

The Mixed Methods Appraisal Tool

**Assessing the methodological quality of qualitative,
quantitative, and mixed methods research**

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OUTLINE

- Brief Introduction
 - Mixed Methods Research
 - Mixed Studies Review
- The Mixed Methods Appraisal Tool
- Conclusion
- **Questions & Discussion**

MIXED METHODS RESEARCH

INTRODUCTION

Mixed Methods Research

- Combination of quantitative and qualitative methods: Integration of data and/or results (not 2 separate studies)
- A longstanding practice in research, e.g., evaluation studies
- Recently conceptualized in terms of mixed methods studies: First handbook in 2003

INTRODUCTION

Mixed Methods Research

- The purpose of mixing methods:
 - Better understand quantitative results, or
 - Generalize qualitative findings, or
 - Corroborate qualitative and quantitative data.
- Guidance on designing, conducting and reporting mixed methods studies, **but no consensus (yet) on how to appraise the methodological quality of mixed methods**

Mixed Methods: Most Common Combinations

QUANTITATIVE DESIGNS	QUALITATIVE APPROACHES
Randomized controlled studies <ul style="list-style-type: none">• RCT	Case study <ul style="list-style-type: none">• social sciences
Non-randomized studies <ul style="list-style-type: none">• Non-randomized controlled trial• Case-control• Cohort• Cross-sectional analytic study	Ethnography <ul style="list-style-type: none">• anthropology & sociology
Descriptive studies <ul style="list-style-type: none">• Incidence or prevalence survey (no comparison group)• Case series• Case report	Grounded theory <ul style="list-style-type: none">• sociology Narratives <ul style="list-style-type: none">• social sciences Phenomenology <ul style="list-style-type: none">• philosophy & psychology Qualitative description <ul style="list-style-type: none">• Generic qualitative research (in health sciences)

MIXED STUDIES REVIEW

INTRODUCTION

4 ideal-types of literature reviews

- Systematic review of randomized controlled trials (Cochrane & Campbell)
- Systematic review of non-randomized studies
- Systematic review of qualitative research studies (e.g., meta-ethnography)
- **Systematic mixed studies review**

INTRODUCTION

Mixed Studies Review

- Rationale: Better understand complex interventions, programs, and phenomena in health sciences
- A type of literature review in which a reviewer (or a team of reviewers) synthesize primary qualitative, quantitative, and mixed methods research studies

A typology of reviews: Grant & Booth (2009). *Health Information & Libraries Journal*, 26(2), 91-108.

Review of mixed studies reviews in health sciences: Pluye, Gagnon, Griffiths & Johnson-Lafleur (2009). *International Journal of Nursing Studies*, 46(4), 529-546.

INTRODUCTION

REVIEW STEPS	Convenience review	Reproducible review	Systematic review
Question	X	X	X
Identification		X	X
Selection		X	X
Appraisal			X
Synthesis	X	X	X

RESOURCES

- Mixed Methods Research

Creswell & Plano Clark (2010). *Designing and conducting mixed methods research*. London: Sage.

- Mixed Studies Reviews

Pope, Mays & Popay (2007). *Synthesizing quantitative and qualitative health research*. Adelaide: Ramsay Books.

- Mixed Methods Research & Mixed Studies Reviews

In French: Pluye (2012). Les méthodes mixtes. In Ridde & Dagenais (eds.), *Approches et pratiques en évaluation de programme*, Presses de l'Université de Montréal, 125-144.

In English: 2014 issue in *Annual Review of Public Health*

- 2013 Summer School

Mixed Methods Research and Mixed Studies Reviews (1-week)
Department of Social & Preventive Medicine, University of
Lausanne, Switzerland.

