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Guidance for deciding upon use of primary mixed methods studies in research synthesis: lessons learned in childhood trauma

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ABSTRACT

When reviewing literature, mixed methods studies (MMS) are increasingly retrieved, yet it is unclear how they should be dealt with in a research synthesis. In this article we examine the inclusion of primary MMS in research synthesis, based on experiences with a meta-analysis (MA) and a qualitative evidence synthesis (QES) in childhood trauma. The aim is to offer guidance for reviewers in deciding upon the use of MMS. This review article examines (1) the qualitative component, (2) the quantitative component, as well as (3) the third component of combined yield for use in a MA, a QES or a mixed studies review. A systematic search for MMS in the field of childhood trauma from January 1980 to October 2011 resulted in twelve MMS. Eight qualitative components, six quantitative components and one combined yield could have been included in a MA or QES. Exclusion of qualitative components was due to insufficient quality. Quantitative components were excluded because sample sizes were too small, different outcome measures than ours were used or no adequate statistics were provided. Yield could not be included because it was absent, outside the scope or otherwise unspecified. Finally, we offer flow charts with clear steps to assist researchers in deciding upon the use of components of MMS. Our study demonstrates that MMS can cover new areas and therefore cannot be neglected in a research synthesis.

When reviewing the literature on a specific scientific domain, mixed methods studies (MMS) will increasingly be retrieved (Alise and Teddlie 2010; Molina-Azorín 2011; O’Cathain et al. 2007). The specific features and identity of MMS, including their added value or yield, have been widely discussed from both a philosophical and a methodological point of view (Green 2008; Small 2011; Sommer Harrits 2011). Whether and how MMS should be included in a research synthesis effort is highly relevant and needs to be explored (Heyvaert et al. 2011; Nicolson 2010; Voils et al. 2008). Currently MMS are left out (e.g. Salter et al. 2008) or the qualitative and the quantitative components are pulled out separately and used in research syntheses (e.g. Madsen and Poulsen 2011; Talseth and Gilje 2011; Vervoort et al. 2007). It is

currently unclear how MMS should be dealt with and what they would contribute to the outcomes of a research synthesis. In this article we reflect on the inclusion of primary MMS in a research synthesis, based on experiences with a meta-analysis (MA) and a qualitative evidence synthesis (QES) in the field of childhood trauma. MMS involve the collection, analysis, and combination of both quantitative and qualitative data, in order to answer research questions in a single study (Creswell and Plano Clark 2007). A large diversity exists in mixed methods designs, due to all the possible combinations of theoretical framework, purposes, temporal orientation, emphasis of components, and integration (Heyvaert et al. 2011; Leech and Onwuegbuzie 2009; Spillane et al. 2010). One of the difficulties of MMS is the integration of the quantitative and qualitative component (Bryman 2007; O’Cathain et al. 2007). It is this integration that should lead to the ‘third component’—the combined yield—that is the ultimate aim of mixing the two. Yet oftentimes studies employing mixed methods tend to involve a component design (Caracelli and Greene 1997) where the qualitative and quantitative methods remain distinct and operate parallel (Lewin et al. 2009; O’Cathain et al. 2007, 2008).

When reviewing literature, the type of studies that need to be considered for inclusion is mainly guided by the purpose of the review and the posed review question. The purpose of a QES is usually exploratory and the purpose of a MA is usually confirmatory (Pluye et al. 2009). Rather in black and white terms, questions pertaining to exploration of a phenomenon and understanding of participants’ views as well as implementation issues associated with interventions, can best be addressed with a synthesis of qualitative studies (Paterson 2012; Pope et al. 2007). Questions about associations between variables, heterogeneity and effectiveness are deemed to be answered best with a synthesis of quantitative studies, i.e. a MA (Petticrew and Roberts 2006; Pope et al. 2007). Potentially, the qualitative component and the quantitative component of primary MMS can be extracted and included in a QES and a MA respectively.

A growing interest exists in review approaches that accommodate qualitative as well as quantitative research findings to guide policy and practice in health and social services (Dixon-Woods et al. 2001; Mays et al. 2005; Sandelowski et al. 2006). For such combinations different terms are coined, e.g. mixed methods research synthesis, mixed research synthesis, mixed methods synthesis and mixed studies reviews (Heyvaert et al. 2011; Pluye et al. 2009). Here we choose the term mixed studies reviews (MSRs) to refer to a literature review that concurrently examines primary qualitative, quantitative and mixed methods studies. The term is preferred because it prevents the confusion that only primary MMS are synthesized and the notation encompasses the whole review process and not only the synthesis of the results (Pluye et al. 2009). The potential of MSRs is that the strengths of the different methodologies of available studies are used to better understand complex interventions and issues in certain domains of scientific research (Heyvaert et al. 2011; Pluye et al. 2009; Sandelowski et al. 2006).

Not only can MMS potentially be included in a QES and a MA, they could also be part of a MSR. Yet approaches to MSRs (for an overview see Pluye et al. 2009; Dixon-Woods et al. 2001; Mays et al. 2005) do not necessarily take MMS into account (Pluye et al. 2009). An exception is the approach proposed by the evidence for policy and practice information and Co-ordinating Centre (EPPI-Centre), London, that pulls out the qualitative and quantitative components of MMS and

synthesizes them with qualitative studies and quantitative studies respectively (Harden and Thomas 2005). The three MSR-designs proposed by Sandelowski et al. (2006)—segregated, integrated and contingent—do not explicitly mention MMS. The segregated design implies that the qualitative and quantitative components will have to be extracted and synthesized with respectively qualitative and quantitative studies before integrating them at the review level. In an integrated design any MMS will be processed in their totality together with qualitative and quantitative studies during the whole review process. A contingent design consists of a sequence of review questions posed and can be segregated, integrated or both depending on the series of research questions posed. Specific guidance for inclusion and use of MMS in different types of research synthesis—QES, MA or MSR—is a methodological issue that needs to be better understood and resolved.

