On the Origin of Hypotheses:

Eliciting meta-analysis, meta-synthesis and experts

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Abstract

Combining qualitative and quantitative research findings can lead to theories on a target phenomenon that overarches insights obtained by only one of these research methods. In this article we use three sources to formulate one integrated theoretical model about factors influencing the development of post-traumatic stress disorder (PTSD) in children who have gone through trauma. The sources are: meta-analysis, meta-synthesis and expert elicitation. The results that emerge from each individual source will be used to formulate a hypothesis. These hypotheses are than integrated leading to an overall hypothesis representing the integrated model. It is concluded that traumatized children's feelings and the interactions with their parents are the most important influential factors in the development of PTSD.

Key words: Elicitation, Children, Meta-analysis, Qualitative synthesis, Trauma.

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Introduction

At the heart of the evidence-based practice are evidence syntheses, or integrations of research findings derived from systematic reviews of empirical research. At the start of the systematic review practice, in the mid-1970s, only quantitative, randomized controlled trial studies were used. This type of review was labeled *meta-analysis* by Glass (1976) and was of particular interest for policy making in health care. As the popularity of this type of research grew, questions arose about whether studies using different methods, such as cross sectional research and qualitative research, should be included in systematic reviews. As these reviews were intended to ``avoid drawing wrong or misleading conclusions, either of the reviews' raw material or from the review process itself'' (Harden & Thomas, 2005), several research groups started to investigate the possibilities of including results from studies using different methods (see, for example, Dixon-Woods, Fitzpatrick, & Roberts, 2001; Harden et al., 2004; Sandelowski, Voils, & Barroso, 2006). The objective of the current study is to explore a method that enables the integration of the findings of studies stemming from different methods.

Studies have shown the added value of combining qualitative evidence with quantitative evidence (synthesis research) in systematic reviews (e.g., Gorecki et al., 2009; Harden, Brunton, Fletcher, & Oakley, 2009; Roberts, Dixon-Woods, Fitzpatrick, Abrams, & Jones, 2002; Thomas et al., 2004). As systematic reviews were originally designed to answer the question: ``What interventions works?'', most synthesis research findings are used for policy making and clinical practice. When qualitative research is added to the review process, adding the views and experiences of the participants being researched, it is also possible to answer the question: ``Why does it work? Under what circumstances? For which groups?'' (Dixon-Woods, Bonas, et al., 2006). Consequently, systematic reviews may also add substantially to the body of scientific knowledge about a target phenomenon (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005; Dixon-Woods, Bonas, et al., 2006; Dixon-Woods, Cavers, et al., 2006). In the current research project, we aim at building such knowledge by constructing a broad theoretical model.

When the review question can best be answered by using both types of evidence, the researchers have to decide on their research method. Sandelowski et al. (2006) propose three designs for what they call ``mixed research synthesis studies.'' These three designs are: a segregated design, an integrated design and a contingent design. The segregated design makes a distinction between qualitative and quantitative research and

analyzes both types separately before the final synthesis. The integrated design minimizes the methodological differences between the studies so findings can be translated into each other. The contingent design focuses on the research question rather than on the differences in methodologies and involves an iterative process, posing different research questions in every iteration. Since the main goal of our study is to construct a broad theory based on multiple sources, for this reason a segregated design is chosen. We assume that the sources will be complementary. We separately analyze quantitative research findings using meta-analysis, and qualitative research findings using meta-synthesis (Paterson, Thorne, Canam, & Jillings, 2001) in order to build a theory for each source. We are also interested in a third source, experts in the field and their theories. For each retrieved theory we will formulate a hypothesis. The final step in this project is to integrate the theories by combining the hypotheses into one overarching theory.

Several methods for synthesizing qualitative and quantitative studies have been proposed. An article by Dixon-Woods et al. (2005) presents several existing approaches that can be modified to handle qualitative as well as quantitative studies. One of the approaches they describe is Bayesian meta-analysis (Roberts et al., 2002), where the prior distribution needed for the Bayesian analysis is based on information from the qualitative studies. We will propose using a modified version of this approach in our research.

The case that is used throughout this article is that of children and trauma. We are interested in which aspects play a role in how children experience a traumatic event and how important these aspects are in predicting the development of a post-traumatic stress disorder (PTSD) in children. To be able to answer this question we need to synthesize the findings per source and deduce a hypothesis. This topic will be explained in the following three sections. Once we have established these hypotheses we will integrate them into one overall hypothesis. Finally, we will propose a strategy to investigate whether the overall hypothesis is more than the sum of its parts. In the discussion, we will reflect on this synthesis endeavor.

Hypotheses

For our review question on how children work their way through trauma, we are interested in finding variables that influence this trauma experience and to what extent these variables can predict the development of PTSD. The appropriate underlying statistical model for such a prediction is that of multiple regression. Therefore, the hypotheses that will be formulated based on the theories that emerge from the three

sources will be in this multiple regression context, and thus about predictors. The hypotheses we will formulate will describe an ordering in the level of predictiveness of the included variables for the development of PTSD. Such hypotheses are called *informative hypotheses* or *(in)equality constrained hypotheses* (Hoijtink, Klugkist, & Boelen, 2008). These hypotheses lie at the heart of the synthesis; they make the translation of qualitative and quantitative findings into each other possible.

Synthesizing quantitative studies

The first source that will be used to formulate a hypothesis is that of meta-analysis. Meta-analysis is a method that evaluates the results of several conceptually equal quantitative studies by means of effect sizes. It is the analysis of the statistics resulting from empirical research, not of the data (Lipsey & Wilson, 2001). Meta-analysis can contribute to policy making as it is the summary of the outcomes of multiple, possibly contradicting, studies. For the same reason, it can also contribute to theory development (Mullen & Rosenthal, 1985; Strube & Hartmann, 1983).

Every meta-analysis starts with determining the research questions and aims. When these are established, a search is performed for articles on the topic. These articles should involve comparable concepts. Next, a coding frame needs to be developed to be able to code the study characteristics. Hereafter, for articles with certain corresponding characteristics, the effect sizes need to be retrieved in such a way that research results can, statistically justified, be translated into each other. Finally, the effect sizes per study will be combined into one statistic, with the possibility to weigh for (un)reliability (sample size) (Hunter, Schmidt, & Jackson, 1982; Lipsey & Wilson, 2001; Mullen & Rosenthal, 1985; Paterson et al., 2001).

As explained previously, in the case of children and trauma the appropriate statistical model is that of multiple regression. When performing a meta-analysis in this statistical context, there are three possible models to choose from: Simple regression (only allows for between study variation), fixed effects meta-regression (allows for within-study variance, ignores between-study variance) and random effects meta-regression (allowing both within-study and between-study variance) (Lipsey & Wilson, 2001). In this study, we use the random effects model.