Contact: pierre.pluye@mcgill.ca

If time allows during the discussion:

Examples of Mixed Methods Research &
Mixed Studies Reviews

MIXED METHODS APPRAISAL TOOL

PROBLEMS

- **No critical appraisal tool for assessing mixed methods research studies**
- **No tool for assessing diverse study designs included in systematic mixed studies reviews**

E.g., the Critical Appraisal Skills Program (CASP) proposes a different critical appraisal tool for:

- Randomized controlled trials
- Cohort studies
- Case-control studies
- Qualitative research

*CASP, Public Health Resource Unit, National Health Services, UK,
<http://www.phru.nhs.uk/Pages/PHD/CASP.htm>*

Mixed Methods Appraisal Tool (MMAT)

- Designed for systematic mixed studies reviews
- Crowe & Sheppard (2011)
 - Unique and content validated
 - One tool for all common study designs
 - Including mixed methods research designs
- Caution
 - Forthcoming refinement of criteria, content validation, and reliability testing

Crowe, M., & Sheppard, L. (2011). A review of critical appraisal tools. Journal of Clinical Epidemiology, 64(1), 79-89.

**The MMAT 2011 (new) version is available online
Introduction + Checklist + Tutorial + References**

<http://mixedmethodsappraisaltoolpublic.pbworks.com>

Clear origin of items, Content validation & Reliability test:

- Literature review
- Pilot test
- 4 workshops
- Revision with experts

Forthcoming development:

- Criteria refinement (best criteria)
- Content validation (panel)
- Reliability testing (larger sample)
- Concurrent validation (if ...)
- Usability testing

MMAT wiki front page



Montréal-Trudeau vous a x Montréal-Trudeau vous a x PB mixedmethodsappraisalto...
mixedmethodsappraisaltoolpublic.pbworks.com/w/page/24607821/FrontPage

FrontPage

last edited by  Genevieve Gore 5 months, 2 weeks ago  Page history

Welcome to the public wiki 'Mixed Methods Appraisal Tool'

Please invite others to use this workspace. Comments and suggestions can be added at the bottom of each page (free comment box).

Aim of this WIKI: To enable collaborative work for developing a Mixed Methods Appraisal Tool (MMAT).

The MMAT is intended to be used as a checklist for concomitantly appraising and/or describing studies included in systematic mixed studies reviews (reviews including original qualitative, quantitative and mixed methods studies). It is a tool in development, and must be used with caution. The development of the MMAT is supported by a project called 'Content Validity, Usability and Reliability of a Mixed Methods Appraisal Tool (MMAT)' (including workshops, presentations and grant application).

For instance, you may state that the Mixed Methods Appraisal Tool is:

- *Designed for systematic reviews that include qualitative, quantitative and mixed methods studies;*
- *Efficient as it allows to use one tool for concomitantly appraising the most common types of empirical studies;*
- *Addressing the quality of mixed methods studies (appraisal of qualitative, quantitative and mixed methods components);*
- *Based on a literature review, and has been revised using mainly feedback from workshops and a mixed methods framework (content validation);*
- *Pilot tested for reliability.*

[Current version: The 2011 version of the MMAT is available here \(criteria and tutorial\)](#)

Pluye, P., Robert, E., Cargo, M., Bartlett, G., O'Cathain, A., Griffiths, F., Boardman, F., Gagnon, M.P., & Rousseau, M.C. (2011). *Proposal: A mixed methods appraisal tool for systematic mixed studies reviews*. Retrieved on [date] from <http://mixedmethodsappraisaltoolpublic.pbworks.com>. Archived by WebCite® at <http://www.webcitation.org/5tTRTc9yJ>



MMAT introduction

MMAT 2011 criteria and tutorial 2011-06-29[1] (Read-Only) - Microsoft Word

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Mixed Methods Appraisal Tool (MMAT) – Version 2011
For dissemination, application, and feedback: Please contact pierre.pluye@mcgill.ca, Department of Family Medicine, McGill University, Canada.

The MMAT is comprised of two parts (see below): criteria (Part I) and tutorial (Part II). While the content validity and the reliability of the pilot version of the MMAT have been examined, this critical appraisal tool is still in development. Thus, the MMAT must be used with caution, and users' feedback is appreciated. Cite the present version as follows.

