

SPINAL PALPATION: THE CHALLENGES OF INFORMATION RETRIEVAL USING AVAILABLE DATABASES

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ABSTRACT

Pp This study addressed 2 questions: first, what is the yield of PubMed MEDLINE for complementary and alternative medicine (CAM) studies compared to other databases; second, what is an effective search strategy to answer a sample research question on spinal palpation?

Mb We formulated the following research question: "What is the reliability of spinal palpation procedures?" We identified specific Medical Subject Headings (MeSH) and key terms as used in osteopathic medicine, allopathic medicine, chiropractic, and physical therapy. Using PubMed, we formulated an initial search template and applied it to 12 additional selected databases. Subsequently, we applied the inclusion criteria and evaluated the yield in terms of precision and sensitivity in identifying relevant studies.

Rb The online search result of the 13 databases identified 1189 citations potentially addressing the research question. After excluding overlapping and nonpertinent citations and those not meeting the inclusion criteria, 49 citations remained. PubMed yielded 19, while MANTIS (Manual Alternative and Natural Therapy Index System), a manual therapy database, yielded 35 citations. Twenty-six of the 49 online citations were repeatedly indexed in 3 or more databases. Content experts and selective manual searches identified 11 additional studies. In all, we identified 60 studies that addressed the research question. The cost of the databases used for conducting this search ranged from free-of-charge to \$43,000 per year for a single network subscription.

Cb Commonly used databases often do not provide accurate indexing or coverage of CAM publications. Subject-specific specialized databases are recommended. Access, cost, and ease of using specialized databases are limiting factors. (*J Manipulative Physiol Ther* 2003;26:374-82)

Keyw **gTn** Complementary Therapies; Palpation; Manual Exam; Spine; Reliability; Interexaminer; Intraexaminer; Information Storage and Retrieval

INTRODUCTION

Over the last decade, several surveys have reported heightened interest in and use of complementary and alternative medicine (CAM) in the United States. Consumer interest and demand for CAM has grown (30% to 50% from 1990 to 1997).¹ This interest in CAM, the Office of Alternative Medicine was established in 1993; Congress elevated it to the National Center for Complementary and Alternative Medicine (NCCAM) at the National Institutes of Health in 1998 (<http://nccam.nih.gov/>). In that same year, 75 out of 117 US allopathic medical schools reported offering CAM courses or included CAM topics in required courses. Simultaneously, insurance companies across the US have increasingly incorporated CAM services under their medical plans.⁵

The use of CAM by the public has tremendously increased. Nearly half of the visits to CAM practitioners were to chiropractic and massage therapists. Conditions commonly treated by CAM practitioners include back pain, neck problems, arthritis, and headaches.²

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of manipulative diagnostic procedures such as spinal palpation.⁸

As the utilization of CAM therapies continues to grow, clinicians and health practitioners are increasingly being called upon to make thoughtful, informed, evidence-based recommendations about CAM treatments.⁸ Many physicians, however, have difficulty accessing CAM journals because of restricted distribution and unavailability in most commonly used allied health databases.^{10,11} For the same reason, researchers and librarians interested in CAM are faced with challenges accessing, searching, and retrieving specialized CAM literature from available databases. The National Library of Medicine and NCCAM recognized the importance of making the access to CAM literature easier and developed CAM on PubMed as a subset of the MEDLINE database.²

While MEDLINE is considered the premier source for accessing clinical medical information, several studies found that searching MEDLINE alone generally fails to identify all possible studies for inclusion in systematic reviews.¹³⁻¹⁶ In addition, a large number of CAM journals and studies are not indexed in MEDLINE or other more commonly used health-related databases and hence cannot be easily identified. Also, inadequate indexing of literature within journals and online databases hinders the effectiveness of retrieval.^{17,18} To protect against bias and ensure that all relevant data are taken into consideration, it is important to search not only PubMed but also multiple sources of information.¹¹ Guidelines have been established for conducting systematic review searches that extend beyond MEDLINE. Librarians and researchers must consider searching the subject-specific and specialized databases.^{19,20}

Despite the need and interest, few articles have explored the strengths and weaknesses of the commonly used allied health databases when searching for CAM literature. This study addressed 2 questions: first, what is the yield of the PubMed MEDLINE compared to select specialized databases; and second, what is an effective search strategy to answer a sample research question on spinal palpation? To answer these questions, we constructed and tested an appropriate search strategy to retrieve literature for a systematic review that addressed the question, what is the reliability of spinal palpatory procedures?

METHODS

To conduct a comprehensive search of the literature, we designed a 4-part search strategy. First, we developed and identified databases relevant to the topic under study. Third, a review committee of experts applied the Cochrane criteria to develop inclusion/exclusion criteria. Fourth, we conducted additional search methods to retrieve literature identified through online searches.