Meta-analysis for our case

A meta-analysis, reported in Alisic, Jongmans, van Wesel, and Kleber (submitted), was performed on the topic of risk factors and protective factors for PTSD in children in prospective studies. The aim of this meta-analysis was to find factors influencing the development and course of over time PTSD in traumatized children. To be able to investigate this, only studies which used a longitudinal design were included in the analysis. This meta-analysis focussed on the reports of the traumatized children themselves or reports of the parents of the traumatized children about the children. Note that not all studies used the same measurement instrument to assess PTSD (the most frequently used instrument was a version of the UCLA Children's PTSD Reaction Index for DSM-IV, Pynoos, Rodriguez, Steinberg, Stuber, & Frederick, 1998. The same holds for the variables associated with Children's PTSD.

Method.

In order to formulate the first theory, we used the meta-analysis mentioned above. We focussed on the variables in these quantitative studies which had a significant effect size when the results of the included studies were combined. The general search for the articles is described elsewhere Alisic, Jongmans, van Wesel, and Kleber (submitted). The search criteria were: longitudinal, empirical, English-language journal articles published between 1980 and January 1, 2010 which investigated participants who had been traumatized. In addition, the first measurement wave had to take place minimally three months after the traumatic experience, the second measurement wave had to take place at least three months after the traumatic experience, the study had to examine post traumatic symptoms in the participants after three months or more after the traumatic experience, the participants had to be younger than 19 years, and the purpose of the study did not involve investigating the effect of an intervention or the evaluation of a psychological measurement instrument. These criteria were met by 41 studies. All authors were contacted to ask for other (possibly non-significant) results; we received such results from several authors.

      The effect size chosen in the meta-analysis was the product moment correlation coefficient, a univariate effect size which describes the strength of the association between two continuous variables. Seven of the 41 studies did not mention univariate results and could not be included in the analysis, consequently, 34 studies were included in the analysis. Furthermore, we assumed a random effects model, as this model allowed

us to estimate within study variance as well as between study variance. When correlation coefficients were not mentioned in the articles but suitable information such as means and standard deviations, *t*-test statistics, or Chi-squared-test statistics were present, we estimated the effect size using the Lipsey and Wilson calculator (Lipsey & Wilson, 2010). Correlation coefficients for non-significant results were imputed with 0 when there was no expectation about the direction of the association (based on the literature and on the other included articles) or by calculating the correlation coefficient given $p=.50$ and the sample size (Rosenthal, 1991) when there were clear indications of the direction of the association. A meta-analysis was performed for all variables that were mentioned in at least five of the 34 articles, which resulted in 12 variables and their analysis. We performed the analysis on Fisher's Z transformed correlation coefficients (as is recommended in Lipsey & Wilson, 2001) in SPSS 16.0 using the macro by Wilson (2010). For the ease of interpretation, the coefficients were transformed back after analysis.

Findings.

Weighted effect sizes were calculated for variables that were measured in at least five articles. This led to the calculation of weighted effect sizes for*: Gender (sex), Age, Ethnicity, Social economic status (SES), Injury severity (severity), Days at hospital (daysH), Acute stress symptoms (acuteS), Posttraumatic stress symptoms measured one to three months after trauma (PTS (1,3) months), Level of depression (depression), Level of anxiety (anxiety), Heart rate (heartR)* and *Posttraumatic stress symptoms of the parents (parPTS).*

Table 1 shows the variables associated with PTS after three months, the total number of participants (*N*), the number of studies (*k*), the weighted effect size mean and its 95% confidence interval lower bound (95% CI lb) and upper bound (95% CI ub). When 0 lies within the 95% confidence interval, a weighted effect size is not significantly associated with post traumatic stress at least three months after the traumatic event (*PTS (3, → months)*). This is the case for *Age, Ethnicity* and *Social economic status*. When following the guidelines proposed by Cohen (1992), we can conclude that what we found is a weak association between *PTS (3, → months)* and *Gender* and *PTS (3, → months)* and *Injury severity*. We found a medium effect for *Days at the hospital, Heart rate* and *Parents's PTS* with PTS at least three months after the trauma occurred. Finally we found strong effects between *PTS (3, → months)* and *Acute stress symptoms, PTS (1,3) months, Depression* and *Anxiety.*

- Insert Table 1 about here -

Since correlation coefficients are closely related to regression coefficients, we are able to formulate a hypothesis that fits the multiple regression context. Note, however, that we shift from a univariate context in the meta-analysis to a multivariate context for the purpose of the research, which means that weak correlations may vanish in the presence of stronger correlations.

> Hypothesis meta-analysis: *Anxiety, Depression, Acute stress and PTS symptoms one to three months after trauma are the strongest predictors, followed by Heart rate, Days in the hospital and Parents' PTS symptoms as medium predictors. Gender and Injury severity are the weakest predictors for developing PTSD in children.*

Synthesizing qualitative studies

The second source which will be used to generate a hypothesis is a meta-synthesis study, a method developed to synthesize qualitative research studies. Synthesizing qualitative studies is also called meta-study (Paterson et al., 2001) or meta-ethnography (Noblit & Hare, 1988). Meta-synthesis can be defined as ``the bringing together and breaking down of findings, examining them, discovering the essential features, and, in some way, combining phenomena into a translated whole" (Schreiber, Crooks, & Stern, 1997). The goal of meta-synthesis is to produce a new and integrative interpretation of findings that is more substantive than those resulting from individual investigations. This methodology allows for the clarification of concepts and patterns, and results in the refinement of existing states of knowledge and emergent operational models and theories (Sherwood, 1999).

In order to synthesize qualitative studies in a scientific manner, a systematical approach is needed. Such approaches can be found in: Dixon-Woods et al. (2005); Noblit and Hare (1988); Paterson et al. (2001); Pope, Mays, and Popay (2007); Sandelowski and Barroso (2007). They generally consist of the following steps: (1) determine the research goal, research team, topic, population, temporal and methodology, (2) search for relevant articles, (3) read the articles and determine which articles will be included and which will

be excluded, (4) establish the quality of the included articles, (5) synthesize research findings, methodologies and theories, and (6) report on the meta-synthesis findings.

Meta-synthesis for our case

A meta-synthesis for the current case of children and trauma was performed by a team of four researchers. The original synthesis is reported in {Authors (submitted)}. The goal of the study was to investigate the trauma experience of children and how they coped with this. The study focused on the perspectives of the traumatized children themselves and on the parents' perspectives on the children's trauma experience. Articles included in the synthesis used different qualitative methodologies.

Method.

The general search for articles on children and trauma is described elsewhere (Authors, submitted). The search criteria were: only peer-reviewed English-language journal articles, articles published between January 1980 and September 2009, articles involving empirical qualitative studies, articles about children no older than 18 years of age who lived trough a traumatic experience, articles that involved the child's perspective or that of a caregiver about the child's experience.

Thirty-eight articles met the criteria. Three researchers read these articles and carefully discussed and decided upon the final inclusion of the articles. Finally, 17 articles were included in the synthesis. Six articles were excluded because they were untraceable and 15 were excluded because either the topic of the study was not primarily the trauma experience, no empirical research was reported or the research did not involve the children's perspectives.