Pluye P, Robert E, Cargo M, Bartlett G, O'Cathain A, Griffiths F, Boardman F, Gagnon M P, & Rousseau M C (2011). *Proposal: A mixed methods appraisal tool for systematic mixed studies reviews*. Retrieved on [date] from <http://mixedmethodsappraisaltoolpublic.pbworks.com>. Archived by WebCite[®] at <http://www.webcitation.org/5tTRTc9yJ>

Purpose: The MMAT has been designed for the appraisal stage of complex systematic literature reviews that include qualitative, quantitative and mixed methods studies (mixed studies reviews). The MMAT permits to concomitantly appraise and describe the methodological quality for three methodological domains: mixed, qualitative and quantitative (sub divided into three sub-domains: randomized controlled, non-randomized, and descriptive). Therefore, using the MMAT requires experience or training in these domains. E.g., MMAT users may be helped by a colleague with specific expertise when needed. The MMAT allows the appraisal of most common types of study methodology and design. **For appraising a qualitative study**, use section 1 of the MMAT. **For a quantitative study**, use section 2 or 3 or 4, for randomized controlled, non-randomized, and descriptive studies, respectively. **For a mixed methods study**, use section 1 for appraising the qualitative component, the appropriate section for the quantitative component (2 or 3 or 4), and section 5 for the mixed methods component. For each relevant study selected for a systematic mixed studies review, the methodological quality can then be described using the corresponding criteria. This may lead to exclude studies with lowest quality from the synthesis, or to consider the quality of studies for contrasting their results (e.g., low quality vs. high).

Scoring metrics: For each retained study, an overall quality score may be not informative (in comparison to a descriptive summary using MMAT criteria), but might be calculated using the MMAT. Since there are only a few criteria for each domain, the score can be presented using descriptors such as *, **, ***, and ****. **For qualitative and quantitative studies**, this score can be the number of criteria met divided by four (scores varying from 25% (*) -one criterion met- to 100% (****) -all criteria met-). **For mixed methods research studies**, the premise is that the overall quality of a combination cannot exceed the quality of its weakest component. Thus, the overall quality score is the lowest score of the study components. The score is 25% (*) when $QUAL=1$ or $QUAN=1$ or $MM=0$; it is 50% (**) when $QUAL=2$ or $QUAN=2$ or $MM=1$; it is 75% (***) when $QUAL=3$ or $QUAN=3$ or $MM=2$; and it is 100% (****) when $QUAL=4$ and $QUAN=4$ and $MM=3$ (QUAL being the score of the qualitative component; QUAN the score of the quantitative component; and MM the score of the mixed methods component).

Rationale: There are general criteria for planning, designing and reporting mixed methods research (Creswell and Plano Clark, 2010), but there is no consensus on key specific criteria for appraising the methodological quality of mixed methods studies (O'Cathain, Murphy and Nicholl, 2008). Based on a critical examination of 17 health-related systematic mixed studies reviews, an initial 15-criteria version of MMAT was proposed (Pluye, Gagnon, Griffiths and Johnson-Laflour, 2009). This was pilot tested in 2009. Two raters assessed 29 studies using the pilot MMAT criteria and tutorial (Pace, Pluye, Bartlett, Macaulay et al., 2010). Based on this pilot exercise, it is anticipated that applying MMAT may take on average 15 minutes per study (hence efficient), and that the Intra-Class Correlation might be around 0.8 (hence reliable). The present 2011 revision is based on feedback from four workshops, and a comprehensive framework for assessing the quality of mixed methods research (O'Cathain, 2010).

Conclusion: The MMAT has been designed to appraise the *methodological quality* of the studies retained for a systematic mixed studies review, not the quality of their *reporting* (writing). This distinction is important, as good research may not be 'well' reported. If reviewers want to genuinely assess the former, companion papers and research reports should be collected when some criteria are not met, and authors of the corresponding publications should be contacted for additional information. Collecting additional data is usually necessary to appraise *qualitative research and mixed methods studies*, as there are no uniform standards for reporting study characteristics in these domains (www.equator-network.org), in contrast, e.g., to the CONSORT statement for reporting randomized controlled trials (www.consort-statement.org).