Table 1. Identification of terms

Reliability Terms	Spine Terms	Procedure Terms
Reliability	Spine (mh)	Palpation (mh)
Reproducibility (mh)	Spinal	Palpatory
Reproducibility	Neck	Manual exam*
Agreement	Cervical	Manual diagnosis
Observer variation (mh)	Thoracic	
Intra-examiner	Lumbar	
Inter-examiner	Vertebra*	
Intra-observer	Paraspinal	
Inter-observer		
Intra-rater		
Inter-rater		

*Manual exam retrieved manual exam(s) or manual examination(s);
 vertebra* retrieved vertebrae or vertebral.

Online Search Strategy

Three major steps were involved in constructing a search strategy:

- A. Break down the research question, what is the reliability of spinal palpatory procedures, to the 3 relevant components: reliability, spine, and procedure terms.
- B. Identify specific MeSH related key terms and their variations for each component (the use of MeSH is qualified as [mh]) (Table 1).
- C. Apply Boolean operators to formulate a search strategy. For each component, the terms were expanded using the OR operator. The result of each set, as shown below, was combined using the AND operator:
 1. Reliability OR reproducibility of results OR reproducibility OR agreement OR observer variation OR intraexaminer OR intra-examiner OR interexaminer OR inter-examiner OR intraobserver OR intra-observer OR interobserver OR inter-observer OR intrarater OR intra-rater OR interrater OR inter-rater
 2. Spine OR spinal OR neck OR cervical OR thoracic OR lumbar OR vertebra* OR paraspinal
 3. Palpation OR palpatory OR manual exam OR manual diagnosis
 4. #1 AND #2 AND #3

Identification of Databases

Using PubMed, we formulated an initial search template and applied it to appropriate bibliographic databases that had potential coverage for the areas of osteopathic medicine, allopathic medicine, chiropractic, and physical therapy. The selection of databases was based mostly on the availability of online resources that we could access from affiliated institution libraries. As a result, we identified allied health databases that were available to us in a variety of platforms through the University of California

Table 2. Summary of online search process

Online Databases	No. of citations identified by search template	No. of citations based on screening titles and abstracts	No. of citations after applying inclusion and exclusion criteria
PubMed	141	51	19
MANTIS	126	88	35
MD Consult	462	51	19
Web of Science	66	37	11
EMBase	57	29	16
CINAHL	232	36	19
BIOSIS Previews	36	13	5
ICL	12	9	6
Osteopathic Database	28	17	8
OCLC FirstSearch	11	6	1
Digital Dissertation	7	1	1
PEDro	0	0	0
Cochrane Database of Systematic Reviews	11	9	5
Total No. of citations	1189	347	145
No. of nonoverlapping articles	797	154	49

MANTIS, Manual, Alternative, and Natural Therapy Index System; CINAHL, Cumulative Index to Nursing and Allied Health Literature; OCLC, Index to Chiropractic Literature; OCLC, Online Computer Library Center, Inc.; PEDro, Physiotherapy Evidence Database.

Irvine (UCI) Library and the Southern California University of Health Sciences Learning Resources Center.

Besides PubMed MEDLINE, the selected databases included MANTIS (Manual Alternative and Natural Therapy Index System), CINAHL (Cumulative Index to Nursing and Allied Health Literature), Web of Science, EMBase, Biosis Previews, OCLC (Online Computer Library Center, Inc.) FirstSearch, Digital Dissertation, Osteopathic database, PEDro (Physiotherapy Evidence Database), Cochrane Library, ICL (Index to Chiropractic Literature), and MD Consult. The scope and content of each database are described in Appendix 1.

AMED (Allied and Complementary Medicine Database) is one of the unique bibliographic CAM databases covering 510 journals in CAM, physiotherapy, occupational therapy, rehabilitation, and podiatry, but our affiliated institution libraries did not have subscription access at the time we conducted the search. Therefore, AMED was not included in this study.

Once the databases were identified, the search template was modified to optimize and enhance the search outcome of other databases. For example, certain databases search platforms allowed the users to apply limits to refine the search template. Limits for the search template included human studies, publication in all languages, and publication dates between 1966 and 2001. We used OVID to search MANTIS, CINAHL, and Cochrane and applied C# All Fields (.af.) to the search terms. In addition, some search platforms could not directly handle our search template. Either the expansions were too large or set-based searching was not available. We modified the search template, as shown below, for databases such as MD Consult, Web of Science, EMBase, and Biosis Previews

((spine or spinal or neck or cervical or thoracic or lumbar or vertebrae or vertebral or paraspinal) and (palpation or palpatory or manual exam or manual examination or manual diagnosis)) and (reliability or reproducibility or reproducibility of results or agreement or observer variation or intra-examiner or intra-examiner or interexaminer or inter-examiner or intraobserver or intra-observer or inter-observer or interobserver or intra-rater or intrarater or interrater or inter-rater).

