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## Five common pitfalls in mixed methods systematic reviews – lessons learned

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## **Abstract**

**Objective:** Mixed methods systematic reviews (MMSR) combine quantitative and qualitative evidence within a single review. Since the revision of the JBI Methodology for MMSRs in 2020, there has been an increasing number of reviews published that claim to follow this approach. A preliminary examination of these indicated that authors frequently deviated from the methodology. This paper outlines five common 'pitfalls' associated with undertaking MMSR and provides direction for future reviewers attempting MMSR.

**Methods:** Forward citation tracking identified 17 reviews published since the revision of the JBI mixed methods methodological guidance. Methods used in these reviews were then examined against the JBI methodology to identify deviations.

**Results:** The issues identified related to the rationale for choosing the methodological approach; incorrect synthesis and integration approach chosen to answer the review question/s posed; the exclusion of primary mixed methods studies in the review; the lack of detail regarding the process of data transformation and a lack of 'mixing' of the quantitative and qualitative components.

**Conclusion:** This exercise was undertaken to assist systematic reviewers considering conducting a MMSR as well as MMSR users to identify potential areas where authors tend to deviate from the methodological approach. Based on these findings a series of recommendations are provided.

**Keywords:** mixed methods systematic review, evidence synthesis, mixed methods review methodology, systematic review, mixed methods research, research methodology

**Running title:** Common pitfalls in mixed methods review

## **Background**

Systematic reviews are considered the gold standard in supporting evidence-based practice. By combining quantitative and qualitative evidence together within a single review, the value of a mixed method systematic review (MMSR) is undeniable. In this context, a MMSR integrates the findings of effectiveness (quantitative evidence) and patient, family, staff or other's experiences (qualitative evidence) to enhance the meaningfulness of evidence for decision-makers.(1)

While their usefulness is acknowledged, (2) the process of undertaking a MMSR remains complex and fraught with difficulties. MMSRs follow the same internationally recognised steps of all other types of systematic review, the main difference being the need to integrate the quantitative and qualitative data/evidence.

The JBI Mixed Methods Methodology Group was formed in 2014 and is comprised of an international panel of researchers, clinicians, and academics in the fields of primary evidence generation, evidence synthesis and evidence implementation. The responsibility of this group is to provide methodological guidance for the JBI Collaboration (JBIC) (an international group of self-governing entities that advocate the synthesis, transfer and utilisation of evidence to improve healthcare outcomes) on how to conduct MMSR. In 2020, the JBI Mixed Methods Methodology Group revised its guidance on the conduct of MMSR,(3, 4) leading to an increase in the number of reviews recently published, which claim to follow the JBI approach (i.e. convergent integrated and convergent segregated, Figure 1). A preliminary examination of these reviews indicated that authors frequently deviated from the methodology, highlighting a need to explore the application of our approach. In this paper, we outline common 'pitfalls' associated with undertaking MMSRs, and provide direction for future reviewers attempting MMSRs.

## **Methods**

Forward citation tracking of the two seminal papers(3, 4) published by the JBI Mixed Methods Methodology Group was undertaken in Google Scholar in June 2021 by one of the authors (LL) to locate all published MMSRs that had cited the JBI methodology and reported following its guidance. All published reviews were included, but protocols were excluded. Two of the authors (LL and CS, co-conveners of the JBI Mixed Methods Methodology Group) independently reviewed each of the reviews in full to examine and extract information regarding a) the review question/s, b) the review methods including the framework used (e.g. PICO) for the inclusion/exclusion criteria, type of studies included in the review, approach taken (i.e. whether segregated or integrated), process for data transformation and steps involved in the integration of the quantitative and qualitative evidence, c) if the review questions and methods reported aligned to the JBI approach and d) where methods deviated from the JBI approach. A meeting was held to compare and discuss the results of the two authors which demonstrated 100% agreement on whether the published reviews did or did not follow the JBI methodology. Reviewing the reasons why a review did not follow the JBI guidance allowed key problems to be identified, which were then presented to the rest of the JBI Mixed Methods Methodology Group for further discussion and refinement where a consensus was reached.

## **Findings**

Using a targeted literature searching strategy (described above), 63 references that cited the JBI methodology were found. Of these, 39 were review protocols, three were methodology papers, two were editorials, one was a book chapter and another one was a case study; only 17 were MMSRs. Eight of the 17 published MMSRs that indicated using the JBI methodology did not follow the methods of the JBI approach. Five pitfalls are outlined next, including a description of the issue as well as examples to narratively illustrate the problem identified and how it should be addressed.