Authors and contributors: Pierre Pluye¹, Marie-Pierre Gagnon², Frances Griffiths³ and Janique Johnson-Laflour¹ proposed an initial version of MMAT criteria (Pluye et al., 2009). Romina Pace¹ and Pierre Pluye¹ led the pilot test. Gillian Bartlett¹, Belinda Nicolau⁴, Robbyn Seller¹, Justin Jagosh¹, Jon Salsberg¹ and Ann Macaulay¹ contributed to the pilot work (Pace et al., 2010). Pierre Pluye¹, Emilie Robert², Margaret Cargo⁵, Alicia O' Cathain¹, Frances Griffiths³, Felicity Boardman³, Marie-Pierre Gagnon², Gillian Bartlett¹, and Marie-Claude Rousseau³ contributed to the present 2011 version.

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MMAT checklist

MMAT 2011 criteria and tutorial 2011-06-29[1] (Read-Only) - Microsoft Word

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PART I. MMAT criteria & one-page template (to be included in appraisal forms)

Types of mixed methods study components or primary studies	Methodological quality criteria (see tutorial for definitions and examples)	Responses			
		Yes	No	Can't tell	Comments
Screening questions (for all types)	<ul style="list-style-type: none"> Are there clear qualitative and quantitative research questions (or objectives*), or a clear mixed methods question (or objective*)? Do the collected data allow address the research question (objective)? E.g., consider whether the follow-up period is long enough for the outcome to occur (for longitudinal studies or study components). 				
	<i>Further appraisal may be not feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.</i>				
1. Qualitative	1.1. Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)?				
	1.2. Is the process for analyzing qualitative data relevant to address the research question (objective)?				
	1.3. Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?				
	1.4. Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?				
2. Quantitative randomized controlled (trials)	2.1. Is there a clear description of the randomization (or an appropriate sequence generation)?				
	2.2. Is there a clear description of the allocation concealment (or blinding when applicable)?				
	2.3. Are there complete outcome data (80% or above)?				
	2.4. Is there low withdrawal drop-out (below 20%)?				
3. Quantitative non-randomized	3.1. Are participants (organizations) recruited in a way that minimizes selection bias?				
	3.2. Are measurements appropriate (clear origin, or validity known, or standard instrument; and absence of contamination between groups when appropriate) regarding the exposure intervention and outcomes?				
	3.3. In the groups being compared (exposed vs. non-exposed; with intervention vs. without; cases vs. controls), are the participants comparable, or do researchers take into account (control for) the difference between these groups?				
	3.4. Are there complete outcome data (80% or above), and, when applicable, an acceptable response rate (60% or above), or an acceptable follow-up rate for cohort studies (depending on the duration of follow-up)?				
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)?				
	4.2. Is the sample representative of the population under study?				
	4.3. Are measurements appropriate (clear origin, or validity known, or standard instrument)?				
	4.4. Is there an acceptable response rate (60% or above)?				
5. Mixed methods	5.1. Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)?				
	5.2. Is the integration of qualitative and quantitative data (or results*) relevant to address the research question (objective)?				
	5.3. Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results*) in a triangulation design?				
<i>Criteria for the qualitative component (1.1 to 1.4), and appropriate criteria for the quantitative component (2.1 to 2.4, or 3.1 to 3.4, or 4.1 to 4.4), must be also applied.</i>					
* These two items are not considered as double-banded items since in mixed methods research, (1) there may be research questions (quantitative research) or research objectives (qualitative research), and (2) data may be integrated, and/or qualitative findings and quantitative results can be integrated.					

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MMAT tutorial: Qualitative studies (examples & explanations)