We modified the broad review question described above to suit the purpose of this study: to identify risk factors and protecting factors for the development of PTSD in children. *Meta-data-analysis* (Paterson et al., 2001) is used as analysis procedure. The analysis consisted of several steps: First, the research findings of five studies were summarized by all three authors (A, B \& C). Second, C and A open-coded the same (self-)summarized five studies using computer software (Maxqda2007) to analyze qualitative data. The codes that emerged from these summaries were compared and after careful consideration one code tree was agreed upon. Third, A and C summarized the remaining articles. Fourth, A coded her own summaries using the established coding tree and then moved on to axial and selective coding (Strauss & Corbin, 1998). This resulted

in a model consisting of three domains. Within each domain several concepts can be found. Fifth, C (who also summarized the remaining articles) used her summaries to check the identified concepts and model. Sixth, for each article the found concepts were compared and discussed by A and C. Much overlap was found and a final model was agreed upon.

The model represents the three domains and a hierarchical structure of the concepts per domain, which gave us insight into the more and less frequently reported concepts (see Figure 1). Note that the type of trauma (i.e. illness, war, parental death) varied among the included articles. In addition to the summarizing of all of the articles, their quality was appraised. This is described elsewhere (Authors, submitted)

- Insert Figure 1 about here -

Findings.

Figure 1 shows the model that emerged from the synthesis. This model describes the hierarchical structure as well as the three domains in which the concepts play a part: *Individual domain*, *Family domain* and *Community domain*. The large, double-lined circles on the top of the figure represent the concepts that were most frequently found in the 17 articles in this synthesis (10-16 articles mentioned them): *Coping, Feelings, Trauma impact, Giving meaning* and *Parenting*. The single-lined circles in the middle represent concepts that appeared in 7-9 articles: *Phases, Current outlook, Identity, Interpersonal relationships* and *Support*. The concepts that were found least frequently (in 1-6 articles) are represented by the smallest, broken-lined circles and can be found in the lower part of the figure: *Negotiation, Normalcy, Growth* and *Culture*. Table 2 briefly describes the concepts and also gives the articles in which the concepts were found.

-       Insert Table 2 about here –

Not all concepts found in this meta-synthesis can be used as predictors of PTSD in children. Only those concepts that involve some form of protective or risk factors for PTSD will be used in the current study. A concept that will not be used as a predictor is *Growth* which represents a possible (positive) outcome of the traumatic experience.

The three levels shown in Figure 1 will be interpreted as weak, medium and strong predictors, as we assume that the concepts most frequently referred to are the

most important ones for the trauma experience of children. This way we are able to formulate four hypotheses describing an order in level of predictiveness of PTSD: one hypothesis for each domain (Individual, Family or Community) and one hypothesis on the entire meta-synthesis.

Hypothesis Individual: *Coping, Feelings, Trauma impact and Giving meaning will be more important predictors for developing PTSD within the individual domain than Phases, Current outlook and Identity, which in turn will be more important predictors than Negotiation and Normalcy.*

Hypothesis Family: *Parenting will be the most important predictor for developing PTSD within the family domain followed by Interpersonal relationships.*

Hypothesis Community: *Support will be the most important predictor for developing PTSD within the community domain followed by Culture.*

Hypothesis meta-synthesis: *Coping, Feelings, Trauma Impact, Giving meaning and Parenting will be the most important predictors for developing PTSD, Negotiation, Normalcy and Culture will be the least important predictors, leaving Phases, Current outlook, Identity, Interpersonal relationships and Support in the middle.*

Eliciting Experts

The third and final source is the expertise of individuals in the proposed field. We can gather this information by eliciting those persons who might have the sought after knowledge. Elicitation is defined as the careful posing of questions in order to obtain information from an interviewee about a selected topic.

Eliciting Experts for our Case
Experts within the field of children and trauma were interviewed in order to gather information about their theories on the topic. The aim of the elicitation interviews was to allow the experts to formulate their theories in terms of the factors influencing the process of children working their way through trauma. The aim was to be able to

construct a hypothesis that represented their theories. Drawing on the network which the second author (B) has in this field, we were able to find and interview experts from different backgrounds such as counselors, health care professionals and scientific researchers, all of whom specialize in children and trauma. We analyzed the qualitative data coming from these interviews in such a way that the aspects influencing the trauma experience of children became clear and that these aspects' levels of predicting PTSD were established.

Method.

We were able to get a purposive sample of six experts. Three of these experts were part-time therapists/counselors and part-time researchers, two were fulltime therapists/counselors and one was a social worker. All of the experts worked within an organization for psychological care; some of these organizations were especially for children. The experts were contacted by e-mail and asked for their participation. After receiving a positive reply, appointments were made for the interviews. Each interview was held at the expert's office and lasted about an hour. The interviews were audio-recorded and transcribed and field notes were made by the interviewer. The interviewer was the first author of this article (A). The interview questions were open-ended but had a fixed structure. The first phase of the interview involved personal acquaintance and introduction about the research purpose (including discussing confidentiality). The second phase involved uncovering aspects that play a role in how a child experiences a traumatic event and building a theoretical model using these aspects. The third phase involved comparing the model we created during our meta-synthesis and meta-analysis with the model created by the expert.

The transcribed interviews and the field notes were analyzed using computer software for qualitative analysis (QSR NVivo 8). Two participants e-mailed additional information after the interviews were held, these e-mails were included in the analysis. The first interview was coded by two of the authors, A and C. These codes were partly the same codes we found in the meta-synthesis and the predictors we found in the meta-analysis. Differences in coding and interpretation were discussed, leading to one code tree acceptable to both authors. The rest of the interviews were coded solely by the first author and only discussed with a second author when in doubt. After this phase of open coding, phases of axial and selective coding followed, resulting in one final model.

The analysis of the expert interviews focused on finding risk and protecting factors for the development of PTSD in children. To be able to integrate all experts' theories but at the same time keeping their accents, we established which factors were mentioned by the most experts and combined this with a weight based upon the beliefs of each individual expert. This way we were able to rank the predictors in a similar manner as we did in the meta-synthesis.

Findings.

Figure 2 displays the results of the analysis of the expert interviews. This figure shows fourteen concepts which can be placed under either *Circumstances* or *Child's world.* Further, the concepts within the Child's world are ordered according to level of distance from the child on the horizontal axis. For example, the *Feelings* a child has are more closely linked to the child's world than the *Support* it receives. The level of importance as weighted by frequency of mentioning by the experts and by their personal beliefs is represented by the vertical ordering. For example, *Safety* is mentioned more frequently than *Trust.*

- Insert Figure 2 about here -

A short description of the fourteen concepts, including quotations of the experts, can be found in Table 3. When considering only the circumstances in which the traumatic event occurred, the *Type of trauma* is thought to be a better predictor of developing PTSD in children than the *Severity* of the trauma. When considering the child's world, the experts indicated that the ability to bring order into the chaos (*Ordering chaos*) of, for example, recognizing and naming their feelings, the presence (or absence) of the *Feelings* themselves, their sense of *Safety* and how their parents handle the situation (*Parenting*) are the most important aspects in developing PTSD. Furthermore, how well they are able to avoid situations, locations and people similar to the trauma (*Avoidance*), how well they are able to *Give meaning* of the traumatic incident, what the *Child's characteristics* are, and the amount of *Support* a child receives are indicated as moderate predictors. Finally, how well a child *Trust*s the people and the world, how they are taken care of during or directly after the trauma (*Care after trauma*), what *Culture* is in the background and how the *Interpersonal relationships* change due to the traumatic event are shown to be the weakest predictors in developing PTSD.

