COMMENTARY

Including papers in languages other than English in systematic reviews: important, feasible, yet often omitted

Sarah Catherine Walpole*

Hull York Medical School, University of York, York, UK

Abstract

A truly international and systematic review (SR) identifies and synthesizes relevant evidence regardless of the geographical provenance or language of publication. Despite recommendations, international SRs continue to exclude papers in languages other than English (LOE) at searching, screening, and analysis phases either explicitly in their protocols or by omitting to attend to LOE. Although guidelines on including LOE publications in SRs are lacking, a small body of literature provides strategies for screening LOE titles and abstracts. Drawing on experience from published SRs, this commentary summarizes the existing literature and highlights further strategies that can be used. Online translation tools and language skills of colleagues can often be used during searching and screening at no financial cost. When LOE papers meet inclusion criteria, a member of the SR team with relevant language skills, if available, or an external translator will ideally be involved multiple times during the review process. Weighing up the novelty and import of insights from a paper against translation costs can inform decisions about whether LOE papers should be included and the frequency with which a translator should be involved. Removing language restrictions requires attention at all stages of an SR. A plan for addressing LOE papers at each stage should be documented at the outset of the review and may need to be revised depending on the number of papers identified. Reporting of the approach used is important for transparency and confirmability. © 2019 Elsevier Inc. All rights reserved.

1. Introduction

Despite recommendations, systematic reviews (SRs) continue to exclude papers in languages other than English (LOE) at searching, screening, and analysis phases either explicitly according to their protocols or by omitting to attend to LOE. A study of 10 psychiatry journals in French, German, Italian, Polish, and Portuguese found that the LOE papers provided important findings, but only half were cited in the following 2 years, and most citations came from the same researchers and journals [1].

Of SRs used to inform clinical practice guidelines, few report screening LOE papers (11 of 123 Campbell SRs in a 2018 study) [2−6], and many do not report whether language restrictions are used (22 of 69 SRs in a 2015 study) [2,6]. A 2016 SR exploring risk factors for youth violence actively searched for studies in LOE. Ten percent of included studies were indexed exclusively in databases in LOE and not in major English-language databases; a further 5% of included studies were in LOE and identified through major English-language databases [7]. Had LOE not been incorporated, 15% of the included studies would have been missed.

This article discusses the value and challenges of including LOE papers in SRs, details existing guidance, and explores approaches and tools for addressing LOE literature at all stages in a SR. It addresses the issue from the perspective of researchers working in English; nonetheless, the theory and practice suggestions will be pertinent to researchers working in LOE.

1.1. Languages other than English matter

All the top 50 medical journals by impact factor are published in English [8], yet there are two important reasons for including LOE papers in SRs. First, to value research regardless of the language of the participants and researchers. Second, because LOE papers may contain insights or provide a context not available in English-language papers and/or report results that alter the direction

What is new?

Key findings
- Despite recommendations, systematic reviews continue to exclude papers in languages other than English (LOE) at searching, screening and analysis phases and guidelines for inclusion of LOE papers are still lacking.

What this adds to what was known?
- Three approaches which can be useful for screening LOE papers are free online translation tools, tools to allow screening in LOE (e.g. looking for keywords), and informal involvement of colleagues' with relevant language skills.

- To address LOE papers at the analysis stage, ideally a member of the review team will have relevant language skills, otherwise an external translator will be involved multiple times during the review process.

- Weighing up the likelihood of new or important insights against translation costs can inform decisions about whether LOE papers should be included and the frequency with which a translator should be involved.

What is the implication and what should change now?
- There is insufficient evidence to support exclusion of LOE papers from SRs.

- Positive contributions would include:
  ○ development and validation of LOE screening tools,
  ○ development of networks of researchers with LOE skills,
  ○ empirical data on accuracy of online translation tools and
  ○ a strategy for addressing LOE as a standard element of a research protocol and requirement for funding applications.

of association or effect of meta-analyses. The relevance and significance of such insights, context, and results vary depending on the population, intervention, outcome, and setting being researched; but given globalization and escalating flows of patients, knowledge, practitioners, and practice between settings, LOE papers are increasingly relevant.

The global distribution of research is skewed toward North America and Europe, yet research outputs inform guidelines and practice internationally. Practitioners in the global south often have to conjecture the relevance of research from the global north to their own population and setting [9]. SRs are

taken as the gold standard to inform guidelines and practice. To merit their international influence, SRs should attempt to synthesize all relevant evidence, regardless of geographical provenance or language of publication.

The ideal search would be 100% sensitive—including all papers regardless of language—which could be impractical. In practice, reviewers must select the most relevant chunk of the literature to search. Whether LOE databases fall within this chunk depends on the research question. Factors that make LOE papers more relevant are the intervention being in a category where research is more frequently published in LOE or a population or setting that is likely to encompass speakers of LOE.

Considering intervention type, the impact of language restrictions has been shown to be more significant in reviews addressing complementary therapies [10] and in certain medical specialties, including orthopedics, rheumatology, and psychiatry [11]. Research in these fields, compared with that in other fields, may be based in countries where English is not an official or prevalent language leading to LOE publication.

It is rare in healthcare research that a question is exclusively about an English-speaking population or setting, yet this may be the case, for example, in the study of psychological interventions or of epidemiology in a very localized setting. For such research, LOE papers have less relevance, yet provide insights that could be translated into hypotheses about the population being studied. Epidemiologic SRs, for example, may be designed to include papers only in one LOE relevant to the population group.

Qualitative research, compared with quantitative, produces findings that are more subjective, more tied to time and place and hence inherently less important in other regional or international contexts [12]. Nonetheless, even findings tied to another setting may provide insights that could be translated and provide relevant hypotheses. A qualitative SR questioning the educational needs of medical students in relation to planetary health found that 11 included LOE papers provided important insights, addressing a different spectrum of issues and representing different methodologies compared with 16 included English-language papers [13]. A qualitative SR exploring risk factors for youth violence found that LOE papers introduced significant insights that would have been missed had the review exclusively studied English-language papers [7].

For efficacy studies, even a relatively small impact on effect size or confidence intervals may alter whether the result crosses a threshold for significance implying efficacy and changing the implications for practice; therefore, what may seem like a minor consideration can be highly consequential [3]. The heterogeneity in clinical outcomes for efficacy studies published in English and those in LOE has been explored. Moher et al. [5] found that trials published in LOE were more likely to report statistically positive results than trials published in English. By contrast, other studies suggest that LOE papers are less likely to report

Table 1. Guidelines on the inclusion of foreign languages in systematic reviews

Guidance, year of publication	Requalitative/ quantitative SRs	Protocol design	Searching	Screening	Analysis	Reporting
EPPI Center, 2006 [18]	Qualitative	—	—	—	• Map studies by language to scope the available research	—
''Practical guide to systematic reviews'' book, Petticrew et al., 2008 [19]	Qualitative and quantitative	• Investigate languages used by the population or in the region being investigated to inform protocol	—	• Use the English-language abstract, if available • Use online translation tools and available language skills • A professional translator need not translate whole text, could answer some relevant questions to inform decision about inclusion	• To reduce costs, a professional translator could translate only directly relevant sections of text; however, this risks losing important contextual information	—
Center for Reviews and Dissemination, 2009 [20]	Qualitative and quantitative	• Time limits may preclude inclusion of LOE papers, but this may introduce bias. Preliminary searches and sensitivity analysis may help determine likelihood that LOE papers will affect the direction of effect of the SR. • If including LOE papers, strategy for translation must be in the protocol. Any language restrictions must be justified.	• Searches can be carried out in databases that include LOE papers.	—	—	—
PRISMA checklist, 2009 [21]	Qualitative and quantitative	• If language is among exclusion criteria, this should be reported	—	—	—	—
BEME, 2010 [22]	Primarily qualitative	• Decision about whether to use translation services should be made by balancing benefit against cost.	—	• An international review group could have language skills to screen all abstracts.	—	—
Cochrane Handbook, 2011 [23]	Primarily quantitative	• Including LOE papers may significantly increase costs. • Language restrictions should be avoided wherever possible, unless justified.	—	—	—	—

(Continued)

Table 1. Continued

Guidance, year of publication	Requalitative/ quantitative SRs	Protocol design	Searching	Screening	Analysis	Reporting
Campbell Collaboration, 2016 [24], 2019 [25]	Primarily qualitative	• Searches should be designed without language restrictions. • Any restrictions on language in the search strategy should be justified.	—	—	—	
Supplementary Guidance for Cochrane SRs, 2018 [26—31]	Qualitative	—	—	—	—	—

statistically significant results [4,14,15] or positive results [16] compared with those published in English. Studies of trials included in Cochrane reviews and Physiotherapy Evidence Database physiotherapy database found marginally lower methodological quality in LOE papers compared with English papers mainly due to issues with reporting of methods such as blinding and random allocation [4,17].

Whether excluding LOE papers from meta-analyses introduces bias that affects the overall result is unclear and is likely to depend on the research question [3,4,10,11,16]. For epidemiologic and pathology study publications, there is a lack of information about the distribution by language to inform decisions about the importance of including LOE papers. Although there is insufficient evidence to prove that excluding LOE does not introduce bias, it is safer to assume that such exclusion may create bias and to include LOE in SRs.

