How does the use of different targeted literature review (TLR) methodologies impact the research output?

A case study of structured vs. focused vs. pearl growing approach

Mangat G[1]; Sharma, S[2]

[1]Parexel International, Mohali, India;
[2]Parexel International, Chandigarh, India

Introduction

Targeted literature reviews (TLRs) play a critical role in evidence synthesis and decision-making in various fields, including healthcare, public health, and policy development. The choice of an appropriate search strategy is essential for obtaining a comprehensive understanding of a research question. Different search methods, such as structured TLR/focused TLR and pearl growing strategy, can yield varying results, and understanding the strengths and limitations of each approach is crucial for researchers and practitioners.

This research aims to compare the effectiveness and value of structured/ focused TLR and pearl growing strategy in the context of a case study investigating the global epidemiology of acromegaly based on observational studies. Acromegaly, a rare endocrine disorder, serves as an example to illustrate the practical implications of selecting different search strategies for conducting TLRs.

The primary objective of this research is to investigate the effectiveness and value of different targeted search methods, specifically comparing structured/focused TLR and pearl growing strategy. The study seeks to evaluate the comprehensiveness of the search results and the geographical representation of the identified studies.

This study focuses on the comparison of two search strategies applied to observational studies published in English from inception till September 2022 in two major databases, Embase® and PubMed®. By examining the search results and comparing the performance of each search strategy in the context of acromegaly, the study aims to provide insights into the optimal approach for conducting targeted literature reviews in various research contexts. While the focus is on comparing the search approaches, the case study on acromegaly serves as an illustrative example to emphasize the practical implications of different search strategies.

Methods

Two major biomedical databases, Embase® and PubMed®, were used to retrieve articles for this study. These databases were chosen due to their extensive coverage of biomedical literature and their relevance to the research question.

The study employed two distinct search strategies: targeted literature review (TLR) and pearl growing strategy. Both approaches were applied to the case study of identifying the global epidemiology of acromegaly based on observational studies.

Structured Targeted Literature Review
The structured TLR approach involved the development of a comprehensive and systematic search strategy using the following steps:

Identification of relevant keywords and terms related to the research question, such as "acromegaly," "epidemiology," "prevalence," "incidence," and "observational studies."

Exploration of controlled vocabulary terms and exploded sub-headings within the databases to ensure a thorough search.

Application of boolean/proximity operators (e.g., AND, OR, NOT) to combine search terms and refine the search results.

Inclusion and exclusion criteria were defined to filter the search results based on study design, population, language, and publication date.

The search strategy was executed in both Embase® and PubMed® databases to maximize the identification of relevant articles.

Focused Targeted Literature Review
The focused TLR approach employed a more pragmatic search strategy, utilizing the same keywords identified for the structured TLR but with methodological shortcuts to save time and resources. The focused TLR was performed using the following steps:

Restricting the search to titles and abstracts in both Embase® and PubMed® databases.

Inclusion and exclusion criteria were defined to filter the search results based on study design, population, language, and publication date.

Pearl Growing Strategy
The pearl growing method is an iterative search process that involves the following steps:

> **Step 1:** Identification of a primary pearl or citation, which is a highly relevant article that addresses the research question.

> **Step 2:** Backward citation mining: Reviewing the reference lists of the primary pearl and relevant articles identified in the initial search to find additional pertinent studies.

> **Step 3:** Forward citation mining: Searching for articles that have cited the primary pearl and any other relevant articles using citation-tracking tools available in the databases.

>> Exploration of the 'similar articles' section in PubMed to identify other potentially relevant articles based on their similarity to the primary pearl.

The pearl growing strategy was primarily conducted in PubMed, as it offers robust citation-tracking and similarity-based search features.

Study Selection
The study selection process involved two stages:

Title and abstract screening: The search results from both search strategies were screened based on their titles and abstracts to identify potentially relevant articles. Articles that did not address the research question or meet the predefined inclusion criteria were excluded.

Full-text screening: The full-text of the potentially relevant articles identified in the first stage was reviewed to confirm their eligibility for inclusion in the study. Articles that did not meet the inclusion criteria upon full-text review were excluded.

Data Extraction
Data extraction was performed using a standardized form to collect information on study design, population, sample size, geographical location, and key findings. The data extraction form ensured that all relevant data were systematically collected and facilitated the comparison of the results obtained from the structured TLR and pearl growing strategy.

Results

The structured TLR approach identified a total of 1,293 citations.

After analyzing the search results, the structured TLR approach identified 40 relevant studies.

The focused TLR approach identified a total of 681 citations.

After analyzing the search results, 21 relevant studies were identified through the focused TLR approach.

The pearl growing strategy identified a total of 574 citations, including 512 from similar articles, 39 from cited-by references, and 23 from bibliographies.

Following the analysis, the pearl growing strategy identified 30 relevant studies.

A summary of the results for each search strategy is provided in the table below.

Search Strategy	Time Used (Days)	Citations Retrieved	Articles Identified
Structured TLR	9	1,293	40
Focused TLR	5	681	21
Pearl Growing Strategy	3	574	30

Additional Studies Identified
The structured TLR identified ten additional studies compared to the pearl growing strategy. This difference may be attributed to the limitations of PubMed's word-weighted algorithm, which relies on keywords and citation relationships to identify similar articles. Consequently, some relevant studies may have been missed due to variations in terminology, geographic focus, or citation linkages. Additionally, the publication period of the primary pearl may have hindered the linking of newer studies to the cited by and bibliography sections.

Geographical Representation
The additional studies retrieved through the structured TLR contributed to a more comprehensive understanding of the global epidemiology of acromegaly. These studies provided relevant data from five new geographies, which were not captured by the pearl growing strategy. This increased geographical representation allows for a more accurate assessment of the global burden of acromegaly and highlights the importance of a comprehensive search strategy.

