The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers

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Abstract (200 words)

Introduction: Appraising the quality of studies included in systematic reviews combining qualitative, quantitative and mixed methods studies is challenging. To address this challenge, a critical appraisal tool was developed: the Mixed Methods Appraisal Tool (MMAT). The aim of this paper is to present the MMAT.

Development: The MMAT was developed in 2006 and was subject to pilot and interrater reliability testing. A revised new version of the MMAT was developed using the results from usefulness testing as well as a literature review on critical appraisal tools and a modified e-Delphi study with methodological experts to identify the core relevant criteria to include in the MMAT.

Tool description: The MMAT includes quality criteria of five categories of study designs: (a) qualitative, (b) randomized controlled trial, (c) nonrandomized, (d) quantitative descriptive and (e) mixed methods studies. The MMAT focuses on core relevant methodological criteria and has five criteria per category of study design.

Conclusion: The MMAT offers an alternative solution by proposing a unique tool that can appraise the quality of different study designs. Also, by limiting to core criteria, the MMAT can provide a more time efficient appraisal.

Body of text (1000 to 1500 words)
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1. Introduction

This paper is the third of a three-part series on the topic of systematic reviews for information professionals. The first paper provided a historical overview of systematic reviews. The second presented a toolkit for conducting and reporting one emergent type of systematic reviews, mixed studies reviews (MSRs). This third paper will focus on a critical appraisal tool that was developed for use in MSRs.

Despite the advantages of MSRs (see Pluye et al – second paper), several challenges are encountered in this type of review because of the heterogeneity of included study designs. One of them is related to the appraisal of the quality of the included studies in a review. Critical appraisal of included studies is a core step of systematic reviews. It consists in a systematic and careful examination of studies to ensure they are trustworthy, valid and reliable (1, 2). The results of the appraisal can be used for different purposes such as to exclude low quality studies, to describe the quality of included studies, to perform sensitivity analysis, and to nuance the recommendations (3). Currently, there exist more than 500 critical appraisal tools (i.e., checklists including a list of criteria to judge the quality of a study) in the literature (4-6). When conducting a MSR, reviewers have to choose different critical appraisal tools for each type of study design included in their review. This can take a lot of time to search for and learn new tools. To address this challenge, a critical appraisal tool for assessing the quality of quantitative, qualitative and mixed methods studies was developed: the Mixed Methods Appraisal Tool (MMAT) (7). The aim of this paper is to present the MMAT.

2. What is the MMAT?

The MMAT is a critical appraisal tool developed to appraise the methodological quality of empirical studies. Its latest version (version 2018) includes a total of 25 criteria and 2 screening questions (8). The MMAT can appraise five different categories of study designs: (a) qualitative, (b) randomized controlled trial, (c) nonrandomized, (d) quantitative descriptive and (e) mixed methods studies. These categories of designs were chosen because they are the most common design included in MSR. For each category, there are five core criteria, i.e., criteria that are the most relevant to appraise the methodological quality of studies. Each criterion is rated on a scale of yes, no and can't tell.

The MMAT checklist comes with a user guide that provides explanations to help the reviewers judge the criteria in the MMAT. For each category of study design, a table is provided presenting a definition, common designs and approaches, and explanation on the criteria. Also, an algorithm is available to help MMAT users choose the category (or categories) of criteria to use for their review. The algorithm was developed based on several existing algorithms of quantitative study designs (9-15). These algorithms were simplified for the purpose of the MMAT: only the main study designs are presented and study designs of qualitative and mixed methods studies were added.

The MMAT (version 2018) checklist and user guide are available at this website and can be downloaded and used free of charge: http://mixedmethodsappraisaltoolpublic.pbworks.com/.