2. Strategies for incorporating LOE

Translation is the transference of meaning between languages and requires more than direct translation of each word or phrase [32]. Against the benefits of incorporating LOE papers, time and financial resource requirements must be considered during cost-benefit analysis [22]. Even before the costs of translating included LOE papers, searching and screening a larger body of literature to include LOE search terms and databases entails more resources. Furthermore, experience has shown that obtaining full-text LOE papers frequently takes more time than obtaining than English-language papers [3,7,13].

A review of SR guidelines identified that none provide advice on incorporating LOE in all stages of an SR (Table 1). Guidelines suggest that LOE papers should not be excluded without valid justification [19,20,23,33], but most provide little or no guidance on how to address language barriers. Although guidelines are lacking, some published papers propose approaches and strategies. The following discussion of practical and theoretical considerations for LOE in SRs is informed by guidelines and the wider literature.

2.1. Planning and protocol

Whether LOE search strategies will be developed and used, whether LOE databases will be searched, and whether the eligibility criteria will include language restrictions should be decided at the outset and documented in the protocol. To explore the relevance of LOE papers to the review question, one option is to carry out rapid searches of a range of English language and LOE databases without language restrictions, then screen a sample of results to explore the quantity and relevance of LOE papers and the likelihood of LOE papers influencing the review outcomes.

If LOE will be included, the protocol should outline a plan for handling LOE papers at each stage in the review. If it is expected that LOE papers relating to the review question will be particularly pertinent or plentiful or an LOE journal will merit hand searching, forming a review group with relevant language skills should be an early consideration [22].

2.2. Searching

Although some LOE papers are cataloged in major English-language databases, many are not (10% of the included studies in one SR [7]). Most universities provide lists of LOE databases that can be searched; see Fig. 1.

Searching for LOE papers may necessitate or be more effective using LOE search terms and strategy. In Chinese-language databases, variable numbers of results were identified depending on whether the same search was carried out in simplified Chinese, traditional Chinese, or English [34]. Development of LOE search terms may be more complex than directly translating from English; therefore, advice from a native speaker is advised to avoid overly sensitive, restrictively specific, or completely amiss searches.

Database name	Language (Region)	Discipline (notes)
Index Medicus for the Eastern Mediterranean Region	Arabic (Eastern Mediterranean)	Health (supplied by the World Health Organization)
King Saud University Repository	Arabic (Saudi Arabia)	Various
YU-DSpace Repository	Arabic	Various (Includes Jordanian Scientific Journals)
Cnki, China National Knowledge Infrastructure	Chinese (China)	Various (Led by Tsinghua University)
China Online Journals, COJ and Chinese Medical Association Journals	Chinese (China)	Various including health sciences and medicine (Produced by Wanfang Data)
VIP China Science Journal Citation Reports (VJCR)	Chinese (China)	Sciences (Provided by Chongqing VIP Information Co.)
Index Medicus Afro	French (Africa)	Health (Implemented by WHO, collaborating with the Association for Health Information and Libraries in Africa)
Refdoc	French (France)	Various (Pay to access)
Elibrary.ru	Russian (Russia)	Social sciences, humanities, technology, medicine
KoreaMed	Korean (Korea)	Medicine (From the Korean Association of Medical Journal Editors)
Scientific Information Databases (SID)	Persian and English (Iran)	Various, including medical sciences
SciELO	Spanish and Portuguese (Various, mainly South America)	Sciences
LILACs	Spanish and Portuguese (Latin America)	Health sciences
Fuente Academica	Spanish and Portuguese (Latin America, Portugal, Spain)	Various, including medical sciences (Hosted by EBSCO)
Panteleimon	Ukrainian and Russian (Ukraine and Russia)	Medicine and biological sciences

Fig. 1. Examples of languages other than English databases [7].

LOE databases may lack functionality compared with English-language databases, thus demanding more time to carry out searches and download results [13,34]. In one SR, results from KoreaMed and IranMedex could not be downloaded into Mendeley database software; therefore, they were screened separately leading to some results being screened twice [13].

2.3. Screening

Screening is usually undertaken in two stages: abstracts then full texts. Eligibility criteria should be clear and predetermined, and researchers should consider translating the eligibility criteria into LOE to facilitate screening.

Many LOE papers provide an abstract in English, but the translation quality is often poor. Review by expert medical translators of 292 titles translated from Spanish to English identified that 77% contained one or more errors, and for 34%, this significantly impacted on meaning [35]. Variations between LOE texts and published English translations can cause misunderstanding, with awkward phrasing and terminology even leaving some sentences unintelligible [13]. English translations are useful for screening, but there is risk of inaccuracy and reference to the original text is advised if the English is not clear, logical, or coherent.

Where no English-language abstract is provided, screening by members of the review team with sufficient language skills is the preferred approach. Review team members have good understanding of the eligibility criteria, the area of study, and associated terminology. Papers may be identified in a language in which the research team does not have the necessary language skills. In this case, three

main options are available: online tools, strategies for screening LOE, and translation by someone external to the review team.