### **Is a MMSR the best methodological approach to answer the review question/s?**

Regardless of the type of systematic review undertaken, once a topic is identified, a specific, answerable question/s needs to be developed.(5) The review question/s dictate which methodological approach should be followed and the rationale for selecting a MMSR approach should be clearly described in the introduction section of the review, with both the qualitative and quantitative evidence bases adequately outlined.

The essence of MMSR is dependent on the nature of the review question/s and how the investigation can allow for examination of the level of agreement between quantitative results and qualitative findings (triangulation), identification of discrepancies within the available evidence, determination of whether the quantitative and qualitative data address different aspects of a phenomenon of interest, or one type of data can explore, contextualize, or explain the findings of the other type of data.(3) If none of these elements apply, a MMSR may not be the best approach to follow.

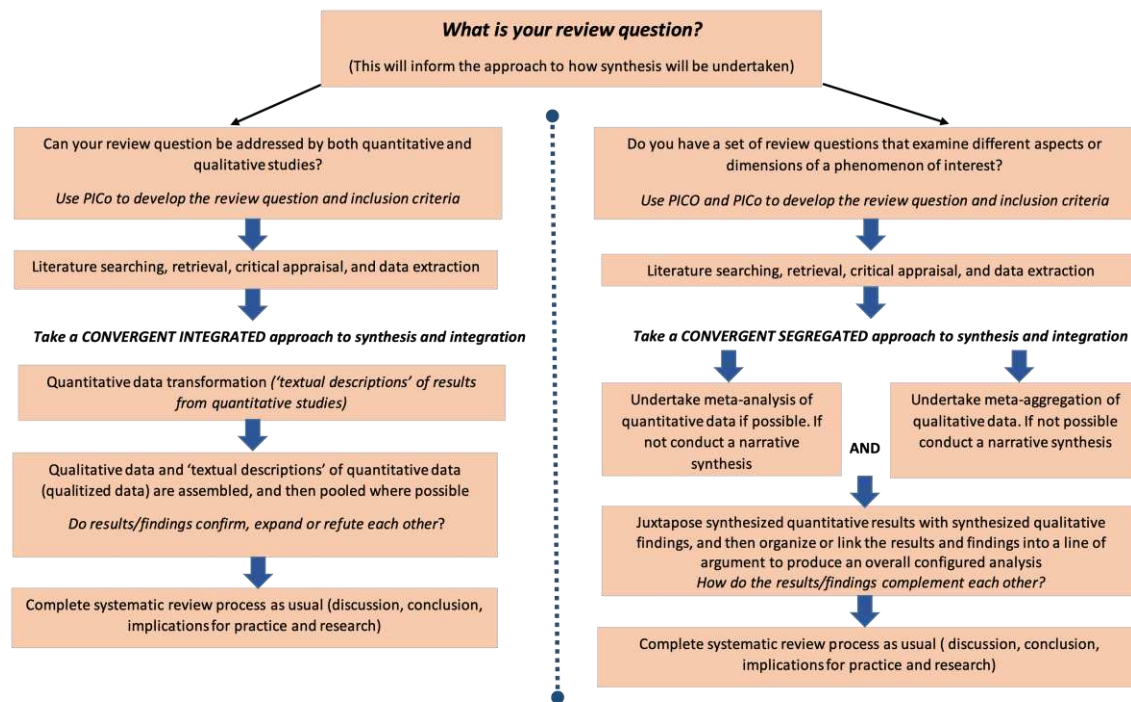
Young et al 2021 sought to evaluate and summarise the findings of relevant qualitative and quantitative studies on genetic counselling and genetic testing in Asian Americans.(6) While it is clear from the aim of the review that the authors wanted to summarise both the quantitative and qualitative evidence bases, it was unclear if their intention was to synthesise and integrate the two perspectives. If a summary of the evidence was the intent, a scoping review would have been a more appropriate approach.(7)

In contrast, Clari et al 2020 (8) investigated mindfulness-based programs for people with chronic obstructive pulmonary disease and while their primary aim was to identify and summarise the qualitative and quantitative evidence (Like Young et al 2021(6)), their additional aim was to aggregate both types of evidence to understand why these programs could be effective and appropriate in this population and under which conditions and modes,(8) thereby justifying the need for a MMSR.