Here we address what to do with primary MMS when conducting a separate QES and a separate MA. Notice that we focus on a stand-alone QES and MA, but that such reviews can also be part of MSRs with a segregated design or within an EPPI-approach. As a case, we choose our research project into childhood trauma in which both a QES of qualitative studies and a MA of quantitative studies were conducted. We employed the QES to examine how children experience traumatic events and what they perceive as supportive or hindering in their efforts to work their way back to normal life (van Wesel et al. 2012). Additionally, we conducted a MA to identify risk and protective factors that predict post-traumatic stress disorder (PTSD) in children. For this review we retrieved longitudinal quantitative studies (Alisic et al. 2011). Subsequently we searched for MMS in our project, to develop a technique for deciding upon their inclusion.

We will address the following research questions: (1) What are the considerations for including the separate qualitative and quantitative components of MMS in our QES and MA respectively? and (2) How to decide upon the use of the combined yield of MMS? We will present the lessons that we have learned in flow charts. These are intended to help researchers who retrieve MMS to decide upon their use when conducting separate qualitative or quantitative research syntheses either as stand-alone reviews or as part of MSRs using a segregated design or an EPPI-approach.

1 METHODS

1.1 Search and retrieval mixed methods studies

For the QES in our project we searched for qualitative studies, but also used ‘mixed-method’ as one of the key words because sometimes studies that refer to themselves as MMS turn out to be solely qualitative ones (see Fig. 1). Additionally we explicitly searched for MMS published between January 1980 and October 2011 in several relevant electronic databases, using additional key words concerning mixed methods research, children and trauma (Fig. 1). The results of both these searches are presented in the left branch of Fig. 2. In the right branch of Fig. 2 the search for the longitudinal quantitative studies for the MA is shown; no MMS were found during this search.

[FIG. 1]

[FIG. 2]

For the current study, MMS were included if they used quantitative and qualitative methods in one single study, examined trauma among children below the age of 19 years old and addressed children's experiences of the traumatic event, the processing of the event, or the factors influencing the recovery process. All hits were checked against eligibility criteria by two researchers [HB, MS] and discussed with the third researcher [FvW] in case of disagreement. In Fig. 2 the reasons for exclusion are given. This process led to a total of 12 papers being included (see Table 1 in Supplementary material, Charles et al. 2007; Feeney and Ylvisaker 2003; Gaskell 2007; Haight et al. 2010; Jones and Kafetsios 2002, 2005; London Bocknek et al. 2008; Miller 1996; Miller et al. 2009; Nyamukapa et al. 2011; Ostler et al. 2007; Roberts et al. 2010).

Note that half of the studies did not claim to be using mixed methods to refer to the methods they employed (Boeije et al. (in preparation)). We included two author groups that each produced two different mixed methods articles (Haight et al. 2010; Ostler et al. 2007, and Jones and Kafetsios 2002, 2005). Although it is not self-evident to include papers of the same authors in a research synthesis because of doubling the results, we thought it acceptable in this case. We are exploring the diverse nature of the available mixed methods articles for methodological reasons, and not conducting a research synthesis as such with a focus on integrating results.

1.2 Analysis and quality appraisal of components

For processing the MMS in the field of childhood trauma as a start we used the first three items of the good reporting of a mixed methods study (GRAMMS, O'Cathain et al. 2008) and coded for (1) the study's justification for using mixed methods, (2) the design in terms of purpose, priority and sequence of methods, and (3) the sampling, data collection and data analysis (Boeije et al. (in preparation)).

Next, we examined the separate qualitative and quantitative components. To this end, we extracted the qualitative and the quantitative findings. We appraised the quality of the qualitative component [HB, FvW]. HB is a sociologist and methodologist with extensive experience in qualitative research. FvW is an organizational psychologist and methodologist with much knowledge of statistics and expertise in qualitative research. We used two core criteria that have been proposed for selection purposes: (1) the information provided should support the notion that the research in question was conducted using accepted qualitative methods; and, (2) the reported findings should appear to be well supported by the raw data (participant quotations) (Finfgeld 2003; Salter et al. 2008). We considered qualitative components that lived up to both criteria rigorous enough to be used in a QES (see Table 1).

Two authors [HB, FvW] coded the qualitative findings of the MMS. We had developed a coding scheme consisting of fourteen themes and subthemes with definitions during the analysis of the qualitative studies in the QES (van Wesel et al. 2012). We used this scheme to analyze the qualitative findings of the MMS.

Next, two authors [MS, FvW] examined the quantitative components of the MMS. MS is a developmental psychologist with expertise in quantitative research. The studies in the MA were prospective studies focusing on the determinants for developing PTSD (Alisic et al. 2011), while all MMS were cross-sectional. Therefore, we coded which cross-sectional associations between PTSD and other

variables were examined. We used these analyses to determine whether the quantitative component of the MMS could be used in a MA as we conducted it. We considered quantitative data useful if adequate statistical information for the calculation of effect sizes was provided and if the sample size was sufficient for drawing statistical inferences.

[TABLE 1]

1.3 Integration and yield

We coded in which stage of the study integration between the qualitative and the quantitative component occurred, as well as the extent to which it occurred. We also described any insights gained from mixing or integrating components. This pertains to items 4 and 6 of the GRAMMS (O’Cathain et al. 2008). We searched for specific sections in the articles in which the components were integrated, either during data collection, data-analysis, in the results, or at the stage of interpretation and conclusion. We coded integration as parallel if findings and interpretations were presented separately and not in an alternating fashion, linked if the components were somewhat related for instance only in the discussion, and integrative if the results were fully integrated, for instance reflected in alternate reporting of quantitative and qualitative findings and a discussion of their meaning (Lewin et al. 2009). We also summarized what insights were gained by integrating both components.