MMAT 2011 criteria and tutorial 2011-06-29[1] (Read-Only) - Microsoft Word

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PART II. MMAT tutorial

Types of mixed methods study components or primary studies	Methodological quality criteria
<p>1. Qualitative</p> <p>Common types of qualitative research methodology include:</p> <p>A. Ethnography The aim of the study is to describe and interpret the shared cultural behaviour of a group of individuals.</p> <p>B. Phenomenology The study focuses on the subjective experiences and interpretations of a phenomenon encountered by individuals.</p> <p>C. Narrative The study analyzes life experiences of an individual or a group.</p> <p>D. Grounded theory Generation of theory from data in the process of conducting research (data collection occurs first).</p> <p>E. Case study In-depth exploration and/or explanation of issues intrinsic to a particular case. A case can be anything from a decision-making process, to a person, an organization, or a country.</p> <p>F. Qualitative description There is no specific methodology, but a qualitative data collection and analysis, e.g., in-depth interviews or focus groups, and hybrid thematic analysis (inductive and deductive).</p> <p>Key references: Creswell, 1998; Schwandt, 2001; Sandelowski, 2010.</p>	<p>1.1. Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)?</p> <p>E.g., consider whether (a) the selection of the participants is clear, and appropriate to collect relevant and rich data; and (b) reasons why certain potential participants chose not to participate are explained.</p> <p>1.2. Is the process for analyzing qualitative data relevant to address the research question (objective)?</p> <p>E.g., consider whether (a) the method of data collection is clear (in depth interviews and/or group interviews, and/or observations and/or documentary sources); (b) the form of the data is clear (tape recording, video material, and/or field notes for instance); (c) changes are explained when methods are altered during the study; and (d) the qualitative data analysis addresses the question.</p> <p>1.3. Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?</p> <p>E.g., consider whether the study context and how findings relate to the context or characteristics of the context are explained (how findings are influenced by or influence the context). "For example, a researcher wishing to observe care in an acute hospital around the clock may not be able to study more than one hospital. (...) Here, it is essential to take care to describe the context and particulars of the case [the hospital] and to flag up for the reader the similarities and differences between the case and other settings of the same type" (Mays & Pope, 1995).</p> <p>The notion of context may be conceived in different ways depending on the approach (methodology) tradition.</p> <p>1.4. Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?</p> <p>E.g., consider whether (a) researchers critically explain how findings relate to their perspective, role, and interactions with participants (how the research process is influenced by or influences the researcher); (b) researcher's role is influential at all stages (formulation of a research question, data collection, data analysis and interpretation of findings); and (c) researchers explain their reaction to critical events that occurred during the study.</p> <p>The notion of reflexivity may be conceived in different ways depending on the approach (methodology) tradition. E.g., "at a minimum, researchers employing a generic approach [qualitative description] must explicitly identify their disciplinary affiliation, what brought them to the question, and the assumptions they make about the topic of interest" (Cassell, Ray & Mill, 2003, p. 5).</p>

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Other MMAT tutorials:

- Randomized controlled trials
- Non-randomized studies
- Quantitative descriptive studies
- Mixed methods studies

The screenshot displays four overlapping Microsoft Word windows, each showing a different page from a document titled "MMAT 2011 criteria and tutorial 2011-06-29[1] (Read-Only)".

- The top-left window shows "Types of mixed methods study components or primary studies" and "2. Quantitative randomized controlled trials".
- The middle-left window shows "Types of mixed methods study components or primary studies" and "3. Quantitative non-randomized or primary studies".
- The middle-right window shows "Types of mixed methods study components or primary studies" and "4. Quantitative descriptive studies".
- The bottom-most window shows a table with two columns: "Types of mixed methods study components or primary studies" and "Methodological quality criteria".

Types of mixed methods study components or primary studies	Methodological quality criteria
5. Mixed methods Common types of design include: A. Sequential explanatory design The quantitative component is followed by the qualitative. The purpose is to explain quantitative results using qualitative findings. E.g., the quantitative results guide the selection of qualitative data sources and data collection, and the qualitative findings contribute to the interpretation of quantitative results. B. Sequential exploratory design The qualitative component is followed by the quantitative. The purpose is to explore, develop and test an instrument (or taxonomy), or a conceptual framework (or theoretical model). E.g., the qualitative findings inform the quantitative data collection, and the quantitative results allow a generalization of the qualitative findings. C. Triangulation design The qualitative and quantitative components are concomitant. The purpose is to examine the same phenomenon by interpreting qualitative and quantitative results (bringing data analysis together at the interpretation stage), or by integrating qualitative and quantitative datasets (e.g., data on same cases), or by transforming data (e.g., quantification of qualitative data). D. Embedded design The qualitative and quantitative components are concomitant. The purpose is to support a qualitative study with a quantitative sub-study (measures), e.g. the efficacy or the implementation of an intervention based on the views of participants. Key references: Creswell & Plano Clark, 2007; O'Connell, 2010.	S.1. Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)? E.g., the rationale for integrating qualitative and quantitative methods to answer the research question is explained. S.2. Is the integration of qualitative and quantitative data (or results) relevant to address the research question (or objective)? E.g., there is evidence that data gathered by both research methods was brought together to form a complete picture, and answer the research question; authors explain when integration occurred (during the data collection, analysis or and during the interpretation of qualitative and quantitative results); they explain how integration occurred and who participated in this integration. S.3. Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results)?