### **Was the right synthesis and integration approach followed to answer the review question/s?**

While the aim of a MMSR is to combine qualitative and quantitative data/evidence together, integration can occur either following the process of data transformation or following independent qualitative and quantitative syntheses. The approach that should be followed depends on the nature of the review question/s posed with the aim/s or questions serving as an anchor.(3, 9-11) (See Figure 1 below). One of the most frequently identified methodological issues in MMSR is the mismatch

between the review question/s and the methodology used to combine quantitative and qualitative data/evidence.



\*PICO (Population, Intervention, Comparison, Outcome); PICo (Population, phenomenon of Interest, Context)

**Figure 1: The JBI Framework for MMSR (adapted from (3))**

Clari et al 2020(8) stated they followed the convergent segregated approach to synthesis and integration which involves separate qualitative and quantitative synthesis followed by integration of the qualitative and quantitative evidence. This approach should be used when the review question/s examine different aspects of a particular phenomenon (e.g., effectiveness and experiences). However, in this review the focus was on the application of mindfulness-based programs in order to describe favorable and unfavorable implementation factors, indicating the question could be addressed by both quantitative and qualitative studies, thus a convergent integrated approach should have been followed.

On the other hand, Rose et al 2021(12) conducted a MMSR to (1) examine the impact of European school food interventions on nutrition, weight status and wellbeing outcomes and (2) explore the experiences and perceptions of adolescents in Europe who have been subject to a school food intervention or national school food policy. Unlike the review by Clari et al 2020(8), this MMSR addressed two different aspects associated with school food interventions, i.e. the effects these interventions have on adolescents, and how adolescents experience or perceive them.(12) Given that the review aimed to address different dimensions of a particular phenomenon of interest (effectiveness *and* experiences of school food interventions), a configurative method of synthesis – i.e., segregated approach, as opposed to aggregation only or the integrated approach, was chosen, which is the appropriate approach for the MMSR.(3)

### **Where is the mixed methods primary research in the MMSR?**

A MMSR combines findings from qualitative, quantitative, and mixed methods primary studies.(13) Although many published MMSRs include mixed methods studies in their review, there are a number of published reviews that do not explicitly state this in their inclusion criteria.(14) This inadvertent or deliberate decision to exclude mixed methods primary studies in a MMSR may be due to the challenges that this type of study design pose to the methods of the systematic review. For example, in some instances, the author's rationale for using a mixed methods design may not match how they combined the methods, which can lead to unnecessary or redundant data that do not address the research question.(14) There are also intrinsic issues with reporting of findings from mixed methods research, specifically the sequence of data analysis and integration of findings.(14) However, given the development of guidelines for reporting of,(15) and critical appraisal tools for mixed methods studies,(16, 17) the inclusion of this type of study in MMSRs is made more feasible and less challenging. Mixed method primary studies are usually 'disaggregated' into quantitative and qualitative data for the purpose of synthesis in a MMSR.(3) This approach of categorising data into quantitative and qualitative is particularly simple and uncomplicated when the mixed methods research is presented as two separate publications, as in the case of a sequential explanatory design where the aim is to use one method to explain the findings of the other.(18) Where mixed methods research findings are presented in a single publication (as in the case of a combined survey and interview data), as long as data from the quantitative or qualitative components could be clearly extracted, 'disaggregation' can occur.

A good example of how mixed methods studies have been included in a MMSR is Clari et al.'s 2020 (8) review on mindfulness-based programs for people with chronic obstructive pulmonary disease. This review included not only primary quantitative and qualitative studies but also mixed methods studies, where each component (quantitative and qualitative) of the mixed methods study was extracted so that they had two streams of data ready to be combined to the data of the primary quantitative and primary qualitative studies.(8)

In contrast, the review by McKenzie et al 2021 looking at barriers and facilitators of physical activity participation for young people and adults with childhood-onset physical disability did not report that primary mixed methods studies were eligible for inclusion, simply stating 'original quantitative or qualitative studies' were of interest.(19) This implies the authors may have potentially missed evidence that could have potentially complemented or strengthened the overall evidence for this systematic review.