2 RESULTS

We will first report how we decided upon the use of the qualitative components of the MMS in our QES. Next, we report our considerations about the use of the quantitative components of the MMS in our MA. Finally, we will address the integration of both components as well as the decision about using the combined yield. All these investigations result in flow charts.

2.1 Inclusion of qualitative components

Of the twelve included studies, eight studies had a qualitative component that could have been used in our QES and four could not have been used (see Table 1). Of the eight studies that could have been used, five (1, 5, 7, 8, 11) provided elaborate qualitative findings addressing children’s experiences and processing of trauma. In study 1 an intensive qualitative component provides knowledge about children’s experiences with a parent with brain injury and the working mechanisms of the family therapy that is offered to these families. In study 5 triangulation is used within the qualitative component, e.g. participant observation, story writing, drawing lifelines, and interviews, to determine adolescent psychological well-being. The information given could have been used in our QES. Study 7 provides valuable data about the children’s experiences with their parents’ incarceration. In study 8 the researchers address the knowledge of young refugee children about the war and atrocities in their home country. In study 11, children of parents who abuse methamphetamine are interviewed about their experiences. The findings, amongst others, address social resources and coping styles that can be used in our QES. Moreover, the study adds the theme “mental health needs” to the coding scheme that we originally developed during the QES.

For the remaining three studies (3, 4, 6) we see different patterns. Two evaluation studies in our sample (3, 4) are characterized by a strong focus on the intervention

itself instead of trauma processing as such. In study 3 summer camps organized for burn victims are evaluated for their effectiveness. Only some information can be found on the children's views on trauma processing, because the qualitative component exclusively focuses on the intervention itself. Still, the study adds the new theme "self-regulation" to the coding scheme. Study 4 involves an evaluation of the impact of an intervention on children's mental health and behavioral functions. Despite presenting a quite elaborate qualitative component, that examines the children's experiences and the possible working mechanisms of the intervention, only a few findings could have been used in our QES as a result of the study's focus on children's participation in the program instead of trauma processing as such. In study 6, drawing on the same data sources as study 5, qualitative methods are used to explain how the context of war and the meaning attached to events influence the psychological effects of war events. This is the only study in our sample in which the qualitative and quantitative findings are reported alternating between themes. However, the qualitative findings can still be extracted and could have been used in our QES. The study adds one new theme to the coding scheme, i.e. "psychological well-being".

Of four mixed methods studies (2, 9, 10, 12) the qualitative components could not have been used in our QES because we appraised the quality of these components as insufficient. Study 2 uses a single-subject reversal design in which two children with brain injury are followed during a program at school and in a follow-up. Although it is clearly reported that qualitative data are collected afterwards and how this is done (quality criterion 1), the quality of the findings that are reported (quality criterion 2) was appraised insufficient for use in our QES. Study 10 aims to discover ingredients for an effective intervention addressing distress among orphans in Zimbabwe.

Although the discussions with the target group could potentially provide knowledge about the experiences of the local group, this is not realized because the quality of the reported results (quality criterion 2) is not sufficient.

In one study (9), qualitative research is used to explore the daily stressors that are important in a war context, i.e. unemployment, poverty and violence. These themes are used to develop a culturally-sensitive measurement instrument for traumatized children. While the study reports how the qualitative research was conducted (quality criterion 1), the results are not reported (quality criterion 2) and as a result this component could not have been used in a QES. In study 12 the qualitative methods used to narrate the victims of hurricane Katrina's voices are not systematically employed (quality criterion 1) and the mental health needs are presented only by some qualitative quotes (quality criterion 2) leading to exclusion on the basis of our quality appraisal.

In sum, we decided that of the twelve MMS in our example, eight qualitative components could have been included in our QES. The outcomes are presented in Table 1.

Generally, the qualitative components provided additional evidence for the existing themes on the coding scheme, but they also resulted in three new themes. This indicates that in our example the MMS covered some new areas compared to the qualitative studies. Of some evaluation studies, only a small part of the qualitative findings, which explicitly focused on the children's views, could have been used in our QES. However, these components can be highly useful in a research synthesis that focuses on the evaluation of such an intervention. To decide upon the inclusion

of the qualitative components of MMS in a QES we propose the left flow chart depicted in Fig. 3.

2.2 Inclusion of quantitative components

Half of the MMS provided quantitative components that could have been used in our MA, and half of them did not (see Table 1). The quantitative components of four studies could have been included directly (5, 6, 7, 9). Study 5 measures adolescent psychological well-being with a self-report symptom checklist. The results of this study fit our MA quite well as the study reports on the relationship between PTSD and predictors, like gender, depression, well-being and anxiety. Additionally, this study reports on the relationship between PTSD and school marks. Study 6 uses the same large quantitative sample of youths as study 5 to determine the relationship between exposure to war events and well-being. Although the quantitative and qualitative results are reported alternately per theme, the quantitative outcomes can be extracted and could have been used in our MA. Study 7 presents relevant correlations between the prevalence of PTSD with socio-emotional functioning, delinquency, support and resilience in children whose parents are incarcerated, the last three of which are new relative to our MA. In study 9 a newly developed questionnaire is tested for its psychometric properties. In assessing the external validity, the new instrument was associated with several mental health outcomes, e.g. a PTSD scale, a depression scale, and an anxiety scale, that pertain to the purposes of our MA. In addition, it was associated with measures of daily stressors, inter-parental conflict, abuse, and deprivation.

