

COMMENTARY

Surveying the Traumatic Stress Literature: The Effective Use of Bibliographic Databases in Preparing Reviews and Meta-Analyses

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The value of a systematic review or meta-analysis depends upon the care with which it is designed and conducted. A major factor in this is the literature search that identifies the articles to be reviewed. Careful selection of bibliographic databases and the use of well-designed search strategies based on the controlled vocabularies contained in published thesauri are essential to ensure retrieval of all relevant articles. This commentary offers suggestions for identifying the literature to be searched, designing a suitable search strategy, using a controlled vocabulary, and describing the bibliographic methodology underlying a systematic review or meta-analysis.

Systematic reviews and meta-analyses can make a substantial contribution to our understanding of traumatic events and their consequences (Guyatt & Rennie, 2002). However, the value of the lessons we learn from reviews and meta-analyses depends on the care with which they are designed, conducted, and evaluated. As much care needs to go into the identification of appropriate articles as into the selection of inclusion/exclusion criteria and the coding of studies.

A small literature exists on the methods of literature searching. The Quality of Reporting of Meta-analyses (QUOROM) Conference, held by an international multidisciplinary group of researchers, clinicians, and editors, formulated standards for conducting meta-analyses of randomized controlled trials (Moher et al., 1999). They suggested that all meta-analyses specify the search strategies used to locate articles for inclusion, but did not tell researchers how to search the literature. Ten years later, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement, developed by a group of 29 researchers, clinicians, editors, and consumers, revised the QUOROM guidelines (Liberati et al., 2009; Moher et al., 2009) encouraging authors of systematic reviews and meta-analyses to “describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and

date last searched” and to “present full electronic search strategy for at least one database, including any limits used, such that it could be repeated” (Liberati et al., 2009, p. 8). However, no guidance was provided on how to conduct the search. In this commentary, we assert that methodologically sound searching is essential, we explain how to conduct dependable searches upon which systematic reviews or meta-analyses can confidently be based, and we describe the documentation necessary to allow proper evaluation and replication of the bibliographic searching underlying the work reported.

Our emphasis is on the bibliographic methodology that we consider necessary to support a systematic review or meta-analysis. For many other purposes, a literature search need not be so rigorous, and the use of natural language searching (i.e., using search terms not constrained by a controlled vocabulary) will be appropriate. Examining the indexing applied by various databases to publications known to be relevant and searching citation indexes to identify subsequent papers in which such publications were cited can also be useful (Lerner, 1996). These techniques may be appropriate at the beginning of a search to get a broad sense of how the content on a topic is indexed. However, we feel that natural language searching is not optimal as a primary strategy and that an authoritative search of the literature should always be based on controlled vocabulary searching.

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IDENTIFYING THE LITERATURE TO BE SEARCHED

The first step to conducting a methodologically rigorous literature search is to define the body of literature to be surveyed. Major bibliographic databases, such as MEDLINE (the National Library

of Medicine's online index to medical literature) and PsycINFO (the online version of *Psychological Abstracts*), index a carefully chosen list of journals. Although these may represent a discipline's major journals, important articles published in other venues will not be found by searching those databases. Searching a single database may therefore be insufficient. As the traumatic stress field is an interdisciplinary one, in many cases it will be necessary to conduct searches in two or more databases.

The PILOTS Database is an online index to Published International Literature On Traumatic Stress produced by the National Center for Posttraumatic Stress Disorder that aspires to index relevant literature from all disciplines. It offers a detailed indexing vocabulary designed specifically for the traumatic stress literature, and should be considered for any comprehensive search of that literature. It is freely available for use at www.ptsd.va.gov.

A comparison of the results obtained by searching MEDLINE, PsycINFO, and the PILOTS Database for literature on the same subject (family therapy for posttraumatic stress disorder [PTSD]) illustrates the advantages of using multiple databases. Because these databases and the search service vendors that host them offer a range of options for entering input from searchers, we show the search strategies as restated by the search engines, demonstrating exactly what was specified in the search process.

In MEDLINE we specified the descriptors (MeSH terms) "stress disorders, post-traumatic" together with "family therapy," resulting in the search command: "stress disorders, post-traumatic" [MeSH terms] AND "family therapy" [MeSH terms]. This retrieved 89 articles. The equivalent search command in PsycINFO was: `de = posttraumatic stress disorder and de = ((family therapy) or (conjoint therapy))`. This retrieved 69 results. In the PILOTS Database, we used the search command: `de = ptsd and de = family therapy`. This returned 175 publications. Each search retrieved several publications found in neither of the other two databases. The PILOTS Database search, which returned the largest number of publications, included many relevant publications that were indexed in PsycINFO, but not under the "posttraumatic stress disorder" descriptor, and many publications not indexed in MEDLINE, which limits its coverage to a select list of journals and does not include books, book chapters, or doctoral dissertations.