List of references

MMAT 2011 criteria and tutorial 2011-06-29[1] (Read-Only) - Microsoft Word

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MMAT checklist

Screening questions (for all types of design)

- Are there clear qualitative and quantitative research questions (or objectives), or a clear mixed methods question (or objective)?
- Do the collected data allow address the research question (objective)? E.g., consider whether the follow-up period is long enough for the outcome to occur (for longitudinal studies or study components).

Further appraisal may be not feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions

MMAT checklist

1. Qualitative research studies

1.1. Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)?

1.2. Is the process for analyzing qualitative data relevant to address the research question (objective)?

1.3. Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?

1.4. Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?

MMAT checklist

2. Randomized controlled trials

2.1. Is there a clear description of the randomization (or an appropriate sequence generation)?

2.2. Is there a clear description of the allocation concealment (or blinding when applicable)?

2.3. Are there complete outcome data (80% or above)?

2.4. Is there low withdrawal/drop-out (below 20%)?

MMAT checklist

3. Non-randomized studies

3.1. Are participants (organizations) recruited in a way that minimizes selection bias?

3.2. Are measurements appropriate (clear origin, or validity known, or standard instrument; and absence of contamination between groups when appropriate) regarding the exposure/intervention and outcomes?

3.3. In the groups being compared (exposed vs. non-exposed; with intervention vs. without; cases vs. controls), are the participants comparable, or do researchers take into account (control for) the difference between these groups?

3.4. Are there complete outcome data (80% or above), and, when applicable, an acceptable response rate (60% or above), or an acceptable follow-up rate for cohort studies (depending on the duration of follow-up)?

MMAT checklist

4. Quantitative descriptive studies

4.1. Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)?

4.2. Is the sample representative of the population understudy?

4.3. Are measurements appropriate (clear origin, or validity known, or standard instrument)?

4.4. Is there an acceptable response rate (60% or above)?

MMAT checklist

5. Mixed methods studies

5.1. Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)?

5.2. Is the integration of qualitative and quantitative data (or results*) relevant to address the research question (objective)?

5.3. Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results*) in a triangulation design?

Pilot test of the MMAT

Pace, Pluye et al. 2012

- Systematic mixed studies review on benefits of participatory research (PR), PRAM, McGill
- 19 PR evaluation studies appraised using MMAT by 2 reviewers
- Corresponding to 32 evaluation components (qualitative, quantitative or mixed methods)

Pilot test of the MMAT

Methods

For each criterion (presence = 1 and absence = 0)

- Discussion of responses
- Consensus reached for 19 of 25 disagreements (76.0%)
- Calculation of an inter-reviewer reliability score (kappa)

For each study (global score)

- Consistency between reviewers
 - Calculation of an intra-class correlation (ICC)
 - Two-way mixed model (absolute agreement type)
- Ease-of-use: Mean appraisal time

Pilot test of the MMAT

Encouraging results

- On average: 14 minutes per study
- Consistency of a 'score/study' (tutorial): ICC = 0.963 post-discussion
- Post-discussion inter-rater reliability
 - *With respect to 17 of the 19 scoring criteria (kappa / criterion)*
 - perfect agreement for 13 criteria
 - substantial agreement for 2 criteria
 - moderate agreement for 2 criteria
 - *With regards to the two remaining criteria (1.1 and 3.3)*
 - Consistent score for all studies (kappa not calculated)
 - Inter-rater agreement: 88.9% (1.1) and 83.3% (3.3)

CONCLUSION

How to use the MMAT

- Criteria for a qualitative study (or the qualitative component(s) of a mixed methods study): 1.1 to 1.4
- Appropriate criteria for a quantitative study (or the quantitative component(s) of a mixed methods study): 2.1 to 2.4, or 3.1 to 3.4, or 4.1 to 4.4
- Criteria for a mixed methods study:
 - 1.1 to 1.4
 - 2.1 to 2.4, or 3.1 to 3.4, or 4.1 to 4.4
 - 5.1 to 5.3

Mixed Methods Appraisal Tool (MMAT)

MMAT compelling: No equivalent (yet)

- Review of critical appraisal tools used in systematic mixed studies reviews in health sciences:
 - 11 tools (not validated, not tested for reliability) with different criteria for only 2 types of studies (qualitative vs. quantitative), and no criteria for mixed methods research studies
 - 1 tool with same criteria for all types of design
 - No validated and reliability-tested tool

Mixed Methods Appraisal Tool (MMAT)

MMAT compelling: Complex alternative

Application of different tools (one per type of design), but:

- Diverse tools with diverse issues in terms of validity, reliability, screening, and user manual (e.g., CASP & NICE)
- No consensus on a validated reliability-tested 'gold standard' tool, regardless of the type of study
- Reliability of validated tools is often unknown
- When known, reliability levels may greatly vary
- Validated tools with different general screening criteria
- Some validated, reliability-tested tools without user manual

Thank you

**QUESTIONS
DISCUSSION
EXAMPLES**

EXAMPLES

EXAMPLES

DESIGN TYPES	EXAMPLES OF MIXED METHODS DESIGNS
EXPLANATORY	QUANTITATIVE results, then QUALITATIVE explanation (e.g., quantitative measurement, and qualitative assessment – <i>Reminder study</i>).
EXPLORATORY	QUALITATIVE proposal, then QUANTITATIVE generalization (e.g., tool development – <i>IAM content validation study</i>).
CONVERGENCE	Concomitant QUALITATIVE and QUANTITATIVE assessment (e.g., collection and analysis of qualitative and quantitative data on same cases - <i>mixed methods matrix & clinical vignettes</i>).

EXAMPLES

MIXED STUDIES REVIEW Examples of synthesis	<i>Specialized</i>
1. Convergence quantitative synthesis	
Content analysis	
2. Convergence qualitative synthesis	
Thematic analysis	
<i>Realist synthesis</i>	X
3. Sequential synthesis	
Exploratory (qualitative then quantitative)	
Explanatory (quantitative then qualitative)	

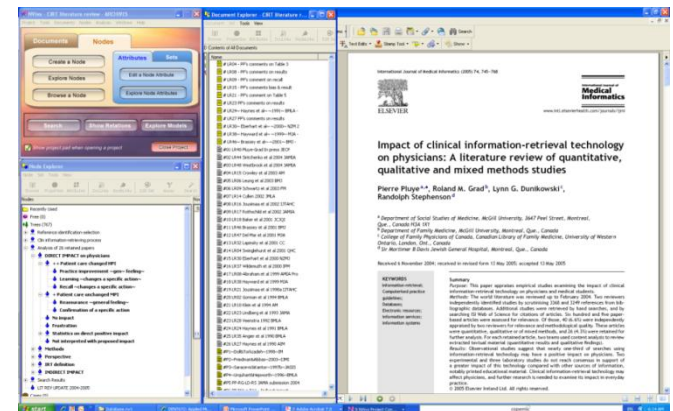
EXAMPLE

MIXED STUDIES REVIEW – Sequential exploratory design

Review question: Impact of databases on physicians?

Step 1: Qualitative synthesis of results of qualitative and quantitative studies (transformation in themes)

- 26 included research studies (diverse types of design)
- Thematic analysis
- Two teams
- Old, revised, new themes
- Consistent 'coding'
- Findings: 7 cognitive impacts



Pluye et al. Internat. Journal of Medical Informatics, 2005, 74, 745-768

EXAMPLE

Table ‘Study / Theme’, e.g., 3rd column: “learning” (n=26)

Table 2 Impact-related passages of 26 retained studies sorted by levels and types of impact