Figure 2 shows the hierarchy of the concepts that resulted from the analysis of the expert interviews. Again, on the basis of this source we formulate one hypothesis for each domain (Circumstances and Child's world) and one overall expert hypothesis.

Hypothesis Circumstances: *Type of trauma will be a more important predictor for developing PTSD than Severity when looking only at the circumstances in which the trauma occurs.*

Hypothesis Child's world: *Ordering chaos, Feelings, Safety and Parenting will be the most important predictors for developing PTSD followed by Avoidance, Making sense, Child characteristics and Support, leaving Trust, Care after trauma, Interpersonal relations and Culture as the least important predictors when looking only at the child's world.*

Hypothesis Experts: *Type of trauma, Ordering chaos, Feelings, Safety and Parenting will be the most important predictors for developing PTSD. Trust, Care after trauma, Interpersonal relations and Culture will be the least important predictors, leaving Avoidance, Making sense, Child characteristics and Support in the middle.*

Synthesizing the three sources

Now that a theoretical model and hypothesis is established for each source, the challenge is how to integrate these findings. Below, we will compare the results of the three sources with reference to the predicting variables/concepts. In this process attention is paid to differences and similarities of the predictors of PTSD development in children themselves, as well as to their difference in predicting value (i.e., effect size). Based on this investigation, we will construct one overall model and its corresponding hypothesis. Furthermore, we will propose an approach to be able to evaluate whether the whole is more than the sum of its parts. This approach will not be put to practice in the current paper, as it involves collecting data concerning all variables in the overall hypothesis.

Similarities and differences

When comparing the predictors of developing PTSD in children found in the meta-analysis, the meta-synthesis and the expert interviews, we find that they all mention *Feelings* and *Parenting*. In the meta-analysis these feelings are operationalized as depression and anxiety scores, in the meta-synthesis these feelings involve fear, anxiety, helplessness, loneliness and guilt and in the experts interviews these feelings involve guilt, shame, loneliness, fear and anger. The aspect *Parenting* is the same in the expert interviews and in the meta-synthesis. In the meta-analysis, this concept is operationalized by the variable PTS parent.

The meta-analysis and the expert interviews both mention *Injury severity* and *Acute reactions* as predictors. The concept *Injury severity* is the same in both sources. However, *Acute reactions* as the experts pointed them out denote the care or the level of consolation a child receives during or directly after the traumatic event occurred, whereas in the meta-analysis it denotes the acute stress symptoms. The similarity lies in the fact that the child's reaction shortly after or during the trauma is an indicator for developing PTSD.

The meta-synthesis and the expert interviews both mention *Child characteristics* (including age), *Coping, Giving meaning, Support, Interpersonal relationships* and *Culture* as predictors. The meaning of the last five predictors is equal for both sources. The *child characteristics* in the meta-synthesis involve identity, self-esteem and self-awareness, while the child characteristics for the experts also involve temperament, cognitive abilities, social abilities and level of development. Note that other than *Feelings* and *Parenting* the meta-analysis and the meta-synthesis do not share any other predictors.

In addition to these commonly shared factors, each source exposes its unique predictors. The meta-analysis gives *Gender, Heart rat}, Days in hospital* and *PTS three months before up to three months after trauma* as unique predictors. The meta-synthesis gives *Trauma impact, Normalcy, Current outlook, Negotiation* and *Growth* as unique predictors. Finally, the experts are the only ones mentioning *Type of trauma, Ordering chaos, Safety* and *Trust* as predictors.

For the predictors we found in more than one source, the predicting value (effect size) differed. For instance, *Age* was exposed as a non-significant predictor in the meta-analysis, but as a medium predictor in both the meta-synthesis and the interviews with the experts. A similar effect was found for *Parenting*, which was a medium predictor in the meta-analysis, but a large predictor in the other two sources. Also, an interesting finding of this sort is that *Giving meaning* is denoted as a large predictor in the meta-synthesis, but

as a medium predictor by the experts. We will take these differences into account by formulating three competing overall hypotheses.

There are various ways of integrating the hypotheses based on in how many sources a predictor appears and the effect size(s) of that predictor. We constructed three competing overall hypotheses based on three ways of weighing the characteristics of the predictors (number of sources and effect size(s)). In the first hypothesis, the ordering is established according to in how many sources the predictor appears and within each count (appeared in 3,2 or 1 source) they are ordered by their mean effect size:

Overall hypothesis 1: *Feelings will be the most important predictor, followed by Parenting, as both predictors are present in all three sources. The next predictors will be those that are mentioned in two of the sources, of which Making sense and Coping are the best predictors, followed by Acute reactions, Child characteristics and Support, which are followed by Interpersonal relations and Injury severity and finally by Culture. The least important predictors, mentioned in only one of the sources are Type of trauma, Safety, Ordering chaos, Trauma impact and PTS three months before up to three months after trauma, followed by Current outlook, Heart rate and Days in hospital. Finally, the least important predictors are Trust, Negotiation, Normalcy and Gender.*

In the second hypothesis the ordering is according to the largest effect size given and within each level (s, m, l) by their mean effect size and the number of sources a predictor appears in:

Overall hypothesis 2: *Feelings will be the most important predictor, followed by Parenting, as both predictors have large effect sizes and are present in all three sources. They are followed by predictors with a large effect size and that are mentioned in two of the sources: Making sense, Coping and Acute reactions. Next come the single source predictors with a large effect size: Type of trauma, Safety, Ordering chaos, Trauma impact and PTS three months before up to three months after trauma. These large effect size predictors are followed by the medium ones mentioned in two sources: Child characteristics, Support, Interpersonal relations and Injury severity which are followed by the ones present in only one source: Current outlook, Heart rate and Days in hospital. Finally the least important predictor mentioned in two sources is Culture, followed by the ones present in one source: Trust, Negotiation, Normalcy and Gender.*

In the third hypothesis the ordering is according to mean effect size:

Overall hypothesis 3: *The best predictors will be: Feelings, Type of trauma, Safety, Ordering chaos, Trauma impact and PTS three months before up to three months after trauma, as they all have a large mean effect size. These predictors are followed by Parenting, which is followed by Making sense and Coping, all having a mean effect size between large and medium. They are followed by the predictors with a medium mean effect size: Child characteristics, Support, Acute reactions, Current outlook, Heart rate and Days in hospital. Then come the predictors with a medium to small mean effect size: Interpersonal relations and Injury severity. Finally, the predictors with a small mean effect size are the least important predictors: Culture, Trust, Negotiation, Normalcy and Gender.*

In the next section, we will describe an approach of how to analyze the three overall hypotheses in order to find out which one is the most likely to be true.

Analyzing the Hypotheses

At this point we have established several hypotheses on which variables best predict the development of PTSD in children. The current investigation ends here, however, we propose a direction for further research.