We also simplified the search template by using major key terms such as palpation, palpatory, or manual exam to perform separate searches for OCLC FirstSearch, Digital Dissertation, and PEDro.

Applying Inclusion/Exclusion Criteria

A committee of experts developed inclusion/exclusion criteria based on the review question and relying on previous criteria developed by the Cochrane Group and in other systematic reviews. Appendix 2 provides the Study Selection Form, which incorporated the inclusion/exclusion criteria.

Additional Searches

After completing the online searches, the committee developed a plan to retrieve literature not identified through online searches. This included gleaning references that were cited in selected studies from the preliminary screening of online search results, consulting experts in the fields of chiropractic and osteopathic medicine, contacting authors of eligible conference abstracts, and manually searching 3 specific journals. The journals were *Manuelle Medizin* (formerly *Yearbook of the American Academy of Osteopathy*), *Journal of the American Academy of Applied Osteopathy*, and the *AAO Journal*.

of Osteopathy Yearbook and the AAO Journal. In all, we identified 11 studies from additional searches.

ativity (10% and 18%, respectively) and low precision (38% and 37%, respectively).

Overall Results

The search results of online databases and additional searches together identified 60 unique studies relevant to the reliability of spinal palpation, which were included in the systematic review.

Cost of Online Searches

The cost of the databases used for conducting the search ranged from free-of-charge for PubMed to \$43,000 per year for a single network subscription for EMBase. If institutional subscriptions are not available for a specific database needed for the search, both OVID and Dialog offer the Online Pay-as-You-Go service. Connect time and cost per full record are available from both vendors' web sites. For instance, OVID MANTIS connect time is \$45 per hour and

Sensitivity and Precision

With the 60 studies, we went back to the databases that were available to us and verified how many of these 60 citations were actually indexed in each respective database. This endeavor provided information about the sensitivity and precision of searching online databases.

The sensitivity of a search refers to the number of relevant studies identified by the search template from a specific database (eg, PubMed 19), divided by the total number of known relevant articles identified by all searches (eg, 60 articles). For instance, the sensitivity of PubMed is calculated as $19/60$ (32%; Table 3, column 1).

The precision of a search refers to the number of relevant studies identified by the search template from a specific database (eg, PubMed 19) divided by the total number of relevant studies identified by all searches that were actually indexed in this database but missed by the search template (eg, PubMed 36). For instance, the precision of PubMed is calculated as $19/36$ (53%; Table 3, column 2).

Using author and title word search, we identified the number of citations our search template had missed in each database. The results in Table 3 indicate that the sensitivity and precision in this study did not necessarily correlate. For instance, Biosis Previews and Cochrane had a low sensitivity (8.3%) but a high precision (63% and 71%, respectively). Compared to the other online databases shown in Table 3, MANTIS demonstrated a high sensitivity (58%) and precision (83%). ICL and Web of Science had low sensi-

as default, did not demonstrate the highest sensitivity of all the selected databases that we identified in the study, relevant studies for this review. The highest sensitivity (58%) and precision (83%) were obtained through MANTIS, especially if one does not have access to some of the expensive databases (eg, EMBase, Biosis Previews, Web of Science, and MD Consult). However, multiple search strategies should be utilized to retrieve the maximum number of citations. In our study, we discovered that our search template had missed a significant number of relevant studies.

While using PubMed to develop our search template seemed to produce a cost-effective outcome, it did create difficulty implementing that search template in other selected databases. A predeveloped search template for a specific database and platform frequently does not work well with another database or platform due to the lack of standardized commands and functions from one database to another. For example, the unique features of automatic mapping and exploding MeSH terms in PubMed are not available in most other selected database that we evaluated in our study.

Therefore, multiple search strategies and expansion of key terms should be used in databases other than PubMed. AMED is a lower priority. For this study, we accessed 13 databases in varied platforms and create a problem for researchers and librarians who might not be familiar with all these databases and take advantage of all available features from each database, thereby affecting the search results (eg, OVID CINAHL). The original search without qualifying the search terms with .af.Öretrieved only 19 citations. Repeating the search with .af.Öresulted in 232 citations, with 7 studies that were either missed or not indexed by other selected databases. In addition, previous studies found that conducting the same search with the same database (eg, OVID or Dialog), the fee is based on connect time and per searching MANTIS through OVID versus Healthindex) but different platforms yielded different results.