Reference number	Level of impact						Negative impact frustration	Not interpreted
	High positive			Moderate positive		No impact		
	Practice improvement	Learning	Recall	Reassurance	Confirmation			
Pluye and Grad [16]	X	X	X	X	X		X	X
Sintchenko et al. [23]						X		
Westbrook et al. [24]	X							
Crowley et al. [27]					X			X
Leung et al. [36]		X		X				X
Schwartz et al. [17]		X						
Cullen [15]								X
Jousimaa et al. [22]						X		
Rothschild et al. [34]	X	X						X
Baker et al. [67]								X
Brassey et al. [26]						X		X
Del Mar et al. [32]								X
Lapinsky et al. [48]						X		
Swinglehurst et al. [30]				X		X		X
Eberhart-Phillips et al. [68]								X
Wildemuth et al. [25]			X					
Abraham et al. [35]						X		
Hayward et al. [28]		X						X
Jousimaa et al. [21]					X	X		X
Gorman et al. [14]								X
Klein et al. [33]								X
Lindberg et al. [29]	X	X			X	X		X
Veenstra [31]								X
Haynes et al. [69]								X
Angier et al. [19]							X	X
Haynes et al. [20]	X	X			X	X	X	X

^a Not interpreted: passages overlapping types of impact, being unspecified or referring to an indirect impact.

EXAMPLE

Step 2: Quantitative synthesis of results of quantitative studies

Find a common entity across studies, e.g., statistics on physicians' searches for information (any type of impact): The proportion (%) of searches with impact varies from 20% to 82% (n=9)

Table 3 Nine observational studies reporting cognitive impact information with positive impact)

Reference number	Searches with positive impact (%)	Number of searches	Number of participants
Hayward et al. [28]	20	20	9
Jousimaa et al. [21]	36	2036	102
Lindberg et al. [29]	36	1158	552
Swinglehurst et al. [30]	39	60	22
Haynes et al. [20]	41	280	158
Gorman et al. [14]	51	60	48
Veenstra [31]	59	261	30
Schwartz et al. [17]	70	92	3
Crowley et al. [27]	82	625	82

^a CIT: critical incident technique. This technique is known to be reliable and valid,

EXTRA SLIDES

Quality of writing & reporting (not the quality of methods)

Uniform standards or guidance

- Randomised controlled trials: Consolidated Standards of Reporting Trials (CONSORT) www.consort-statement.org
- Non-randomized studies such as cohort and case control studies: STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) www.strobe-statement.org
- Guidance (**but no uniform standard**) for other designs such as quantitative descriptive studies, qualitative research and mixed methods research.

The quality of methods (vs. quality of reporting)

Ideally, authors must be asked additional information (when missing) to truly appraise the quality of methods of quantitative, qualitative and mixed methods research studies.

MIXED METHODS RESEARCH

- **QUALITY OF WRITING & REPORTING** (for authors and editors)
 - Creswell & Plano Clark 2010 Chapter 8
 - O'Cathain et al. JHSRP 2008 = GRAMMS*
- **QUALITY OF METHODS** (for authors and reviewers)
 - Crowe & Sheppard JCE 2011 Review of appraisal tools*
 - Pluye et al. JAN 2009 Mixed methods appraisal tool (MMAT)*
 - Pace Pluye et al. JAN 2012 MMAT reliability and efficiency*
 - MMAT wiki

WRITING MIXED METHODS RESEARCH

Creswell & Plano-Clark, 2010

- Description of QUANT & QUAL & MM components
 - E.g., context, problem, needs, objective, question
- Supporting literature review of all types of studies
- MM design (triangulation, embedded, explorat., explanat.)
- Rigorous data collection and data analysis procedures
- Validation of QUANT & QUAL data and/or results-inferences using appropriate standards for each component
- Integration of QUANT & QUAL data and/or results-inferences
- Interpretation of QUANT & QUAL & MM evidence
- Discussion of QUANT & QUAL & MM limitations
- Expertise in both QUANT & QUAL approaches

REPORTING MIXED METHODS RESEARCH

O'Cathain et al. *J. Health Services Research & Policy*, 2008, 13(2), 92-98.

Good Reporting of A Mixed Methods Study (GRAMMS)

- Justification for using mixed methods
- Description of the design
- Description of each methods (sampling, etc.)
- Integration of data collection/analysis and/or results
- Limitations because of the mixing
- Insights gained from mixing