Now that the hypotheses are formulated we should try to find out which hypothesis is the most likely to be correct. We suggest taking a three-step procedure to do so: 1) collect data on all variables in the overall hypotheses, 2) evaluate which overall hypothesis is the most likely, 3) evaluate whether the best overall hypothesis is more likely than the three single-source hypotheses. Using this procedure, two questions are answered; In (2) the question ``What predictors are the most important for the development of PTSD in children?" is answered and in (3) the question ``Is the whole more than the sum of its parts?" or stated differently, ``Does integrating evidence from different sources have a surplus value?" is answered.

The six (in)equality constrained hypotheses stated above can be evaluated using a Bayesian model selection procedure especially developed for this purpose (Hoijtink et al., 2008). The technique behind this procedure for multivariate models is explained in an article by Mulder, Hoijtink, and Klugkist (2009) and the software used for the analysis of

Inequality Constrained Multivariate Models is described in Mulder, Leeuw, and Hoijtink (submitted) and can be downloaded from: http://tinyurl.com/informativehypotheses.

Results from this analysis are expressed in a figure for the model selection criterion, a Bayes factor and a figure for the posterior model probability (PMP) per hypothesis. A Bayes factor is calculated for each hypothesis compared to another hypothesis and can be interpreted as the amount of support for one hypothesis compared to another hypothesis. The model with the highest Bayes factor is the best model in terms of model fit and model complexity. A PMP is calculated from the Bayes factors and can be interpreted as an indication of which hypothesis is the most likely within the proposed set on a 0 to 1 scale.

Discussion

In this research project we investigated how to integrate evidence from different sources in order to form a more robust theory on how children work their way through trauma. We found that some parts of the single source hypotheses overlap while other parts are source-unique. In addition, the predictors shared by different sources may differ in terms of their level of importance, their effect size. Both characteristics - in how many sources a predictor appeared and the effect size per source - should be taken into account when integrating the single source hypotheses into an overall hypothesis.

We found that each source reveals a distinctive perspective on the same phenomenon. The variables from the meta-analysis, on the one hand, are all concepts that are measurable (countable). Information from this source relies heavily on questionnaires, such as depression inventories, and characteristics that are easily measured, such as age and the number of days a child stayed in the hospital. It focusses very little on the context in which the phenomenon occurs or how it was experienced. The variables revealed by the meta-synthesis, on the other hand, are concepts that are rather large and relatively vague. For instance, `Parenting' is a concept that involves much more than the parent-child relationship alone; it also involves parents' reactions to the traumatic event and parent characteristics. An advantage of the concepts found in the meta-synthesis is that they take the context of the phenomenon into consideration and that they focus on the experiences of the children. Finally, the experts mention variables from both meta-analysis and meta-synthesis. It seems that they integrate these units into one theory and add a few variables of their own. However, the experts have their own

unique perspective as their focus is practical. They want to know how to help the children cope with the trauma and in order to do so, they need to know how a child develops PTSD. It seems reasonable to assume that when these different perspectives are integrated, we get a more robust, broader and deeper understanding of the target phenomenon.

This synthesis endeavor is only one way of integrating evidence from different sources. However, during the project we discovered that there are many ways of doing so. We decided to integrate research findings on the meta or review level, as Harden et al. (2009); Roberts et al. (2002); Thomas et al. (2004) have done before us. However, integrating research findings using different methodologies can also be done on the level of the primary studies, i.e., mixed studies reviews as Sandelowski et al. (2006) have proposed. As the methods of integrating qualitative and quantitative evidence are diverse, developing systematic and transparent ways of doing so deserve more research in the future.

Conclusion

In this synthesis project we used hypotheses in order to integrate research findings from different evidence sources. We constructed these hypotheses by eliciting theories that emerged from a meta-analysis, a meta-synthesis and from expert interviews. By integrating the hypotheses we were able to investigate a broad spectrum of scientific research on how children work their way through a traumatic event. We conclude that integrating qualitative and quantitative studies brings about a critical perspective on a target phenomenon and a gain in the development of general scientific theories.

References

References marked with an asterisk indicate studies included in the meta-analysis or in the qualitative synthesis.

*Ahmad, A. (1992). Symptoms of posttraumatic stress disorder among displaced Kurdish children in Iraq - victims of a man-made disaster after the Gulf War. *Nordic Journal of Psychiatry*, *46*, 315-319.

*Ahmad, A., Mohamad, H. T., & Ameen, N. M. (1998). A 26-month follow-up of posttraumatic stress symptoms in children after the mass-escape tragedy in Iraqi Kurdistan. *Nordic Journal of Psychiatry, 52* , 357-366.

Alisic, E., Jongmans, M. J., van Wesel, F., & Kleber, R. J. (submitted). Risk and protecting factors for posttraumatic stress in children: A systematic review of prospective studies.

*Al-Mashat, K., Amundson, N. E., Buchanan, M., & Westwood, M. (2006). Iraqi children's war experiences: The psychological impact of "Operation Iraqi Freedom". *International Journal for the Advancement of Counselling, 28(2)*, 195-211.

*Bronner, M. B., Knoester, H., Bos, A. P., Last, B. F., & Grootenhuis, M. A. (2008). Posttraumatic stress disorder (PTSD) in children after paediatric intensive care treatment compared to children who survived a major _re disaster. Child and *Adolescent Psychiatry and Mental Health, 2* , 9.

*Bryant, B., Mayou, R., Wiggs, L., Ehlersand, A., & Stores, G. (2004). Psychological consequences of road traffic accidents for children and their mothers. *Psychological Medicine, 34*, 335-346.

*Bryant, R. A., Salmon, K., Sinclair, E., & Davidson, P. (2007a). Heart rate as a predictor of posttraumatic stress disorder in children. *General Hospital Psychiatry, 29*, 66-68.

*Bryant, R. A., Salmon, K., Sinclair, E., & Davidson, P. (2007b). A prospective study of appraisals in childhood posttraumatic stress disorder. *Behaviour Research and Therapy, 45*, 2502-2507.

*Bryant, R. A., Salmon, K., Sinclair, E., & Davidson, P. (2007c). The relationship between acute stress disorder and posttraumatic stress disorder in injured children. *Journal of traumatic stress, 20*, 1075-1079.

Cohen, J. (1992). A power primer. *Psychological Bulletin., 112*, 155-159.

*Coholic, D., Lougheed, S., & Cadell, S. (2009). Exploring the helpfulness of arts-based methods with children living in foster care. *Traumatology, retrieved from http://tmt.sagepub.com/cgi/content/abstract/1534765609341590v1.*

*Dalgleish, T., Meiser-Stedman, R., Kassam-Adams, N., Ehlersand, A., Winston, F., & Smith, P. (2008). Predictive validity of acute stress disorder in children and adolescents. *British Journal of Psychiatry, 192*, 392-393.

*DeVoe, E. R., & Smith, E. L. (2002). The impact of domestic violence on urban preschool children: battered mothers' perspectives. *Journal of Interpersonal Violence, 17(10)*, 1075-1100.

Dixon-Woods, M., Agarwal, S., Jones, D. R., Young, B., & Sutton, A. J. (2005). Synthesising qualitative and quantitative evidence: a review of methods. *Journal of Health Services Research and Policy, 10*, 45-53.