Several factors contributed to lower sensitivity and precision in search outcomes of our study: the accuracy of indexing, the comprehensiveness of a search strategy, the strength and weakness of a database search engine/platform and the subject coverage on a particular topic. Similarly, as previous studies pointed out, incompleteness or errors in citation indexing or misused keywords by authors may result in citations not being retrievable despite the use of a good search strategy.^{16,17,22} In our study, most user-friendly web-based search engine/platforms could not handle a complex search template as the one we used. For these reasons, the overall online search of some databases resulted in a low sensitivity and precision. For example, Web of Science, one of the major health and life sciences commercial databases, resulted in a low sensitivity (18%) and a low precision (37%). On the other hand, Biosis Previews provided a much lower sensitivity (8.3%) and a high precision (63%), which might be due to the limited scope in subject coverage. Thus, all the constraints mentioned above contributed to retrieval results in this study (ie, indexing, search strategy, platform and subject coverage problems).

Our results showed that 35 of the 60 relevant studies (58%) from all searches were repeatedly indexed in 3 more databases. This suggests it is not necessary to search more databases. This suggests it is not necessary to search more databases. This suggests it is not necessary to search more databases.

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studies by using other search methods, like screening for 6. A great number of CAM studies were available only in eight publications, gleaned references of the relevant articles, and contacting content experts. Thus, we support the Cochrane recommendation to glean references from selected studies and manually search specialized journals.

Study Limitations

Our study had several limitations that might have affected the total number of relevant studies being included in this review. We used a pre-defined online search template with a variety of databases and platforms. The simplicity of a web-based search engine did not allow us to fine-tune our search template. Selected databases were not all available to us or too expensive to use.

Due to potential bias in a given platform, researchers in this field might want to perform their searches using different platforms and search strategies within the same database. However, cost would be a constraint.

We limited the expansion of related key terms (eg, assessment, soft tissue, motion test, etc.) to avoid a large number of irrelevant citations. The initial search of PubMed with the expansion of related key terms retrieved almost 900 citations and fewer than 10% of these were relevant. On the other hand, we might have missed articles about the reliability of palpation in general that could have been relevant to our study. The reason is that articles about the reliability of palpation for all areas of the body will not include a term like spine unless a significant part of that study specifically addressed the spine. For comparison, further evaluations of web-based search interface with few constraint terms should be tested.

CONCLUSION

In summary, we found that conducting a comprehensive search of CAM evidence is challenging for the following reasons:

1. Some user-friendly web-based search interfaces cannot handle complex search strategies.
2. Search platforms from various databases are not standardized and some do not have the capability to fine-tune a specific search.
3. A substantial amount of CAM literature has been published in languages other than English, and budget constraints might not allow for translation expenses. While this was not an issue in our study (only 2 relevant studies were found in a foreign language), searches on other topics are likely to identify studies published in foreign journals.
4. Many online databases provide inadequate indexing and categorization of CAM publications.
5. CAM on PubMed only covers a relatively small segment of CAM literature, making access to a specialized database very important. However, access is frequently expensive.

Our study confirmed an extended observation made by others recently. Researchers and librarians conducting a systematic review in a particular area of CAM should develop the search strategy using PubMed and then adapt the PubMed search approach to their subject-specific specialized databases. Researchers have to be aware that biases can be introduced on platforms that they use. Our study shows that a specialized database such as MANTIS does offer unique resources that are not typically indexed by commonly used databases (eg, PubMed). As health care institutions and providers are increasing their services in the areas of CAM to meet public demands, an ever-growing number of subject-specific bibliographic databases are becoming available within the field of CAM. Libraries and research centers must fund to increase access to specialized databases for CAM if institutional priorities focus on this growing area of medicine. It is important to use additional search methods (gleaning reference lists, contacting experts in the field, and searching manually) to conduct systematic reviews. While this endeavor is time consuming and costly, it adds significantly to the completeness of a systematic review.

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of North Texas Health Sciences Center where the database is under construction.

OCLC FirstSearch is an index of papers presented at international conferences, symposia, meetings, expositions, workshops, and congresses produced by the Online Computer Library Center, Inc. (<http://www.oclc.org/home/>). The index covers a wide variety of disciplines from 1993 to the present. It also incorporates published information received from the British Library Document Supply Center.

Digital Dissertation indexes more than 1.6 million doctoral dissertations and master theses covering over 1000 graduate schools and universities.

Cochrane Database of Systematic Reviews (CDSR) is a fee-based Evidence-Based Medicine (EBM) database (<http://www.cochranelibrary.com/clibhome/clib.htm>). It includes full text of regularly updated systematic reviews. Abstracts of Cochrane reviews are performed by the Cochrane Centers and are available free of charge.

PEDro (Physiotherapy Evidence Database) is a free web-based database (<http://ptwww.cchs.usyd.edu.au/pedro/>). It provides bibliographic details and abstracts of randomized controlled trials and systematic reviews in physiotherapy.

Appendix 2

STUDY SELECTION FORM

UID: