print publications Resources in Education (RIE) and Current Index to Journals in Education (CIJE). It has an American focus but also indexes international educational material.</td>
</tr>
<tr>
<td>MEDLINE</td>
<td>The MEDLINE database is produced by the U.S. National Library of Medicine. It encompasses information from Index Medicus, Index to Dental Literature, and International Nursing, as well as other sources of coverage in the areas of allied health, biological and physical sciences, humanities, and information science as they relate to medicine and health care, communication disorders, population biology, and reproductive biology.</td>
</tr>
<tr>
<td>PsycINFO</td>
<td>Produced by the American Psychological Association, PsycINFO is an international database covering summaries of journal articles, book chapters, technical reports, and citations to dissertations in the field of psychology and psychological aspects of related disciplines. Journal coverage is from 1872 onward, and book coverage is from 1987 onward.</td>
</tr>
<tr>
<td>SIGLE</td>
<td>(System for Information on Grey Literature in Europe). A database that contains records covering pure and applied science and technology, economics, other social sciences and humanities from 1980 onwards. “Grey” literature is best defined as literature that cannot readily be acquired through normal bookselling channels and that is therefore difficult to identify and obtain. Examples of grey literature include technical or research reports, doctoral dissertations, some conference papers and preprints, some official publications, and discussion and policy papers.</td>
</tr>
</tbody>
</table>
be some records that have not yet been allocated thesaurus terms at all, and some databases where indexing is ongoing. So, using broad-brush approaches or thesaurus terms only will not always work, and the term stuttering and its synonyms should be used as thesaurus terms as well as “textwords.”

Textword searches ensure that the term is identified whenever it appears in the record looked for, regardless of whether the record has been indexed with a thesaurus term. Through this process, we came up with the following terms for our study:

- stuttering
- stammering
- dysfluency (also spelled as disfluency)
- nonfluency

We were conscious of conceptual and historical differences, as our experiences of other subject areas have taught us that terms can change over time for a variety of reasons, including refinements in diagnoses or simply attempts to reduce stigmatization. We found stuttering to be the more common term in America, whereas in Britain, stammering was the more common term. Overall, the history of these terms was robust in the annals of research back to the early 1900s.

Combine terms. Once the basic terms were identified, we now approached the problem of how best to combine them to produce the first “draft” of our electronic search strategy in our first test of the MEDLINE database. One of the ways to make electronic searches more time effective is to use words that help to combine terms or concepts such as stuttering and treatment. A common procedure is to use what are called Boolean operators. Boolean operators are the three words and, or, and not. Boolean operators underpin most electronic search facilities and correct manipulation of these terms is essential. Figure 2 is a graphic representation of the relationship that the Boolean terms generate in the search strategy.

First, try to conceive of the complete set of all records in a database that is indexed as pertaining to treatment as being represented by the shaded circle to the left (below). Meanwhile, those in the circle on the right represent all records indexed as pertaining to stuttering. Figure 2a is what our database would give you if you entered the search phrase treatment AND stuttering. The white intersection of the two sets of records now represents the number of overlapping records that contain both treatment AND stuttering.

Results for a search using the phrase treatment OR stuttering are represented graphically in Figure 2b. Here, the use of or allows you to see every record concerning treatment, every record concerning stuttering, and the overlapping records that contain both treatment AND stuttering.

Finally, the use of the Boolean word not denotes all records that concern treatment alone and excludes not only all records on stuttering, but all records on treatment and stuttering. The white section on the left of Figure 2c is a representation of this combination of terms. Not should rarely be used as you run the risk of excluding many records that may otherwise be relevant to the review.

Use filters or limits. Electronic searches (as suggested above and demonstrated below) in a well-researched area can yield massive lists of citations. Experience has shown that where possible, built-in database filters or limits can help reduce the volume of irrelevant results. For example, both MEDLINE and PsycINFO allow you to screen out nonhuman studies. In the area of stuttering, these filters will help to avoid scores of irrelevant citations on the auditory cortices of macaque monkeys or the song cycles of the zebra finch. In the case of other review topics, if you are examining the effects of a drug or behavioral treatment that was only developed in the past 5 years, you might think about using date limits to reduce the number of irrelevant results received by searching only for studies

Figure 2. Venn diagrams of Boolean term retrieval constructs.
published after 2000. You may also want to limit the results of your searches to literature that was published within the English language. However, limiting the search to studies in the English language only is a controversial practice (Moher, 1996, 2000). If you do limit studies to the English language, you must record this in the final report.

Use truncation symbols and wildcards. Truncation symbols can help with plurals and variant forms of words. For example, using teen* in a database should capture all records beginning with teen, including teen-aged, teen-a-ger, teenager, as well as all plural forms (teens, teenagers, etc.). But, truncate with caution! If you are looking for pediatric terms, then truncating too early (say, using terms like paed* or ped*) will bring in not just pediatrics and pediatricians, but pedophiles as well. Also, truncation symbols may vary between databases. For example, MEDLINE uses $; PsycINFO uses *$. Be sure to check the help page of the database or search engine before you begin the search. Wildcards have a similar function and can pick up differences in spelling in the middle of a word (e.g., behavio?r, labo?r or colo?r).

Account for variations in spelling. Some search functions are more forgiving than others. These functions use a “fuzzy logic” to try to understand what you are asking for, even if you do not spell it right. Some pharmaceutical databases allow this because the spelling of a 30-character hyphenated drug name might be a challenge for some. Assistance is automatically provided to your query with a list of drug names they think you might have been looking for. Others such as MEDLINE or PsycINFO are not so charitable. If you spell dysfluenced* wrong when you search, you may miss retrieving records that should be included in the review.

Running Your Searches

When we had completed the steps above, we ran searches in the selected databases (see Table 2). Here is what the first attempt looked like:

1. Stuttering/ (2,195)
2. dysfluens$tw. (143)
3. disfluens$tw. (244)
4. stutter$tw. (2,057)
5. stammer$tw. (139)
6. (non fluens$ or non-fluen$).tw. (125)
7. 1 OR 2 OR 3 OR 4 OR 5 OR 6 (2,740)

Table 2. Search terms used and citations returned from MEDLINE.

<table>
<thead>
<tr>
<th>Search term</th>
<th>Citations returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Stuttering/</td>
<td>2,195</td>
</tr>
<tr>
<td>2 dysfluens$tw.</td>
<td>143</td>
</tr>
<tr>
<td>3 disfluens$tw.</td>
<td>244</td>
</tr>
<tr>
<td>4 stutter$tw.</td>
<td>2,057</td>
</tr>
<tr>
<td>5 stammer$tw.</td>
<td>139</td>
</tr>
<tr>
<td>6 (non fluens$ or non-fluen$).tw.</td>
<td>125</td>
</tr>
<tr>
<td>7 1 OR 2 OR 3 OR 4 OR 5 OR 6</td>
<td>2,740</td>
</tr>
</tbody>
</table>

Taking this apart line by line, what does it mean?

1. **Stuttering/**

   Of all, the “/” is MEDLINE’s way of expressing that the thesaurus term, or MeSH term, for stuttering was used to retrieve 2,195 records. Note that this thesaurus term will have captured all records tagged by indexers, even records that do not contain the word stuttering in any form. The MEDLINE indexer may have done this in the case of records in languages other than English or for records in which alternate terms like stammering were used.

2. **dysfluens$tw.**

   The textword (.tw) term dysfluens$ truncation captures words like dysfluency, dysfluency, and dysfluencies, without typing them out. This term revealed 143 records in MEDLINE.

3. **disfluens$tw.**

   Line 3, “disfluens$,” used an alternative spelling and a truncation symbol and netted 244 records—considerably more than the variant spelling in line 2.

4. **stutter$tw.**

   Use of the truncated textword “stutter$tw” in line 4 captured 2,057 records—an interesting figure that clearly differs from the number we arrived at in line 1 using the thesaurus term. This discrepancy may indicate a number of things. Sometimes an indexer may have indexed an article on stuttering that did not have the word stuttering in it. Perhaps the article was in another language and so line 1 might show a greater number of hits than line 4. In other cases, the text word rather than the MeSH term will capture a larger number of records because the text word is misleading. For example, it could be the case that in an abstract, the researcher was careful to note that “all children who stuttered were excluded from this study.” Likewise, line 4 is likely to have brought into our pool of searches many records of stuttering that refer to realms outside of speech therapy—a phenomenon that we will discuss below.

5. **stammer$tw.**

   Line 5 shows the records that were retrieved using the common U.K./European term, stammering. Clearly, the fact that only 139 records were returned compared to the more than 2,000 results in lines 1 and 4 indicate the greater usage of the word stutter.

6. **(non fluens$ or non-fluen$).tw.**

   The brackets in this line show an efficient method of grouping terms within a search phrase to capture variants. You will note that we were attempting to capture records without a hyphen or a break. Using the Boolean term or captures both sets of records. Had we used and, we would have retrieved only the subset of records that used the term in both spellings.

7. **1 OR 2 OR 3 OR 4 OR 5 OR 6**

   Note the total in line 7, where the inclusive Boolean term or was used to combine results. The use of and
would have narrowed them. The result is that the number of records retrieved does not appear to add up. After all, the combined total of lines 1 to 6 should be nearly 5,000 records! Why the discrepancy? The much smaller final total of 2,740 records indicates that duplicate citations were identified.

This is a good sign, meaning that indexers have done their job and that most records were captured in either lines 1 or 4. However, it is clear that all terms individually and combined contributed to the total number of records retrieved.

**Question 4. How do I manage the volume of results achieved electronically?**

For a process that takes a long time to develop and describe, this search actually took less than 2 hr to run across all databases. When all searches were complete, we imported them into the reference manager package Procite to electronically remove the majority of duplicate records.

The elimination of duplicates is done by automatically rejecting any record where author, title, and date are identical to those that are already in the database. This process has to be repeated manually because duplicates will remain for a number of reasons. For example, different databases record authors in different styles, use different keyword terminology, or use different entry structures and the reference manager software usually is not sophisticated enough to parse the information. Duplicates occur naturally because almost all of the databases we searched overlap.

Table 3 shows our preliminary results for all eight databases we searched.

Following mechanical and manual removal of duplicate records, we reduced the number of individual records retrieved to 7,870. Naturally, this still represents a great deal of work. The reason for such a large number of retrieved records may be due to the structure of the search itself. If we had included combined terms for a single intervention using the Boolean operator and, the total number of citations would have decreased by 90%. For broad-based searches that are not focused on a specific intervention, the number of citations can be inflated because some terms are used in completely different contexts. The truncated textword stutter$ will, for example,

<table>
<thead>
<tr>
<th>Database</th>
<th>No. of hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2-SPECTR</td>
<td>6</td>
</tr>
<tr>
<td>CENTRAL (Cochrane Library</td>
<td>160</td>
</tr>
<tr>
<td>CINAHL (1982–December 2005)</td>
<td>760</td>
</tr>
<tr>
<td>ERIC (1966–December 2005)</td>
<td>818</td>
</tr>
<tr>
<td>EMBASE (1980–2005)</td>
<td>1,965</td>
</tr>
<tr>
<td>MEDLINE (1966–December 2005)</td>
<td>2,740</td>
</tr>
<tr>
<td>SIGLE search (1980–2004/12)</td>
<td>63</td>
</tr>
<tr>
<td>MASTER PROCITE</td>
<td>11,112</td>
</tr>
</tbody>
</table>

The results of your information retrieval strategies should contain a large number of citations that are potential candidates for inclusion. At a minimum, you should have logged (a) the names and dates of the databases searched, (b) the number of records obtained from each database, and (c) the total number of records after duplicates were eliminated.

Table 3. Search strategy for eight electronic databases.

Remember that you ultimately hope for three separate reference lists: one for general references of use in supporting the background and discussion portions of the review; the second for records that meet the inclusion criteria; and a third for studies that appeared to meet your inclusion criteria at the stage of initial assessment, but on closer inspection failed to meet one or more criteria. A list of excluded studies should not include the 7,000+ records that were located but will not be used in the review, but only the “near misses,” which at a minimum could be classed as intervention studies of some type.

This teaches us, if we did not already know, that stuttering has multiple meanings outside of speech-language pathology. The lack of a thoughtful use of appropriate search terms will produce content-relevant results that ultimately will not be of use in the review. Here are two examples that are content relevant but inappropriate for use in a systematic review of stuttering intervention. It should be apparent that these titles look immediately disposable even without delving into individual records to read the abstract because they clearly relate to considerations other than stuttering intervention.


Working through the database at a microlevel, removing records one by one, you will find records in which the keyword is being used as a literary metaphor and therefore can quickly be deleted (e.g., “Competitive tendering in local government: a stuttering progress”). The moral of the story here is: Expect your terms to bring up the unexpected. Work will be swift to begin and slower as you come closer to the golden handful of studies meeting your inclusion criteria.

Once you have reduced the number of retrieved records to a core list of citations that appear relevant to the review, it is time to review the titles and abstracts. At this stage, we are constructing a concentrated list of potential studies, and the work of obtaining them in hard copy begins.

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Question 5. What journals should I consider searching by hand to make sure that I haven’t missed important studies?

We mentioned earlier that some systematic reviewers in medicine recognized that health care databases are now at a stage where electronic searches are sufficient for identifying all of the literature needed to complete a comprehensive review. It was noted that the situation outside medicine is less advanced. However, it is not enough to let the search strategy end with electronic searches of journals in databases like ERIC or MEDLINE. The review must also account for strategically searching a limited number of specialist journals to increase the potential numbers of studies meeting the inclusion criteria. To avoid duplication of effort, consult sources including the master list of journals being handsearched by the Campbell and Cochrane Collaborations to determine whether or not the most important journals in your area have been handsearched and their results submitted to registers that you could search electronically. When we consulted these sources, we decided that handsearches of the Journal of Speech, Language and Hearing Research; the Journal of Fluency Disorders; and the International Journal of Language & Communication Disorders from inception until the latest issue would be an important retrieval exercise.

Question 6. What people and organizations should I consider contacting who could alert us to unpublished or ongoing studies of relevance?

Attempts to locate ongoing, unpublished, or poorly indexed research can be mutually beneficial to both the reviewer and the reader. Your aim is to identify more studies suitable for inclusion within the review, and researchers may be glad to hear of your interest. They are often willing to ransack their own bibliographies and file drawers to help find appropriate studies. In addition to contacting researchers of primary studies that were identified via the electronic searches, a contact with other professional organizations can provide guidance in the information retrieval process. Internet searches convinced us that several national and international forums exist in the field of stuttering, including The Research Committee of the National Stuttering Association (www.nsastutter.org/), The International Stuttering Association (www.stutterisa.org/isa004.html#memberassociations), and the Stuttering Foundation of America (www.stuttersfa.org/).

Approaching the information officers and e-mail listservs available by such organizations, as well as perusing organizations on their “links” pages, can be valuable and quickly done. Any written comments should be polite, clear, and brief; include your name and institution of study; and be attached to a copy of your inclusion criteria. Finally, as always, make a note of the date of contact, its format, and any response received; and log it in the completed search strategy.

Question 7. How do I write up my search strategy for presentation within my completed review?

The presentation of the search strategy should incorporate details of all sources of data you search or consult for the review and the search terms and combinations you plan to use within them. At this point, dates of searching need not be reported as they may change during the course of your searching process.

When your review is complete, this work can be presented formally in a format similar to that in Figure 3, which is recognized by the Campbell and Cochrane Collaborations. Note that the “search strategy” section is a simple report setting out the parameters of your searches, not their results. Recording your search results in terms of the number of included and excluded studies takes place in another section of your systematic review that is typically titled “Description of Studies.” A basic table or flowchart may be appended to the review to enhance clarity at this point. This section should be brief, clear, and organized in such a way as to form a template for the order in which the “Description of Studies” will subsequently be documented. Clarity at this point thus becomes its own reward later in the review. Figure 3 is a sample of a report for the study retrieval we have illustrated in this article.

SUMMARY

Undertaking a systematic review is an ambitious enterprise and one you can rightly feel some excitement in beginning. You are, after all, attempting to produce the most even-handed summary of the best evidence available. It is inevitable that your work will have been constrained by time and your access to sources. Be transparent in recording the search history. If circumstances compelled you to omit any components in the retrieval process, now is the time to “come clean” in print. If, for example, a database or journal was unavailable at your library or you could not obtain translations of certain studies, this needs to be reported. Your goal is to do your best and to be clear about the limitations of your information retrieval process. As many have pointed out, systematic reviews may be subject to biases and the best we can do as systematic reviewers is to be clear about our processes.