In order to be able to use the results of two other studies (8, 12), some calculations would have been required. In study 8, PTSD-symptoms are measured as part of a broader mental health score, which is then correlated with other measures. However, if the author had provided raw quantitative data, it would have been possible to calculate a specific PTSD-score. This score could be correlated with children's anxiety, depression—like in our MA—but also with somatic complaints, aggression, and social withdrawal, as well as with their mothers' somatic and psychological distress. Likewise, based on the raw data about the mental health needs of victims of hurricane Katrina in study 12, we could have calculated effect sizes for the relationship of PTSD with depression, anxiety and somatic complaints, and we could have used these in the MA.

The quantitative components of the remaining six studies could not have been used. In two studies (1, 2) the sample size was too small to allow inferential statistics to be used in a MA. Study 1 is a case-study involving six families and study 2 involves two children.

The outcomes of two studies (3, 10) could not have been used because PTSD was not measured. Study 3 addresses the effect of burn camps on psychological rehabilitation and study 10 examines psychological distress of orphans in Zimbabwe.

Study 4 offers an experimental assessment of the impact of an intervention on children's mental health and behavioral functions. The study has an (indirect) measurement of PTSD, but it is not related to other variables except the grouping variable (treatment versus control group) and therefore could not have been used in our MA.

Finally, study 11 only presents general descriptive statistics of children of parents who abuse methamphetamine, and as a result they could not have been used in the MA.

In sum, we could have included the quantitative components of six out of twelve studies in our MA (see Table 1), although in two studies we would have needed raw data to calculate effect sizes. This is not to say that the other six components that are not valuable for us cannot be used in any research synthesis. For example pre- and post-intervention scores as presented in study 4 could be used in a realist review examining this specific intervention. The quantitative components, like our MA, examined associations of PTSD with demographic variables and internalizing problems such as anxiety and depression. However, the quantitative components also examined associations with a range of other variables. This indicates that in our example the MMS covered some new areas compared to the primary quantitative studies. As a lesson learned we present the steps to make a decision about the inclusion of the quantitative components of MMS in the middle flow chart of Fig. 3.

[FIG. 3]

2.3 Inclusion of yield

Now we will shift our interest from the value of the separate components—quantitative and qualitative—to the use of the third component or yield. As stated before, yield refers to the knowledge that results of combining the qualitative and the quantitative components. Yield can never be used in a MA because of its non-numerical nature. Therefore we examine the potential use of the yield in our QES. In seven studies (1, 2, 4, 8, 10, 11 and 12) both components are neither related in the results section nor in the discussion section. Because of the absence of mixing, no combined yield was produced that could have been used in a QES.

Five studies (3, 5, 6, 7 and 9) produced yield, of which only one would have been suitable for inclusion (6). In study 3 both components are linked. Whereas the quantitative results show no effect of burn camps on the mental health of burn victims, the qualitative results do. This divergence is not systematically examined but merely observed. In this study, new insights are obtained by combining the methods: the children have different criteria for judging effectiveness and overall acceptability of the camps than the outcome measures used in the quantitative research. This insight is outside the scope of our QES because it does not match our review question, but it could for example be used in a research synthesis that explicitly focuses on the evaluation of this intervention.

In study 5, the authors explicitly wish to compare whether adolescent psychological well-being measured with a self-report symptom checklist confirms the findings determined with qualitative methods. The outcomes are compared per participant. In this study, the potential of integrating methods is exploited and leads to the conclusion that the self-report checklist did not discriminate between individuals as reliably as other means. This knowledge could not have been used in our QES because it does not match our review question, but it could be useful in a research synthesis that examines measurement instruments for psychological well-being in young adolescents.

In study 7, results about the prevalence of PTSD, socio-emotional functioning, support and resilience are presented first, followed by elaborate results about the children's experiences with their parents' incarceration. The components are linked in the discussion section, interpreting the findings per theme. The qualitative themes, e.g. support, loss, and resilience, are not systematically compared to the quantitative results but provide a general context for the quantitative findings to be understood.

The yield is unspecified and cannot be extracted as new insights. As a consequence, the yield of study 7 could not have been used in our QES.

In study 9, a questionnaire was developed from which the items originate in qualitative research, thus linking both components. In this study the qualitative data collection facilitates the sequential quantitative data collection and the yield of the integration is the resulting instrument. However, this yield cannot be phrased and extracted as new knowledge that can be synthesized in any way.

Only the combined yield of study 6 could have been used in our QES. The focus of study 6 is to find out how the meaning given to different types of war events moderates the effect between exposure to war events and psychological well-being. Per theme the quantitative and qualitative results are presented and compared exploiting the potential of the design for explanatory purposes. The insights gained by mixing the two could have been used in our QES because they address the meaning given to traumatic events and the processing of trauma.

In sum, in seven studies yield was absent as a result of the methods not having been integrated. In three studies the yield was outside the scope of our QES and in one study the yield could not be specified for use. Only one study provided yield that could have been used in our QES (see Table 1). To decide upon the use of combined yield of MMS in a QES, the right flow chart depicted in Fig. 3 can be used.

3 CONCLUSION AND DISCUSSION

The increasing number of MMS (Alise and Teddlie 2010; Molina-Azorin 2011) will result in a mounting number of them being retrieved when conducting a research synthesis. Our study demonstrates that using MMS in research syntheses might add valuable knowledge covering new areas, but so far little guidance exists for handling these studies. Based on our example case of twelve MMS about childhood trauma, we developed flow charts for each of the components—qualitative, quantitative and yield—to offer guidance when deciding upon the use of MMS in a QES, a MA or a MSR with a segregated design or EPPI-approach. Considerations for the use of each of the components are (a) the possibility to extract the separate findings, (b) the relevance for the review question, and (c) the sufficiency of the quality. With concern to the component of yield, we found it challenging to determine whether the quantitative and qualitative components had been integrated and had resulted in new insights gained that we could extract for the purpose of synthesis.

Our findings can have been influenced by the limitations of our study. One limitation is that we only examined studies in childhood trauma. Although this topic is examined within different scientific disciplines, it is possible that we would have found other findings had we explored a different scientific domain. In this field, our findings suggest that MMS cover some new grounds when compared with qualitative and quantitative studies (Author reference). However, we cannot be sure whether this is because saturation has not yet been reached in qualitative and quantitative articles studying this topic, or whether MMS by nature examine other topics within a certain scientific domain. This question needs further examination. A second limitation is that we examined the use of the mixed methods components for our QES and MA, for which specific review questions were formulated. While this is useful to demonstrate decisions with respect to using MMS, some of the components that we could not use, could possibly be used in syntheses with different objectives. A third limitation is that we included six studies that do not refer to the label mixed methods.

Besides a sometimes arbitrary use of the label, we are of the opinion that studies that employ qualitative and quantitative methods in a single study should provide a rationale for doing so and need to relate both components to a certain degree in order to produce yield.

We could only use all three components of one study in our example. It is precisely a primary mixed methods study such as this one—in which both components are integrated, producing yield—that challenges current synthesis practice most. First, extracting the separate qualitative and quantitative components can be difficult when they are tightly integrated in the different stages of the study, e.g. data collection, data-analysis, and interpretation. Second, in MMS in which components are integrated, the components will be more concise and narrow in scope. These studies specifically aim to compare and integrate well-defined qualitative and quantitative components. The very nature that turns these studies into MMS as they are meant to be, can make the separate components unfit for inclusion in separate research syntheses—be it a QES, a MA or a MSR with a segregated design or EPPI-approach. Third, as a result of the integration, the MMS produce yield which in our experience is hard to extract and formulate as newly gained insights. This reflects the debate about the nature and the quality of the yield in MMS (O’Cathain et al. 2008; Pluye et al. 2009; Bryman et al. 2008).

In our study we focused on the decision to include MMS in a research synthesis. Future research should focus on how to extract and process the findings of MMS in such efforts. Further, we focused on separate components of MMS—qualitative, quantitative, and yield. We have not addressed the use of entire MMS in MSRs with an integrated design (Sandelowski et al. 2006). To date, no ready-to-use methods are available for achieving this aim. Future research is needed to explore ways for dealing with MMS in their totality and in particular with the yield resulting from the mixing.

In our flow charts to help researchers decide upon the use of the components of MMS in their research syntheses, one of the criteria is whether the separate qualitative and quantitative components can be extracted. Extracting the different components seems to be at odds with the essence of MMS, which is the integration of both methods. Our findings confirm earlier studies which reported that most MMS used a component design, i.e. qualitative and quantitative findings are reported separately (O’Cathain et al. 2007, 2008; Lewin et al. 2009). Such a design facilitates extraction of the separate findings and thus enables MMS to be used in a QES, MA, or MSR. In case of a MSR, the EPPI-approach could be used that juxtaposes the outcomes of a QES and a MA at the review level (e.g. Candy et al. 2011; Harden et al. 2009).

The most frequent reasons for not using the quantitative components in our example were the sample size being too small or the selected outcome measures not matching ours, i.e. PTSD. For quantitative components of MMS to be used in research syntheses it is important to use common outcome measures. In case of childhood trauma this could very well be PTSD. When we could not use qualitative components in our QES, this was always due to an insufficient quality assessment. The quality of MMS is debated (Bryman et al. 2008; Sale and Brazil 2004) and initiatives like the mixed methods appraisal tool (Pace et al. 2012), are currently undertaken to concomitantly appraise qualitative, quantitative and mixed methods studies. Promising attempts to offer guidance for reporting MMS exist as well, like

the GRAMMS (O’Cathain et al. 2008). In the near future, these attempts can contribute to an improvement of MMS that will make them more suitable for use in syntheses as well.

Leaving MMS out of synthesis efforts can potentially lead to a loss of evidence and to different synthesis outcomes. It is worthwhile investing in sophisticated synthesis methodology that can accommodate MMS. Recently, attempts have been made to develop frameworks for mixing studies at the review level, like the classification framework for MSRs (Heyvaert et al. 2011) and frameworks for methodological integration (Wiggins 2011). Despite these efforts there is no solution yet for dealing with MMS and in particular with the combined yield at the synthesis level. In this article we have attempted to bridge part of this gap. We have provided decision charts that may aid in deciding whether qualitative, quantitative, and yield components of MMS can be used in a QES, MA, or MSR.

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REFERENCES

- Alise, M.A., Teddlie, C.: A continuation of the paradigm wars? Prevalence rates of methodological approaches across the social/behavioral sciences. *J. Mix. Methods Res.* 4(2), 103–126 (2010)CrossRef
- Alisic, E., Jongmans, M.J., van Wesel, F., Kleber, R.J.: Building child trauma theory from longitudinal studies: a meta-analysis. *Clin. Psychol. Rev.* 31, 736–747 (2011)
- Boeije, H.R., Slagt, M., van Wesel, F.: The contribution of mixed methods research to the field of childhood trauma: a narrative review focused on data integration. *J. Mix. Methods Res.* (in preparation)
- Bryman, A.: Barriers to integrating quantitative and qualitative research. *J. Mix. Methods Res.* 1(1), 8–22 (2007)CrossRef
- Bryman, A., Becker, S., Sempik, J.: Quality criteria for quantitative, qualitative and mixed methods research: a view from social policy. *Int. J. Soc. Res. Method.* 11(4), 261–276 (2008)CrossRef
- Candy, B., King, M., Jones, L., Oliver, S.: Using qualitative synthesis to explore heterogeneity of complex interventions. *BMC Med. Res. Methodol.* 11, 124–132 (2011)CrossRef
- Caracelli, V.J., Greene, J.C.: Crafting mixed-method evaluation designs. In: Greene, J.C., Caracelli, V.J. (eds.) *Advances in Mixed-Method Evaluation: The Challenges and Benefits of Integrating Diverse Paradigms*, pp. 19–32. Jossey-Bass, San Francisco (1997)
- Charles, N., Butera-Prinzi, F., Perlesz, A.: Families living with acquired brain injury: a multiple family group experience. *NeuroRehabilitation* 22, 61–76 (2007)
- Creswell, J.W., Plano Clark, V.L.: *Designing and Conducting Mixed Methods Research*. Sage, Thousand Oaks (2007)
- Dixon-Woods, M., Fitzpatrick, R., Roberts, K.: Including qualitative research in systematic reviews: opportunities and problems. *J. Eval. Clin. Pract.* 7(2), 125–133 (2001)
- Feeney, T.J., Ylvisaker, M.: Context-sensitive behavioral supports for young children with TBI. Short-term effects and long-term outcome. *J. Head. Trauma. Rehabil.* 18(1), 33–51 (2003)CrossRef
- Finfgeld, D.L.: Metasynthesis: the state of the art—so far. *Qual. Health. Res.* 13(7), 893–904 (2003)CrossRef

- Gaskell, S.L.: The challenge of evaluating rehabilitative activity holidays for burn-injured children: qualitative and quantitative outcome data from a Burns Camp over a five-year period. *Dev. Neurohabil.* 10(2), 149–160 (2007)CrossRef
- Green, J.C.: Is mixed methods social inquiry a distinctive methodology? *J. Mix. Methods Res.* 2(7), 7–22 (2008)CrossRef
- Haight, W., Black, J., Sheridan, K.: A mental health intervention for rural, foster children from methamphetamine-involved families: experimental assessment with qualitative elaboration. *Child Youth Serv. Rev.* 32, 1446–1457 (2010)CrossRef
- Harden, A., Brunton, G., Fletcher, A., Oakley, A.: Teenage pregnancy and social disadvantage: systematic review integrating controlled trials and qualitative studies. *Br. Med. J.* 339, b4254 (2009)CrossRef
- Harden, A., Thomas, J.: Methodological issues in combining diverse study types in systematic reviews. *Int. J. Soc. Res. Method.* 8(3), 257–271 (2005)
- Heyvaert, M., Maes, B., Onghena, P.: Mixed methods research synthesis: definition, framework, and potential. *Qual. Quant.* (2011). doi:10.1007/s11135-011-9538-6
- Jones, L., Kafetsios, K.: Assessing adolescent mental health in war-affected societies: the significance of symptoms. *Child Abuse Negl.* 26, 1059–1080 (2002)CrossRef
- Jones, L., Kafetsios, K.: Exposure to political well-being in Bosnian adolescents: a mixed method approach. *Clin. Child Psychol. Psychiatr.* 10(2), 157–176 (2005)CrossRef
- Leech, N.L., Onwuegbuzie, A.J.: A typology of mixed methods research designs. *Qual. Quant.* 43, 265–275 (2009)CrossRef
- Lewin, S., Glenton, C., Oxman, A.D.: Use of qualitative methods alongside randomized controlled trials of complex healthcare interventions: methodological study. *Br. Med. J.* 339, b3496 (2009)CrossRef
- London, Bocknek E., Sanderson, J.: Ambiguous loss and posttraumatic stress in school-age children of prisoners. *J. Child Fam. Stud.* 18, 323–333 (2008)
- Madsen, K., Poulsen, H.S.: Needs for everyday life support for brain tumor patients' relatives: systematic literature review. *Eur. J. Cancer Care* 20, 33–43 (2011)CrossRef
- Mays, N., Pope, C., Popay, J.: Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field. *J. Health Serv. Res. Policy* 10(1), 6–20 (2005)CrossRef
- Miller, K.E.: The effects of state terrorism and exile on indigenous Guatemalan refugee children: a mental health assessment and an analysis of children's narratives. *Child. Dev.* 67, 89–106 (1996)CrossRef
- Miller, K.E., Fernando, G.A., Berger, D.E.: Daily stressors in the lives of Sri Lankan youth: a mixed methods approach to assessment in a context of war and natural disaster. *Intervention* 9(3), 187–203 (2009)CrossRef
- Molina-Azorín, J.F.: The use and added value of mixed methods in management research. *J. Mix. Methods Res.* 5(1), 7–24 (2011)CrossRef
- Nicolson, D.J.: Studies that mix methods and don't identify as "Mixed methods research": a nuisance for systematic reviews and a challenge for mixed methods research. Paper presented at: The 6th International Mixed Methods Conference, Baltimore (2010)
- Nyamukapa, C.A., Gregson, S., Wambe, M., Mushore, P., Lopman, B., Mupambireyi, Z., Nhongo, K., Jukes, M.C.H.: Causes and consequences of psychological distress among orphans in eastern Zimbabwe. *AIDS Care* 22(8), 988–996 (2011)CrossRef
- O'Cathain, A., Murphy, E., Nicholl, J.: Integration and publications as indicators of "yield" from mixed methods studies. *J. Mix. Methods Res.* 1, 147–163 (2007)CrossRef
- O'Cathain, A., Murphy, E., Nicholl, J.: The quality of mixed methods studies in health services research. *J. Health Serv. Res. Policy* 13(2), 92–98 (2008)
- Ostler, T., Haight, W., Black, J., Choi, G., Kingery, L., Sheridan, K.: Case series: mental health needs and perspectives of rural children reared by parents who abuse methamphetamine. *J. Am. Acad. Child Psychiatr.* 46(4), 500–507 (2007)CrossRef
- Pace, R., Pluye, P., Bartlett, G., Macaulay, A.C., Salsberg, J., Jagosh, J., Seller, R.: Testing the reliability and efficiency of the pilot Mixed Methods Appraisal Tool (MMAT) for systematic mixed studies review. *Int. J. Nurs. Stud.* 49, 47–53 (2012)
- Paterson, B.L.: It looks great but how do I know if it fits? An introduction to meta-synthesis research, choosing the right approach. In: Hannes, K., Lockwood, C. (eds.) *Synthesizing Qualitative Research*, pp. 1–20. Wiley-Blackwell, Oxford (2012)CrossRef