3. How was the MMAT developed?

The MMAT was developed back in 2006 from a literature review on MSRs and in line with a social constructionist worldview (7). The first version of the MMAT included 15 criteria on four categories of studies (qualitative, quantitative experimental, quantitative observational, and mixed methods). This version was pilot tested during workshops and with four reviewers that used the MMAT to appraise the quality of six studies. This led to suggest a second version in 2011 in which changes were made in some existing criteria and new criteria for assessing nonrandomized studies were added (16). Then, two interrater reliability studies on the MMAT were conducted using respectively 32 and 261 papers (16, 17). These studies showed the need to clarify some criteria in the MMAT, particularly those related to nonrandomized and qualitative studies. To further its development, usefulness testing was performed by interviewing 20 researchers who have used the MMAT in a systematic review or have contacted the developer of the tool for questions or permission to use the tool (18). The results of this study were helpful to identify changes to be made in the MMAT. Also, a literature review on critical appraisal tools was conducted as well as a Delphi study with 73 methodological experts with expertise in qualitative, survey and mixed methods research to identify the most relevant criteria to include in the MMAT. The results of these studies informed the revision of the MMAT and led to develop a third version of the tool (version 2018).

4. How to use the MMAT?

Three main steps can be followed to use the MMAT. First, there are two optional screening questions at the beginning of the tool. Responding ‘No’ or ‘Can’t tell’ to one or both questions might indicate that the paper is not an empirical study, and thus cannot be appraised using the MMAT since it includes methodological criteria.

Second, the MMAT was conceived as a building block and users need to choose the appropriate categories of studies to appraise. To appraise the quality of a qualitative study, one category of criteria should be chosen (i.e., the qualitative category). For a quantitative study, users have to decide which quantitative category of criteria is most appropriate (either RCT, nonrandomized studies, or quantitative descriptive studies). When appraising a mixed methods study, three categories of criteria should be used, i.e., the qualitative category, one of the three quantitative categories, and the mixed methods category. In doing so, the MMAT acknowledges the methodological distinctive characteristics specific to each component used in mixed methods studies (i.e., qualitative, quantitative, and mixed methods) (19).

The third step consists in rating the criteria of the chosen category (or categories). There are three response options: 'Yes' means that the criterion is met, 'No' means that the criterion is not met, and 'Can't tell' means that there is not enough information in the paper for you to judge if the criterion is met or not.

Regarding the scoring of the MMAT, it is advised to provide a detailed presentation of the ratings of each criterion. This may lead to perform a sensitivity analysis (i.e., to consider the quality of studies by contrasting the results of the synthesis). The use of an overall numerical score is discouraged because a single number does not provide information on what aspects of studies are problematic (20).

4. Conclusion

The MMAT can be a useful critical appraisal tool for MSRs since it provides, within a single tool, methodological quality criteria for different study designs. Also, the MMAT focuses on a limited number of core criteria, which can provide a more time efficient quality appraisal. Moreover, it includes specific criteria for mixed methods studies, which is not often found in other tools (21). The criteria in the MMAT are more difficult to judge than in other appraisal tools because they focus on methodological quality and not on reporting quality. Methodological quality criteria are more difficult to interpret because the reviewers need to judge whether the results of a study that are reported can be trustworthy (3, 22).

Up to now, the revision of the MMAT has focused on its content validity and usefulness. Further testing on its validity and reliability will be needed in the future. Also, as evidence develops, modifications might be necessary in the MMAT to keep it up to date with the latest developments.

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6. References

1. Harden A, Gough D. Quality and relevance appraisal. In: Gough D, Oliver S, Thomas J, editors. An introduction to systematic reviews. London: SAGE Publications; 2012. p. 153-78.
2. Burls A. What is critical appraisal? 2nd ed. Newmarket, UK: Hayward Medical Communications; 2009.
3. Hong QN, Pluye P. A conceptual framework for critical appraisal in systematic mixed studies reviews. J Mix Methods Res. 2018;Advance online publication:https://doi.org/10.1177/1558689818770058.
4. Bai A, Shukla VK, Bak G, Wells G. Quality assessment tools project report. Ottawa, ON: Canadian Agency for Drugs and Technologies in Health; 2012.
5. Heyvaert M, Hannes K, Maes B, Onghena P. Critical appraisal of mixed methods studies. J Mix Methods Res. 2013;7(4):302-27.
6. Santiago-Delefosse M, Gavin A, Bruchez C, Roux P, Stephen S. Quality of qualitative research in the health sciences: Analysis of the common criteria present in 58 assessment guidelines by expert users. Soc Sci Med. 2016;148(1):142-51.
7. Pluye P, Gagnon MP, Griffiths F, Johnson-Lafleur J. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in mixed studies reviews. Int J Nurs Stud. 2009;46(4):529-46.
8. Hong QN, Pluye P, Fàbregues S, Bartlett G, Boardman F, Cargo M, et al., inventorsMixed Methods Appraisal Tool (MMAT), version 20182018.
9. Hartling L, Bond K, Harvey K, Santaguida PL, Viswanathan M, Dryden DM. Developing and testing a tool for the classification of study designs in systematic reviews of