Dixon-Woods, M., Bonas, S., Booth, A., Jones, D. R., Sutton, T. M. A. J., Shaw, R. L., et al. (2006). How can systematic reviews incorporate qualitative research? A critical perspective. *Qualitative Research, 6(1)*, 24-44.

Dixon-Woods, M., Cavers, D., Agarwal, S., Arthur, E. A. A., Harvey, J., Hsu, R., et al. (2006). Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *Medical Research Methodology, 6*, 35.

Dixon-Woods, M., Fitzpatrick, R., & Roberts, K. (2001). Including qualitative research in systematic reviews: Opportunities and problems. *Journal of Evaluation in Clinical Practice, 7(2)*, 125-133.

*Dyb, G., Holen, A., Braenne, K., Indredavik, M. S., & Aarseth, J. (2003). Parent-child discrepancy in reporting children's post-traumatic stress reactions after a traffic accident. *Nordic Journal of Psychiatry, 57*, 339-344.

*Earle, E. A., & Eiser, C. (2007). Children's behaviour following diagnosis of acute lymphoblastic leukaemia: A qualitative longitudinal study. *Clinical Child Psychology and Psychiatry, 12(2)*, 281-293.

*Ehlers, A., Mayou, R. A., & Bryant, B. (2003). Cognitive predictors of posttraumatic stress disorder in children: results of a prospective longitudinal study. *Behaviour Research and Therapy, 41*, 1-10.

*Forinder, U., & Norberg, A. L. (2009). "Now we have to cope with the rest of our lives". Existential issues related to parenting a child surviving a brain tumour. *Supportive Care in Cancer,* retrieved from *http://www.springerlink.com/content/eq8w4l2870826722/*.

*Gallo, A. di, Barton, J., & Parry-Jones, W. L. (1997). Road tra_c accidents: early psychological consequences in children and adolescents. *British Journal of Psychiatry, 170*, 358-362.

*Garralda, M. E., Gledhill, J., Nadel, S., Neasham, D., O'Connor, M., & Shears, D. (2009). Longerterm psychiatric adjustment of children and parents after meningococcal disease. *Pediatric Critical Care Medicine, 10*, 675-680.

Glass, G. V. (1976). Primary, secondary and meta-analysis of research. *Educational Researcher, 5(10)*, 3-8.

Gorecki, C., Brown, J. M., Nelson, E. A., Briggs, M., Schoonhoven, L., Dealey, C., et al. (2009). Impact of pressure ulcers on quality of life in older patients: a systematic review. *JAGS, 57*, 1175-1183.

*Greca, A. la, Silverman, W. K., & Wasserstein, S. B. (1998). Children's predisaster functioning as a predictor of posttraumatic stress following Hurricane Andrew. *Journal of Consulting and Clinical Psychology, 66*, 883-892.

Harden, A., Brunton, G., Fletcher, A., & Oakley, A. (2009). Teenage pregnancy and social disadvantage: Systematic review intergrating controlled trails and qualitative studies. *BMJ, 339*,4254.

Harden, A., Garcia, J., Oliver, S., Rees, R., Shepherd, J., Brunton, G., et al. (2004). Applying systematic review methods to study people's views: an example from public health. *Journal of Epidemiology and Comminity Health, 58(9),* 794-800.

Harden, A., & Thomas, J. (2005). Methodological issues in combining diverse study types in systematic reviews. *International Journal of Social Research Methology, 8(3)*, 257-271.

*Hernandez, P., & Romero, A. (2003). Adolescent girls in Colombia's guerrilla: An exploration into gender and trauma dynamics. *Journal of Prevention & Intervention in the Community, 26(1)*, 21-38.

Hoijtink, H., Klugkist, I., & Boelen, P. A. (Eds.). (2008). *Bayesian evaluation of informative hypotheses.* Springer, New York.

*Horowitz, K., McKay, M., & Marshall, R. (2005). Community violence and urban families: Experiences, effects, and directions for intervention. *American Journal of Orthopsychiatry, 75(3)*, 356-368.

Hunter, J. E., Schmidt, F. L., & Jackson, G. B. (1982). *Meta-analysis: Cumulating research findings across studies.* Sage Publications, Inc.

*Jones, L. (2002). Adolescent understandings of political violence and psychological well-being: a qualitative study from Bosnia Herzegovina. *Social Science & Medicine, 55*, 1351-1371.

*Karabekiroglu, K., Akbas, S., Tasdemir, G. N., & Karakurt, M. N. (2008). Post-traumatic stress symptoms in adolescents after two murders in a school: a controlled follow-up study. *International Journal of Psychiatry in Medicine, 38*, 407-424.

*Karakaya, I. (2006). Post-traumatic stress reaction symptoms among Turkish students: Assessments one and six months after a terrorist attack in Istanbul. *Hong Kong Journal of Psychiatry, 16*, 65-70.

*Kassam-Adams, N., Garcia-Espana, J. F., Fein, J. A., & Winston, F. K. (2005). Heart rate and posttraumatic stress in injured children. *Archives of General Psychiatry, 62*, 335-340.

*Kassam-Adams, N., & Winston, F. K. (2004). Predicting child PTSD: the relationship between acute stress disorder and PTSD in injured children. *Journal of the American Academy of Child and Adolescent Psychiatry, 43*, 403-411.

*Kenardy, J., Smith, A., Spence, S. H., Lilley, P. R., Newcombe, P., & Dob, R. (2007). Dissociation in children's trauma narratives: an exploratory investigation. *Journal of Anxiety Disorders, 21*, 456-466.

*Kim, B. N., Kim, J. W., Kim, H. W., Shin, M. S., Cho, S. C., & Choi, N. H. (2009). A 6-month follow-up study of posttraumatic stress and anxiety/depressive symptoms in Korean children after direct or indirect exposure to a single incident of trauma. *Journal of Clinical Psychiatry, 70*, 1148-1154.

*Kuterovac-Jagodic, G. (2003). Posttraumatic stress symptoms in Croatian children exposed to war: a prospective study. *Journal of Clinical Psychology, 59*, 9-25.

*Landolt, M. A., Vollrath, M., Gnehm, H., & Sennhauser, F. (2009). Post-traumatic stress impacts on quality of life in children after road traffic accidents: Prospective study. *Australian and New Zealand Journal of Psychiatry, 43*, 746-753.

*Landolt, M. A., Vollrath, M., Timm, K., Gnehm, H. E., & Sennhauser, F. H. (2005). Predicting posttraumatic stress symptoms in children after road traffic accidents. *Journal of the American Academy of Child and Adolescent Psychiatry, 44*, 1276-1283.

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Sage, Newbury Park CA .

Lipsey, M. W., &Wilson, D. B. (2010, 4/12). *Spreadsheet for calculating standardized mean difference type effect sizes*. Available from http://mason.gmu.edu/dwilsonb/ma.html.

*Lustig, S. L., Weine, S. M., Saxe, G. N., & Beardslee, W. R. (2004). Testimonial psychotherapy for adolescent refugees: a case series. *Transcultural Psychiatry, 41(1)*, 31-45.

*Mather, F. J., Tate, R. L., & Hannan, T. J. (2003). Post-traumatic stress disorder in children following road traffic accidents: a comparison of those with and without mild traumatic brain injury. *Brain Injury, 17*, 1077-1087.

*McDermott, B. M., & Cvitanovich, A. (2000). Posttraumatic stress disorder and emotional problems in children following motor vehicle accidents: an extended case series. *Australian and New Zealand Journal of Psychiatry, 34*, 446-452.

*Meiser-Stedman, R., Dalgleish, T., Glucksman, E., Yuleand, W., & Smith, P. (2009). Maladaptive cognitive appraisals mediate the evolution of posttraumatic stress reactions: A 6-month follow-up of child and adolescent assault and motor vehicle accident survivors. *Journal of Abnormal Psychology, 118*, 778-787.

*Meiser-Stedman, R., Smith, P., Glucksman, E., Yule, W., & Dalgleish, T. (2007). Parent and child agreement for acute stress disorder, post-traumatic stress disorder and other psychopathology in a prospective study of children and adolescents exposed to single-event trauma. *Journal of Abnormal Child Psychology, 35*, 191-201.

*Meiser-Stedman, R., Smith, P., Glucksman, E., Yule, W., & Dalgleish, T. (2008). The posttraumatic stress disorder diagnosis in preschool- and elementary school-age children exposed to motor vehicle accidents. *American Journal of Psychiatry, 165*, 1326-1337.

*Meiser-Stedman, R., Yule, W., Dalgleish, T., Smith, P., & Glucksman, E. (2006). The role of the family in child and adolescent posttraumatic stress following attendance at an emergency department. *Journal of Pediatric Psychology, 31*, 397-402.

*Meiser-Stedman, R., Yule, W., Smith, P., Glucksman, E., & Dalgleish, T. (2005). Acute stress disorder and posttraumatic stress disorder in children and adolescents involved in assaults or motor vehicle accidents. *American Journal of Psychiatry, 162*, 1381-1383.

*Mirza, K. A., Bhadrinath, B. R., Goodyer, I. M., & Gilmour, C. (1998). Post-traumatic stress disorder in children and adolescents following road traffic accidents. British *Journal of Psychiatry, 172*, 443-447.

*Moscardino, U., Axia, G., Scrimin, S., & Capello, F. (2007). Narratives from caregivers of children surviving the terrorist attack in Beslan: issues of health, culture, and resilience. *Social Science & Medicine, 64(8),* 1776-1787.

Mulder, J., Hoijtink, H., & Klugkist, I. (2009). Inequality and equality constrained multivariate linear models: objective model selection using constrained posterior priors. *Statistical planning and inference, 140*, 887-906.

Mulder, J., Leeuw, C. de, & Hoijtink, H. (submitted). Biems: A fortan90 program for calculating bayes factors of inequality and equality constrained models.

Mullen, B., & Rosenthal, R. (1985). *Basic meta-analysis: Procedures and programs.* Lawrence Erlbaum Associates, Publishers, London.

Noblit, G. W., & Hare, R. D. (1988). *Meta-ethnography: Synthesizing qualitative studies.* Sage, London.

*Nugent, N. R., Christopher, N. C., & Delahanty, D. L. (2006a). Emergency medical service and in-hospital vital signs as predictors of subsequent PTSD symptom severity in pediatric injury patients. *Journal of Child Psychology and Psychiatry, 47*, 919-926.

*Nugent, N. R., Christopher, N. C., & Delahanty, D. L. (2006b). Initial physiological responses and perceived hyperarousal predict subsequent emotional numbing in pediatric injury patients. *Journal of traumatic stress, 19,* 349-359.

*Nugent, N. R., Ostrowski, S., Christopher, N. C., & Delahanty, D. L. (2007). Parental posttraumatic stress symptoms as a moderator of child's acute biological response and subsequent posttraumatic stress symptoms in pediatric injury patients. *Journal of Pediatric Psychology, 32* , 309-318.

*Okundaye, J. N. (2004). Drug tra_cking and urban African American youth: Risk factors for PTSD. *Child & Adolescent Social Work Journal, 21(3)*, 285-302.

*Olsson, K. A., Kenardy, J. A., Young, A. C. D., & Spence, S. H. (2008). Predicting children's post-traumatic stress symptoms following hospitalization for accidental injury: Combining the child trauma screening questionnaire and heart rate. *Journal of Anxiety Disorders, 22*, 1447-1453.

*Ostrowski, S. A., Christopher, N. C., & Delahanty, D. L. (2007). Brief report: the impact of maternal posttraumatic stress disorder symptoms and child gender on risk for persistent post-traumatic stress disorder symptoms in child trauma victims. *Journal of Pediatric Psychology, 32*, 338-342.

*Ostrowski, S. A., Christopher, N. C., Dulmen, M. H. van, & Delahanty, D. L. (2007). Acute child and mother psychophysiological responses and subsequent PTSD symptoms following a child's traumatic event. *Journal of traumatic stress, 20*, 677-687.

Paterson, B. L., Thorne, S. E., Canam, C., & Jillings, C. (2001*). Meta-study of qualitative health research: a practical guide to meta-analysis and meta-synthesis.* Thousand Oaks, Sage.

*Paton, J., Crouch, W., & Camic, P. (2009). Young offenders' experiences of traumatic life events: a qualitative investigation. *Clinical Child Psychology and Psychiatry, 14(1)*, 43-62.

*Pervanidou, P., Kolaitis, G., Charitaki, S., Lazaropoulou, C., Papassotiriou, I., & Hindmarsh, P. (2007). The natural history of neuroendocrine changes in pediatric posttraumatic stress disorder (PTSD) after motor vehicle accidents: progressive divergence of noradrenaline and cortisol concentrations over time. *Biological Psychiatry, 62*, 1095-1102.

*Pervanidou, P., Kolaitis, G., Charitaki, S., Margeli, A., Ferentinos, S., & Bakoula, C. (2007). Elevated morning serum interleukin (IL)-6 or evening salivary cortisol concentrations predict posttraumatic stress disorder in children and adolescents six months after a motor vehicle accident. *Psychoneuroendocrinology, 32*, 991-999.

Pope, C., Mays, N., & Popay, J. (2007). *Synthesizing qualitative and quantitative health research: a guide to methods.* Open University Press, UK.

Pynoos, R., Rodriguez, N., Steinberg, A., Stuber, M., & Frederick, C. (1998). UCLA PTSD index for DSM-IV.

*Qouta, S., Punamaki, R. L., Montgomery, E., & Sarraj, E. E. (2007). Predictors of psychological distress and positive resources among Palestinian adolescents: Trauma, child, and mothering characteristics. *Child Abuse and Neglect, 31(7)*, 699-717.

*Qouta, S., Sarraj, E. E., & Punamaki, R. (2001). Mental exibility as resiliency factor among children exposed to political violence. *International Journal of Psychology, 36*, 1-7.

Roberts, K. A., Dixon-Woods, M., Fitzpatrick, R., Abrams, K. R., & Jones, D. R. (2002). Factors affecting uptake of childhood immunisation: A Bayesian synthesis of qualitative and quantitative evidence. *The Lancet, 360*, 1596-1599.