- Petticrew, M., Roberts, H.: *Systematic Reviews in the Social Sciences. A Practical Guide*. Blackwell, Oxford (2006)CrossRef
- Pluye, P., Gagnon, M., 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.* 46, 529–546 (2009)CrossRef
- Pope, C., Mays, N., Popay, J.: *Synthesizing Qualitative and Quantitative Health Evidence. A Guide to Methods*. Open University, Berkshire (2007)
- Roberts, Y.H., Mitchell, M.J., Witman, M.M.N., Taffaro, C.: Mental health symptoms in youth affected by hurricane Katrina. *Prof. Psychol. Res. Pract.* 41(1), 10–18 (2010)CrossRef
- Sale, J.E.M., Brazil, K.: A strategy to identify critical appraisal criteria for primary mixed-method studies. *Qual. Quant.* 38, 351–365 (2004)CrossRef
- Salter, K., Hellings, C., Floey, N., Teasell, R.: The experience of living with stroke: a qualitative meta-synthesis. *J. Rehabil. Med.* 40, 595–602 (2008)CrossRef
- Sandelowski, M., Voils, C.I., Barroso, J.: Defining and designing mixed research synthesis studies. *Res. Schools* 13(1), 29–40 (2006)
- Small, M.L.: How to conduct a mixed methods study: recent trends in a rapidly growing literature. *Annu. Rev. Sociol.* 37, 57–86 (2011)CrossRef
- Sommer, Harrits G.: More than method? A discussion of paradigm differences within mixed methods research. *J. Mix. Methods Res.* 5(2), 150–166 (2011)CrossRef
- Spillane, J.P., Stitzel, Pareja A.: Mixing methods in randomized controlled trials (RCTs): validation, contextualization, triangulation, and control. *Educ. Assess. Eval. Account.* 22, 5–28 (2010)CrossRef
- Talseth, A., Gilje, F.L.: Nurses' responses to suicide and suicidal patients: a critical interpretive synthesis. *J. Clin. Nurs.* 20, 1651–1667 (2011)CrossRef
- van Wesel, F., Boeije, H.R., Alisic, E., Drost S.: I'll be working my way back: a qualitative synthesis on the trauma experiences of children. *Psychological trauma: theory, research, practice, and policy.* 4(5), 516–526 (2012)
- Vervoort, S., Borleffs, J.C.C., Hoepelman, A.I.M., Grypdonck, M.H.F.: Adherence in antiretroviral therapy: a review of qualitative studies. *AIDS* 21(3), 271–281 (2007)CrossRef
- Voils, C.I., Sandelowski, M., Barroso, J., Hasselblad, V.: Making sense of qualitative and quantitative findings in mixed research synthesis studies. *Field Method.* 20(1), 3–25 (2008)CrossRef
- Wiggins, B.J.: Confronting the dilemma of mixed methods. *J. Theor. Philos. Psychol.* 31(1), 44–60 (2011)CrossRef

TABLES AND FIGURES

<p>Databases searched</p> <ul style="list-style-type: none"> ▪ <i>For all searches:</i> <ul style="list-style-type: none"> -PsycINFO -PubMed -EMBASE -PILOTS ▪ <i>Extra for qualitative & mixed methods search:</i> <ul style="list-style-type: none"> -CINAHL 	<p>Key words used to search titles, abstracts, key words, heading words and tables of contents:</p> <p style="text-align: right;"><i>•In all searches:</i></p> <p>AND (trauma* or PTSD or "posttraumatic stress") AND (child* or youth or adolescen* or toddler or infant or youngster or kid or teen* or preschool or kindergarten*)</p> <p style="text-align: right;"><i>•Qualitative filter:</i></p> <p>qualitative or mixed-method* or "mixed method*" or "unstructured interview*" or "semistructured interview*" or "semi-structured interview*" or "focus group*" or "grounded theory" or ethnograph* or phenomenologic* or hermeneutic or "life history" or "participant observation"</p> <p style="text-align: right;"><i>•Mixed methods filter:</i></p> <p>mixed-method* or "mixed method*" or (multitrait AND method) or "methodological triangulation" or hybrids or (qualitative AND quantitative)</p> <p style="text-align: right;"><i>Note. * means a wildcard.</i></p>
<p>Journals searched</p> <ul style="list-style-type: none"> ▪ <i>For quantitative studies:</i> <ul style="list-style-type: none"> -Journal of Traumatic Stress -Journal of Child & Adolescent Trauma -Journal of the American Academy of Child and Adolescent Psychiatry ▪ <i>For qualitative and mixed methods studies:</i> <ul style="list-style-type: none"> -Qualitative Research -Journal of Mixed Methods Research -Trauma, Violence and Abuse -Traumatology -Clinical Child Psychology and Psychiatry -Transcultural Psychiatry -Journal of Interpersonal Violence 	

Fig. 1 Databases, key words and journals used in the search of the mixed methods studies