interventions and exposures. Rockville, MD: Agency for Healthcare Research and Quality (AHRQ); 2010.
10. Hartling L, Bond K, Santaguida PL, Viswanathan M, Dryden DM. Testing a tool for the classification of study designs in systematic reviews of interventions and exposures showed moderate reliability and low accuracy. J Clin Epidemiol. 2011;64(8):861-71.
11. Seo H-J, Kim SY, Lee YJ, Jang B-H, Park J-E, Sheen S-S, et al. A newly developed tool for classifying study designs in systematic reviews of interventions and exposures showed substantial reliability and validity. J Clin Epidemiol. 2016;70(2):200-5.
12. Zaza S, Wright-De Agüero LK, Briss PA, Truman BI, Hopkins DP. Data collection instrument and procedure for systematic reviews in the guide to community preventive services. Am J Prev Med. 2000;18(Suppl 1):44-74.
13. National Institute for Health Care Excellence. Methods for the development of NICE public health guidance. London: National Institute for Health and Care Excellence (NICE); 2012.
14. West SL, King V, Carey TS, Lohr KN, McKoy N, Sutton SF, et al. Systems to rate the strength of scientific evidence. Rockville, MD: Agency for Healthcare Research and Quality (AHRQ); 2002.
15. Scottish Intercollegiate Guidelines Network. Algorithm for classifying study design for questions of effectiveness Edinburgh: Scottish Intercollegiate Guidelines Network,; 2017 [Available from: http://www.sign.ac.uk/assets/study_design.pdf.
16. Pace R, Pluye P, Bartlett G, Macaulay AC, Salsberg J, Jagosh J, et al. Testing the reliability and efficiency of the pilot Mixed Methods Appraisal Tool (MMAT) for systematic mixed studies review. Int J Nurs Stud. 2012;49(1):47-53.
17. Souto RQ, Khanassov V, Hong QN, Bush PL, Vedel I, Pluye P. Systematic mixed studies reviews: Updating results on the reliability and efficiency of the Mixed Methods Appraisal Tool. Int J Nurs Stud. 2015;52(1):500-1.
18. Hong QN, Gonzalez-Reyes A, Pluye P. Improving the usefulness of a tool for appraising the quality of qualitative, quantitative and mixed methods studies, the Mixed Methods Appraisal Tool (MMAT). J Eval Clin Pract. 2018;24(3):459-67.
19. O'Cathain A. Assessing the quality of mixed methods research: Towards a comprehensive framework. In: Tashakkori A, Teddlie C, editors. Handbook of mixed methods in social and behavioral research. Thousand Oaks, CA: SAGE Publications; 2010. p. 531-55.
20. Crowe M, Sheppard L. A review of critical appraisal tools show they lack rigor: Alternative tool structure is proposed. J Clin Epidemiol. 2011;64(1):79-89.
21. Pluye P. Critical appraisal tools for assessing the methodological quality of qualitative, quantitative and mixed methods studies included in systematic mixed studies reviews. J Eval Clin Pract. 2013;19(4):722.
22. Carroll C, Booth A, Lloyd-Jones M. Should we exclude inadequately reported studies from qualitative systematic reviews? An evaluation of sensitivity analyses in two case study reviews. Qual Health Res. 2012;C22(10):1425-34.