### **Transforming the data – where is it and how was it done?**

MMSRs that follow an integrated approach to synthesis require a process known as data transformation which enables integration of the two different types of data. Transformation occurs when one type of data is transformed into another format. This can involve transforming qualitative data into a quantitative format (known as quantitising) or converting quantitative data into a qualitative format (qualitising).(3) JBI guidance advocates data transformation involve 'qualitising', where



quantitative data are converted into 'textual descriptions' such as themes, categories, or narratives, to allow integration with the qualitative data.(3) This approach is recommended as codifying quantitative data is generally considered less error-prone than attributing numerical values to qualitative data.(20)

Gonzalez-Gonzalez et al 2021(21) reported using the JBI approach in their review looking at end of life care preferences in older patients with multi-morbidities. The JBI's approach to data transformation involves 'qualitisation.' However, this review quantified the qualitative data by using 'meta-analysis to convert qualitative data into a numerical format for quantitative synthesis by transforming verbal counts into numbers.' It remains unclear how this process was undertaken as transformed data are simply presented as a range of those who stated their preferences with percentages calculated e.g. Yes (n (%)) = 12-18(60-100).

When transformation is necessary, the specific approach used as well as the process taken should be detailed in the review. Additionally, the original data as well as the transformed data should be provided within the review to allow readers to see the 'before and after' of the process. A good example of this is found in Gray et al's 2021 review on factors influencing physical activity engagement following coronary artery bypass graft surgery, where the authors explicitly detail the qualitisation process including how each member contributed.(22) The authors also provide a table which includes both the qualitative data and the qualited data, demonstrating a transparent approach to data transformation.

### **Lack of integration – where is the mixing of the quantitative and qualitative components?**

A core element of MMSRs is the integration of quantitative evidence and qualitative evidence to create a breadth and depth of understanding and corroboration that answers the systematic review question/s.(2, 10) Despite being a key feature of MMSRs, this process is either lacking or poorly described. Depending on the systematic review question, the integration of these two sets of data or evidence allows reviewers to triangulate or determine discrepancies within the available evidence, and/or use one type of evidence to explore, contextualise, or explain the findings of the other type of evidence.(3)

In a review investigating women's knowledge about prostate cancer presentation and screening practices, Wiafe et al 2021 (23) chose to follow a convergent segregated approach to synthesis and integration, where qualitative and quantitative evidence were integrated together following independent syntheses. This should be done by attempting to answer the five 'trigger' questions indicated in the JBI methodology which include:

- (1) Are the results/findings from individual synthesis supportive or contradictory?
- (2) Does the qualitative evidence explain why the intervention is or is not effective?
- (3) Does the qualitative evidence help explain differences in the direction and size of effect across the included quantitative studies?
- (4) Which aspects of the quantitative evidence are/are not explored in the qualitative studies? And

(5) Which aspects of the qualitative evidence are/are not tested in the quantitative evidence?

While Wiafe et al 2021 present a narrative synthesis of the qualitative and quantitative results, they do not attempt to answer questions 2-5.(23)

Davis et al evaluated the efficacy of telehealth and mobile health interventions in adults with inflammatory bowel disease and explored their benefits and challenges as they are experienced by this population group.(24) While the authors also followed a convergent segregated approach to synthesis and integration like Wiafe et al 2021,(23) these reviewers used the five 'trigger' questions to formally integrate the findings. Addressing these questions allowed the reviewers to make the quantitative and qualitative evidence 'speak' to each other while maintaining their epistemological foundation.

## **Conclusion**

The information above outlines five issues the authors have encountered in reviews that claim to align themselves to the JBI MMSR methodological approach. This is by no means a comprehensive critique of the MMSR literature published since the revised guidance, but simply our collective experiences when reading a sample of MMSR, and the items described here are relevant to all types of MMSRs regardless of methodological approach taken (refer to references 9, 10, 11 for other approaches). A more formal evaluation of adherence to the JBI methodological approach will be undertaken in the future.

This paper is intended to assist systematic reviewers considering conducting a MMSR as well as MMSR users to identify potential areas where authors may deviate from the methodological approach. Based on these findings we would recommend the following:

- Reviewers should ensure the review question/s can be answered by a MMSR, and that they are aligned with the appropriate approach to synthesis and integration.
- The inclusion of primary mixed methods studies should be considered essential and explicitly detailed in the review's inclusion criteria.
- If transformation of data is necessary, the process for doing so is sufficiently described including the specific approach used, the process undertaken and a description of both the original data and the transformed data.
- Regardless of the approach taken, the quantitative and qualitative components should be integrated appropriately. In the case of those reviews following a convergent segregated approach this should entail the five trigger questions being answered following independent synthesis of the qualitative and quantitative data. For the convergent integrated approach, this will involve data transformation allowing the quantitative and qualitative data to be combined.

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