Time Efficiency
The structured TLR took nine days to complete (screening 400 citations/ day), whereas the pearl growing method took only three days. While the structured TLR was more comprehensive, it required a significantly greater investment of time and resources. This trade-off between comprehensiveness and time efficiency should be considered when selecting a search strategy for a targeted literature review.

Discussion

The study compared three different targeted search methods: structured TLR, pearl growing strategy, and focused TLR. Each approach offers distinct advantages and disadvantages, and the choice of method depends on the objectives and resource constraints of the research project. The following discussion provides a detailed evaluation of the effectiveness and value of each search method.

The structured TLR approach was found to be the most comprehensive method, identifying the highest number of relevant publications. The extensive search strategy using pre-defined keywords, exploded sub-headings, and boolean/proximity operators ensured the most exhaustive retrieval of pertinent articles.

However, this comprehensiveness came at a cost: it took nine days to complete the assessment, significantly longer than the other two approaches. Researchers who prioritize comprehensiveness and are willing to invest more time and resources might prefer the structured TLR approach.

The pearl growing strategy, on the other hand, identified two-thirds of the relevant publications compared to the structured TLR approach, while being considerably faster, taking only three days to complete. This method allows for rapid evidence synthesis, making it particularly suitable for projects with tight deadlines or limited resources.

1: Structured TLR
- A semi-systematic literature review with 1-reviewer only (instead of two independent reviewers) with a manageable scope while retaining rigor and minimizing bias
- Formal and expanded search strategies are developed using exploded sub-headings, boolean/proximity operators, etc.
- Google searching is conducted
- Conference searching is covered

2: Focused TLR
- Informative, rather than all-encompassing, review of the literature
- Employs methodological "shortcuts" such as search restricted to titles-abstracts, major terms only, author country, etc.
- Formal but restricted search strategies are developed
- Google searching is conducted
- Conference searching is not covered

3: Pearl Growing Approach
- It uses a relevant and authoritative article called "primary pearl."
- Backward citation mining: After identifying the primary pearl, the references cited in its bibliography are evaluated to determine "secondary pearls."
- Forward citation mining: Titles of primary and secondary pearls are utilized on "PubMed" and "ScienceDirect" to identify "tertiary pearls" using the "cited by" and "similar articles" options

The pearl growing strategy leverages the identification of a primary pearl or citation, followed by backward and forward citation mining, as well as exploring the 'similar articles' section in PubMed. The efficiency of this approach may be attributed to its focused nature, targeting articles that are closely related to the primary citation, and minimizing the inclusion of less relevant articles.

Although the pearl growing strategy identified fewer relevant studies than the structured TLR approach, its time efficiency and acceptable comprehensiveness make it a viable option for researchers who need to balance these competing priorities.

The focused TLR was found to be less effective compared to the other two methods. It identified the lowest number of relevant studies (only 50% of the structured TLR) while taking a moderate amount of time to complete (five days). The focused TLR utilized the same keywords as the structured TLR but restricted the search to titles and abstracts to save time and resources.

While the focused TLR approach was faster than the structured TLR, it did not offer a significant advantage in terms of time efficiency compared to the pearl growing strategy. Additionally, the comprehensiveness of the focused TLR was considerably lower than that of the structured TLR and only slightly higher than that of the pearl growing strategy. Therefore, the focused TLR seems to be a less attractive option, as it does not provide a substantial benefit in either time efficiency or comprehensiveness.

Implications for Research

The findings of this study emphasize the importance of carefully selecting the appropriate search strategy depending on the research question, available resources, and required comprehensiveness of the review. When time is a critical factor, the pearl growing strategy may be the most suitable approach, as it provides a good balance between time efficiency and comprehensiveness. Conversely, when comprehensiveness is the primary goal, the structured TLR may be the preferred method, despite the longer time investment required. The focused TLR, offering limited advantages in both time efficiency and comprehensiveness, appears to be a less viable option for researchers.

In conclusion, researchers should weigh the trade-offs between comprehensiveness and time efficiency when selecting a search strategy for a targeted literature review. The structured TLR approach is most comprehensive but requires a substantial time investment. The pearl growing strategy, while not as comprehensive as the structured TLR, identifies a significant portion of relevant publications in a much shorter time frame, making it an attractive option for early-stage or rapid evidence synthesis. The focused TLR, offering limited advantages in both time efficiency and comprehensiveness, appears to be a less viable option for researchers.

Limitations and Future Research Directions

This study is based on a case study of identifying the global epidemiology of acromegaly, and the findings may not be generalizable to all research questions or topics. Further research comparing the effectiveness and value of different targeted search methods in diverse research domains would provide valuable insights into their applicability across various disciplines.

Additionally, the time and resources available to researchers can vary depending on the project's scope, funding, and personnel. This study assumes a constant rate of screening for all approaches (400 citations per day). However, researchers with different levels of expertise or time constraints might experience variations in the time taken to complete each search strategy.

Future research could also explore the development of hybrid search strategies that combine the strengths of the structured TLR and the pearl growing strategy. For instance, incorporating citation mining techniques into the structured TLR approach may enhance its time efficiency while maintaining comprehensiveness. Similarly, refining the pearl growing strategy by incorporating additional search techniques or databases could improve its comprehensiveness without sacrificing time efficiency.

Ultimately, the choice of search strategy should be informed by the specific research question, objectives, and available resources. Researchers must consider the trade-offs between comprehensiveness and time efficiency when selecting an approach that best aligns with their goals and constraints.

parexel®