These searches were performed on April 6, 2010. The PsycINFO and PILOTS searches were performed on the CSA Illumina platform, and the MEDLINE search was performed on the PUBMED platform. Bibliographic databases are frequently updated with additional records, corrections, and deletions. The hosting services (such as CSA Illumina, Dialog, or Ovid) through which searchers access these databases may have different schedules or policies for making these changes. Thus for a reader to evaluate or replicate a literature search it is helpful to identify the channels through which access to the databases used was gained, and the dates on which the searches were performed.

DESIGNING A SEARCH STRATEGY

The second step is to design a search strategy that will produce a comprehensive list of important publications relevant to the topic under study (Lerner, 2006). Like any other computer program, a bibliographic database's search engine will only do what the user tells it to—which is not necessarily what the user wants it to do. If it is given imprecise instructions, it is likely to produce imprecise results, or none at all.

The English language contains an abundance of synonyms and ambiguities. Writers representing different disciplines may use the same words in different ways—"trauma" means different things to an internist and a psychiatrist. Those writing in earlier times or in distant countries may use different words entirely—such terms as "vegetative neuroses" and "shell shock" are seldom encountered in the contemporary North American literature.

Fortunately, there is a solution to this problem. Almost all bibliographic databases employ a controlled vocabulary to represent the subject content of the publications that they index (Lancaster, 1986). This vocabulary is published in a thesaurus, a list of terms shown in their relationship to other terms within that database's indexing vocabulary. MEDLINE's thesaurus is published in *Medical Subject Headings*, a three-volume compilation often referred to as MeSH (National Library of Medicine, 2010). PsycINFO uses the *Thesaurus of Psychological Index Terms* (Tuleya, 2007). The PILOTS thesaurus is published in the *PILOTS Database User's Guide* (Lerner, 2007). Online versions of these thesauri are often incorporated into the search engines provided by commercial database vendors.

These controlled vocabularies are usually conceived and presented in hierarchical form, to display the increasingly specific layers of terms under each broad heading. An alphabetical index leads the searcher from the "entry term" that he or she might have in mind to the "descriptor" that the database assigns to standardize its representation of a particular topic.

USING A CONTROLLED VOCABULARY

A descriptor is "a term in an indexing language chosen as the preferred or authorized representation of a concept conveyed by the text of a document or a feature of it" (Wellisch, 2000, p. 21). When an article is indexed in MEDLINE, PsycINFO, or the PILOTS Database, trained librarians with considerable subject experience assign those descriptors from that database's thesaurus that most accurately reflect the article's subject matter, methodological approach, and other characteristics covered by the database.

A descriptor is not the same as a "keyword." This latter term has no universally understood meaning in bibliographic searching. Many databases construe a search command to find a "keyword" as an instruction to search in the title, abstract, and descriptor fields of the bibliographic records. The term is often used more generally, to describe whatever words or phrases a searcher instructs

a search engine to find. When these words or phrases are entered without any further instructions, this is often interpreted as a command to find them wherever in the bibliographic records they might occur. Thus, when one reads a list of “keywords” used in a database search, one cannot be sure exactly what they were, how they were used, and whether their use was likely to produce satisfactory results. Keywords used in database searches should not be confused with the “key words” that authors often append to the abstract of a journal article. As these author-supplied “key words” are not drawn from a controlled vocabulary, they are of little use to the searcher save as enrichments to the author abstracts.

The need to employ controlled vocabularies in database searching is particularly acute in the traumatic stress literature. Consider the basic terminology of the field. What the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV;* American Psychiatric Association, 1994) calls “posttraumatic stress disorder” was spelled differently in the *DSM-III* (American Psychiatric Association, 1987). The hyphen in “post-traumatic stress disorder” might seem insignificant, but to computer software it can make all the difference between matching or not matching a phrase. The disorder’s name is rendered differently in the three major controlled vocabularies as “stress disorders, post-traumatic” in MeSH, “posttraumatic stress disorder” in PsycINFO’s *Thesaurus of Psychological Index Terms*, and “PTSD” in the PILOTS thesaurus. A search of each database using these terms as “descriptors” will yield different results from one using them as keywords (see Table 1).

Let us consider a simple search for literature on PTSD and alcohol abuse, conducted in PsycINFO (as hosted on the CSA Illumina platform) on April 6, 2010. When we used the simple unrestricted search command: `posttraumatic stress disorder and alcohol abuse`, which has the effect of searching for those terms wherever in the bibliographic record they might occur, we retrieved 2,276 records. Not all of these were relevant. Many (such as Oei & Raylu, 2008) were retrieved solely because the phrases “posttraumatic stress disorder” and “alcohol abuse” occurred in the titles of publications cited in their reference lists, which are included in PsycINFO records.

When we formulated the search using descriptors from the PsycINFO thesaurus, entering the search command: `DE = posttraumatic stress disorder and DE = alcohol abuse`, 104 records were retrieved, representing those publications that PsycINFO’s expert indexers determined to be about those two subjects (as opposed to merely mentioning them). However, by consulting the PsycINFO thesaurus we found several narrower terms that should also have been included in our search, such as “alcoholism” and “binge drinking.” By including them, entering the search command: `DE = (posttraumatic stress disorder) and DE = ((alcohol abuse) or alcoholism or (binge drinking))`, we increased the number of records retrieved to 214. Among the first 25 of these displayed in the search results, 5 (20%) were not included among the 2,276 retrieved by our unrestricted search.

Table 1. Search Results for Terms Employed as Descriptors for the PTSD Concept in MEDLINE, PsycINFO, and the PILOTS Database

	Descriptor	Keyword	Unrestricted (all fields)	
MEDLINE				
	<i>“posttraumatic stress disorder”</i>	0	—	16,809
	<i>“PTSD”</i>	0	—	16,571
	<i>“stress disorders, post-traumatic”</i>	14,651	—	15,547
PsycINFO				
	<i>“posttraumatic stress disorder”</i>	14,910	17,205	32,211
	<i>“PTSD”</i>	0	13,883	25,828
	<i>“stress disorders, post-traumatic”</i>	0	2	3
PILOTS				
	<i>“posttraumatic stress disorder”</i>	0	4,197	4,666
	<i>“PTSD”</i>	21,835	23,103	23,500
	<i>“stress disorders, post-traumatic”</i>	0	32	32

Note. The assigned descriptor in each database is italicized. Searches were performed on April 6, 2010, using the CSA Illumina platform to search PsycINFO and the PILOTS Database, and the PUBMED platform to search MEDLINE.

Entering a descriptor in a search command does not automatically extend the search to those descriptors listed as its “narrower terms” in the thesaurus. In many cases, it is possible to enter a command that instructs the search engine to “explode” a search; that is, to search for all items to which a particular descriptor or any of its narrower terms has been assigned. The capabilities and mechanics of this process vary among databases and search services, providing another reason for consulting user’s guides, help screens, and other documentation. Effective use of the “explode” command requires careful study of the thesaurus for each database being searched.

One of the articles from our unrestricted search (Scherrer et al., 2008) offers an excellent example of the importance of employing the controlled vocabulary when searching a bibliographic database. Surely, an article titled “Posttraumatic Stress Disorder, Combat Exposure, and Nicotine Dependence, Alcohol Dependence, and Major Depression in Male Twins” would be of interest to someone searching for literature for PTSD and alcohol abuse. But the term “alcohol abuse” does not occur in the title or abstract of the article, nor had it been applied as a descriptor by the PsycINFO indexers. They chose “alcoholism” as a more precise descriptor, whereas the article’s authors employed “alcohol dependence” in their title and

abstract. The result is that this potentially valuable article was not brought to the attention of the searcher—but nearly 2,000 articles of little relevance were. A review of the first 20 journal articles from this search identified only 2 of potential relevance.

CONCLUSION

To construct an effective subject search strategy for a bibliographic database, one should consult its thesaurus and use the appropriate descriptors to identify those publications relevant to the study in hand. If that seems a dauntingly complicated task—and a controlled vocabulary designed to index a vast literature is bound to be complex—the researcher should call upon the help of a reference librarian to design and perform the search. This should also be done when appropriate terminology cannot be found in the thesaurus. Many databases and search services offer online or telephone assistance to users of their products.

Bibliography is an inexact science. Two equally experienced indexers using the same thesaurus might choose different sets of descriptors to apply to the same document. Indexers are human, and sometimes they make mistakes. Thus it might be advisable to supplement a controlled-vocabulary search by using the other search techniques mentioned above, and by consulting reference lists and corresponding with colleagues to identify potentially relevant studies. Even the most careful indexer will be unable to index a document that does not come to his or her attention. If a systematic review or meta-analysis is to include data from unpublished studies, these will have to be found by some means other than searching the published literature.

In describing the methodology used, the author of a systematic review or meta-analysis should go beyond the suggestions contained in the PRISMA Statement and (a) list the databases searched, and explain why they were chosen; (b) indicate that the thesauri for those databases were used in constructing the search, identifying each by name and edition, or explain why they were not used; and (c) provide the search history for each database (the record of all search commands used, including the descriptors and other terms employed and how these terms combined in each instruction), and state the date on which the search was performed and the hosting service or other channel through which access to the database was gained. The goal should be to provide sufficient detail that a skilled searcher can evaluate and replicate it. If this information is not incorporated in the Method section of the resulting publication, it should be provided as supplementary ma-

terial online or its availability from the author should be indicated in a footnote. By following these guidelines, the researcher can be confident of having produced a literature review or meta-analysis that will accurately reflect the significant published work it is intended to cover, and make a genuine contribution to the reader's understanding.

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