REFERENCES

Chow, T. K., To, E., Goodchild, C. S., & McNeil, J. J. (2004). A simple, fast, easy method to identify the evidence base in pain-relief research: Validation of a computer search strategy used...
Relevant studies were identified through electronic searches of the following sources:

- CENTRAL (Cochrane Library [Issue 4, 2005])
- C2-SPECTR
- SIGLE (1980–2004/12)

Search strategies were as follows:

**CENTRAL**
1. disfluen* in All Fields in all products
2. dysfluen* in All Fields in all products
3. stutter* in All Fields in all products
4. stammer* in All Fields in all products
5. (non fluen* or non-fluen*) in All Fields in all products
6. MeSH descriptor Stuttering explode all trees in MeSH products

**CINAHL**
1. dysfluen$.tw.
2. disfluen$.tw.
3. stutter$.tw.
4. stammer$.tw.
5. (non fluen$ or non-fluen$).tw.
6. Fluency Disorders/
7. or/1-6

**C2-SPECTR**
1. stutter* (in all indexed and non-indexed fields)
2. disfluen* (in all indexed and non-indexed fields)
3. dysfluen* (in all indexed and non-indexed fields)
4. non-fluen* or non fluen* (in all indexed and non-indexed fields)
5. stammer* (in all indexed and non-indexed fields)
6. 1 OR 2 OR 3 OR 5

**EMBASE**
1. Stuttering/
2. disfluen$.tw.
3. dysfluen$.tw.
4. stutter$.tw.
5. stammer$.tw.
6. (non fluen$ or non-fluen$).tw.
7. or/1-6

**MEDLINE**
1. Stuttering/
2. dysfluen$.tw.
3. disfluen$.tw.
4. stutter$.tw.
5. stammer$.tw.
6. (non fluen$ or non-fluen$).tw.
7. 1 OR 2 OR 3 OR 5 OR 6

**PsycINFO**
1. “Stuttering-” in MJ,MN
2. (dysfluen*) or (dysfluen*) or (stutter*)
3. (stammer*) or (non fluen*) or (non-fluen*)
4. ((stammer*) or (non fluen*) or (non-fluen*)) or ((dysfluen*) or (dysfluen*) or (stutter*)) or (“Stuttering-” in MJ,MN)

**SIGLE**
1. (dysfluen*) or (disfluen*) or (stutter*)
2. (stammer*) or (non fluen*) or (non-fluen*)
3. ((stammer*) or (non fluen*) or (non-fluen*)) or ((dysfluen*) or (disfluen*) or (stutter*))

Journals handsearched for relevant studies included:

- Journal of Speech, Language, and Hearing Research
- Journal of Fluency Disorders
- International Journal of Language & Communication Disorders
- International Journal of Language & Communication Disorders

Contacts with individuals and organizations were undertaken from October to December 2005. Personal contacts with program developers and independent investigators were made to identify unpublished reports and ongoing studies, as follows (Jane Doe, personal communication, 7 September 2005; John Smith, personal communication, 4 October 2005).

Bibliographies of review articles and identified trials were scrutinized.

Figure 3. Sample search strategy for identification of studies report.

ERIC
1. Stuttering
2. Dysfluen*
3. Disfluen*
4. Stutter
5. Stammer
6. Non fluen* OR non-fluen*
7. Stuttering OR dysfluen* OR disfluen* OR stutter OR stammer
   OR (non fluen* OR non-fluen*)

MEDLINE
1. Stuttering/
2. dysfluen$.tw.
3. disfluen$.tw.
4. stutter$.tw.
5. stammer$.tw.
6. (non fluen$ or non-fluen$).tw.
7. 1 OR 2 OR 3 OR 5 OR 6

PsycINFO
1. “Stuttering-” in MJ,MN
2. (dysfluen*) or (dysfluen*) or (stutter*)
3. (stammer*) or (non fluen*) or (non-fluen*)
4. ((stammer*) or (non fluen*) or (non-fluen*)) or ((dysfluen*) or (dysfluen*) or (stutter*)) or (“Stuttering-” in MJ,MN)

SIGLE
1. (dysfluen*) or (disfluen*) or (stutter*)
2. (stammer*) or (non fluen*) or (non-fluen*)
3. ((stammer*) or (non fluen*) or (non-fluen*)) or ((dysfluen*) or (disfluen*) or (stutter*))


Muschol, M., Kosterin, P., Ichikawa, M., & Salzberg, B. M. Activity-dependent depression of excitability and calcium transients in the neurohypophysis suggests a model of ‘stuttering conduction.’ *Journal of Neuroscience, 10*, 11352–11362.


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