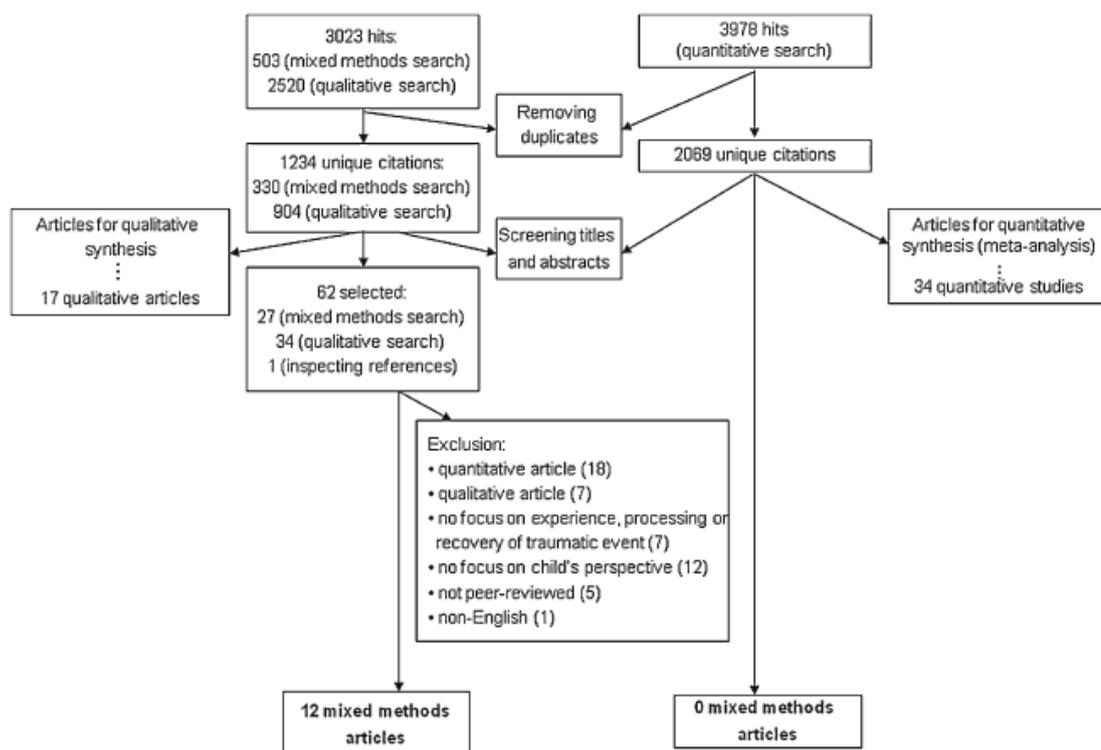


Fig. 2 Retrieval of mixed methods studies and the relationship with the retrieval of the qualitative and quantitative studies in the research project

Table 1 Primary mixed methods studies and their use in qualitative evidence synthesis and meta-analysis

Study no.	Qualitative component could have been used in QES and reason	Quantitative component could have been used in MA and reason	Yield could have been used in QES and reason
1	Yes	No, sample size too small	No, absent
2	No, quality insufficient	No, sample size too small	No, absent
3	Yes	No, no PTSD as outcome measure	No, outside of scope
4	Yes	No, no adequate statistics provided	No, absent
5	Yes	Yes	No, outside of scope
6	Yes	Yes	Yes
7	Yes	Yes	No, unspecified
8	Yes	Yes, but raw data needed	No, absent
9	No, quality insufficient	Yes	No, outside of scope
10	No, quality insufficient	No, no PTSD as outcome measure	No, absent
11	Yes	No, no adequate statistics provided	No, absent
12	No, quality insufficient	Yes, but raw data needed	No, absent

PTSD post traumatic stress disorder, MA meta-analysis, QES qualitative evidence synthesis

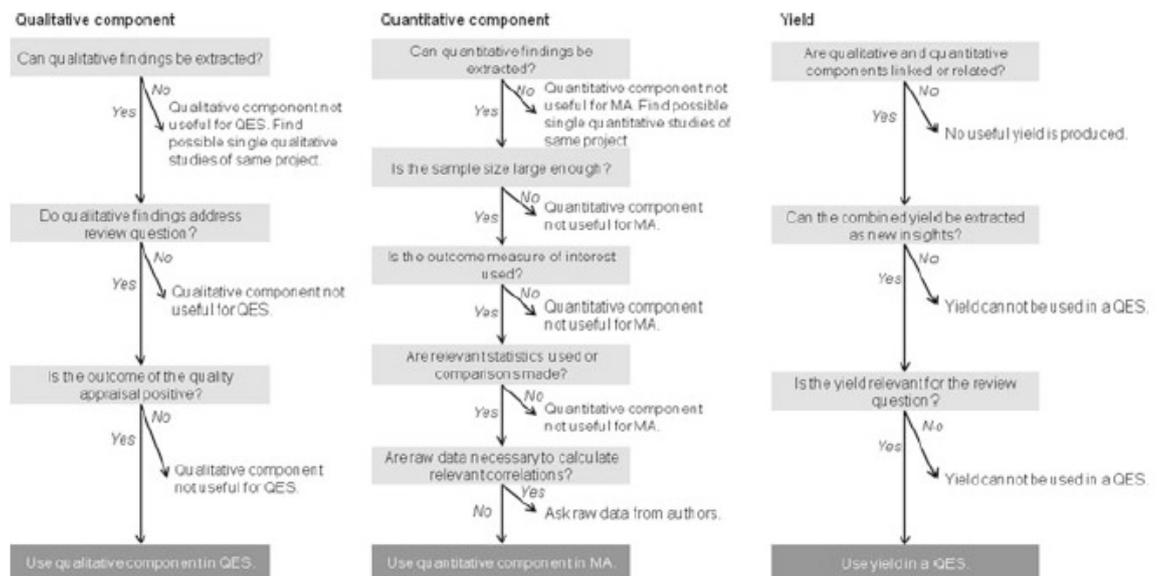


Fig. 3 Flow chart for deciding upon inclusion of qualitative components of mixed methods studies in a qualitative evidence synthesis, of quantitative components of mixed methods studies in a meta-analysis and of combined yield of mixed methods studies in a qualitative evidence synthesis