Many online translation tools such as Microsoft Translator, PROMT-online Translation, and Google Translate are free, although their use may entail significant time resources particularly for formats where cut-and-paste is not possible, for example, older pdfs. The accuracy of such machine translators is increasing, including due to access to an increasing quantity of data (e.g., through social media) and developments in artificial intelligence, as discussed further in the "technological developments" section below. Balk et al. explored the accuracy of Google Translate's English translations of Chinese, French, German, Japanese, and Spanish papers by comparing with translations by native speakers. Google Translate's accuracy was greater for Latin alphabet languages and for certain sections of reports (e.g., description of intervention) [36]. Whether online translation tools will provide sufficiently accurate translation depends on the type of data to be extracted and the language of the abstract.

LOE abstracts may be screened even with limited language skills if key technical terms are known [19,37]. A decision tool comprising questions for nonnative speakers to use to assess an abstract for eligibility was developed by an SR team and trialed, demonstrating high sensitivity (0.96) and acceptable specificity (0.70), thus significantly reducing the need to involve translation support [37].

Informal translation support may be very effective; for example, university colleagues with relevant language skills may have good insight into technical vocabulary [13]. Professional translation is an expensive option, infrequently used at the screening stage; it is discussed in the analysis section.

2.4. Analysis

When LOE papers are included, online translation tools and informal translation are unlikely to meet the demands of analysis. If no review team member has relevant language skills, professional translation is necessary. Factors to consider when employing a translator include his or her understanding of the relevant culture and dialect, knowledge of the topic, technical vocabulary and costs [13]. If a translator with topic-specific expertise cannot be found, time should be committed for discussion with the interpreter to combine linguistic and subject knowledge, interpret the text's meanings, and extract data relevant to the review question.

To minimize costs, translating only relevant sections of included LOE papers is an option, but risks losing contextual information [19]. For a qualitative SR, given the challenges of translating meaning and the evolution of understanding during rereading of papers, it is ideal to involve a translator at multiple points during the review process. In practice, financial limitations usually result in less than adequate translation support. For example, sessions may be held with translators at the start and toward the end of the review, and researchers make notes during these sessions to refer to in between [13].

Theoretical and intellectual challenges include achieving adequate translation across languages, geographies, societies, and cultures [20]. Translation requires not only knowledge of language but also understanding of cultural and social connotations and contextual meanings [32]. Even where the same language is spoken, there may be variation in meanings of words according to culture, such as between British and American [18].

Evaluation of the product of synthesis becomes particularly important where LOE are included because of the challenges of translating meaning and giving adequate weight and visibility to findings from LOE papers. Authors of primary studies should be invited to review the product of synthesis to validate translation of quotations and concepts from the paper [13].

2.5. Write-up

The SR report should detail the extent of identification and inclusion of LOE papers. Quotations from LOE papers can be cited both in the original language and as an English translation. Accurate and clear reporting of the review process and findings is crucial for transparency and confirmability [21]; thus, write-up should detail any challenges related to LOE and translation and any deviations from the protocol for addressing LOE papers with justifications [18].

3. Technological innovation and future considerations

Technology now permits cross-lingual data extraction and analysis, for example, for analyzing news to detect outbreaks and synthesize case findings about rare diseases with prevalence of only a few thousand worldwide [38]. Machine translation has acceptable sensitivity and specificity for simple tasks and is evolving rapidly but is not currently as good as customized translation and is insufficient for more complex in-depth analysis [38]. Software which uses language standardization for clinical coding in multiple languages demonstrates promise but also many challenges, which call for multiple revisions to allow even simple cross-lingual data synthesis [39].

This commentary highlights that searching, screening, and including LOE papers in SRs require investment of time and language skills; financial resources are primarily required to procure these resources. Factors associated with inclusion of LOE papers in SRs include larger SR team, increased range of language skills within the SR team, search strategy that includes contacting experts to identify relevant literature, and increased availability of financial resources [2,6]. Researchers stated that the greatest barriers to

including LOE papers were lack of professional translation services and limited financial resources [2,6].

Removing language restrictions is, in most SRs, worth the effort that it demands. Where an SR has any qualitative aspect or explores a question that is highly relevant to speakers of LOE, including in global health research, LOE papers may bring novel insights and context, which help to elucidate hypotheses or variables that may modify an outcome. Valuable future research could explore the extent and characteristics of LOE papers in different specialties, further develop and validate tools for screening LOE abstracts and provide empirical data on accuracy of online translation tools. Development of machine translation is underway by various companies, and the products will require assessment. Meanwhile, universities could support LOE screening by developing local networks of researchers with relevant language skills. Funders could require a strategy for addressing LOE as part of any funding application and allocate funds accordingly.

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