*Rohrbach, L. A., Grana, R., Vernberg, E., Sussman, S., & Sun, P. (2009). Impact of Hurricane Rita on adolescent substance use. *Psychiatry, 72*, 222-237.

Rosenthal, R. (1991). *Meta-analytic procedures for social research.* Sage, Newbury Park.

*Rusch, M. D., Grunert, B. K., Sanger, J. R., Dzwierzynski, W. W., & Matloub, H. S. (2000). Psychological adjustment in children after traumatic disfiguring injuries: a 12-month follow-up. *Plastic and Reconstructive Surgery, 106*, 1451-1458.

*Saldinger, A., Cain, A., & Porter_eld, K. (2003). Managing traumatic stress in children anticipating parental death. *Psychiatry: Interpersonal and Biological Processes, 66(2)*, 168-181.

*Salter, E., & Stallard, P. (2004). Posttraumatic growth in child survivors of a road traffic accident. *Journal of Traumatic Stress, 17(4)*, 335-340.

Sandelowski, M., & Barroso, J. (2007). Handbook for synthesizing qualitative research. Springer, New York.

Sandelowski, M., Voils, C. I., & Barroso, J. (2006). Defining and designing mixed research synthesis studies. *Research in the Schools, 13(1)*, 29-40.

*Saxe, G., Geary, M., Bedard, K., Bosquet, M., Miller, A., & Koenen, K. (2006). Separation anxiety as a mediator between acute morphine administration and PTSD symptoms in injured children. *Annals of the New York Academy of Sciences, 1071*, 41-45.

*Saxe, G., Stoddard, F., Courtney, D., Cunningham, K., Chawla, N., & Sheridan, R. (2001). Relationship between acute morphine and the course of PTSD in children with burns. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*, 915-921.

*Saxe, G., Stoddard, F., Hall, E., Chawla, N., Lopez, C., & Sheridan, R. (2005). Pathways to PTSD, part 1: Children with burns. *American Journal of Psychiatry, 162*, 1299-1304.

*Schafer, I., Barkmann, C., Riedesser, P., & Schulte-Markwort, M. (2004). Peritraumatic dissociation predicts posttraumatic stress in children and adolescents following road traffic accidents. *Journal of Trauma and Dissociation, 5*, 79-92.

*Schafer, I., Barkmann, C., Riedesser, P., & Schulte-Markwort, M. (2006). Posttraumatic syndromes in children and adolescents after road traffic accidents: a prospective cohort study. *Psychopathology, 39,* 159-164.

Schreiber, R., Crooks, D., & Stern, P. N. (1997). *Completing a qualitative project: Details and dialogue.* In J. Morse (Ed.), (p. 311-326). Sage, Thousand Oaks.

*Schwarzwald, J., Weisenberg, M., Solomon, Z., & Waysman, M. (1994). Stress reactions of schoolage children to the bombardment by Scud missiles: a 1-year follow-up. *Journal of traumatic stress, 7*, 657-667.

*Shears, D., Nadel, S., Gledhill, J., & Garralda, M. E. (2005). Short-term psychiatric adjustment of children and their parents following meningococcal disease. *Pediatric Critical Care Medicine, 6*, 39-43.

*Shears, D., Nadel, S., Gledhill, J., Gordon, F., & Garralda, M. E. (2007). Psychiatric adjustment in the year after meningococcal disease in childhood. *Journal of the American Academy of Child and Adolescent Psychiatry, 46,* 76-82.

Sherwood, G. (1999). Meta-synthesis: Merging qualitative studies to develop nursing knowledge. *International Journal for human caring, 3*, 37-42.

Strauss, A. L., & Corbin, J. (1998). *Basics of qualitative research. techniques and procedures for developing grounded theory.* Thousand Oaks, Sage.

Strube, M. J., & Hartmann, D. P. (1983). Meta-analysis: Techniques, applications and functions. *Journal of Consulting and Clinical Psychology, 51*, 14-27.

*Terranova, A. M., Boxer, P., & Morris, A. S. (2009). Factors influencing the course of posttraumatic stress following a natural disaster: Children's reactions to Hurricane Katrina. *Journal of Applied Developmental Psychology, 30*, 344-355.

*Thastum, M., Johansen, M. B., Gubba, L., Olesen, L. B., & Romer, G. (2008). Coping, social relations, and communication: A qualitative exploratory study of children of parents with cancer. *Clinical Child Psychology and Psychiatry, 13(1),* 123-138.

Thomas, J., Oakley, A. H. A., Oliver, S., Sutcli_e, K., Rees, R., Burton, G., et al. (2004). Intergrating qualitative research with trails in systematic reviews. *BMJ, 328*, 1010-1012.

*Urman, M. L., Funk, J. B., & Elliott, R. (2001). Children's experiences of traumatic events: The negotiation of normalcy and difference. *Clinical Child Psychology and Psychiatry, 6(3)*, 403-424.

*Weems, C. F., Pina, A. A., Costa, N. M., Watts, S. E., Taylor, L. K., & Cannon, M. F. (2007). Predisaster trait anxiety and negative affect predict posttraumatic stress in youths after Hurricane Katrina. *Journal of Consulting and Clinical Psychology, 75*, 154-159.

Wilson, D. B. (2010, 4/12). *Meta-analysis macros for sas, spss, and stata.* (No. version 2005.05.23). Available from http://mason.gmu.edu/ dwilsonb/ma.html

*Woodgate, R. L., & Degner, L. F. (2003). A substantive theory of keeping the spirit alive: the spirit within children with cancer and their families. *Journal of Pediatric Oncology Nursing, 20(3)*, 103-119.

*Young, A. C. D., Kenardy, J. A., & Spence, S. H. (2007). Elevated heart rate as a predictor of PTSD six months following accidental pediatric injury. *Journal of traumatic stress, 20*, 751-756.

*Zatzick, D. F., Grossman, D. C., Russo, J., Pynoos, R., Berliner, L., & Jurkovich, G. (2006). Predicting posttraumatic stress symptoms longitudinally in a representative sample of hospitalized injured adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 45*, 1188-1195.

*Zatzick, D. F., Jurkovich, G. J., Fan, M. Y., Grossman, D., Russo, J., & Katon, W. (2008). Association between posttraumatic stress and depressive symptoms and functional outcomes in adolescents followed up longitudinally after injury hospitalization. *Archives of Pediatrics and Adolescent Medicine, 162*, 642-648.

*Zehnder, D., Prchal, A., Vollrath, M., & Landolt, M. A. (2006). Prospective study of the effectiveness of coping in pediatric patients. *Child Psychiatry and Human Development, 36*, 351-368.

*Zink, K. A., & McCain, G. C. (2003). Post-traumatic stress disorder in children and adolescents with motor vehicle-related injuries. *Journal for Specialists in Pediatric Nursing, 8*, 99-106.

Authors. (submitted). Making a difference: Towards a method for weighing the evidence in a qualitative syntheses.

Authors. (submitted). I'll be working my way back: A qualitative synthesis on the trauma experiences of children.
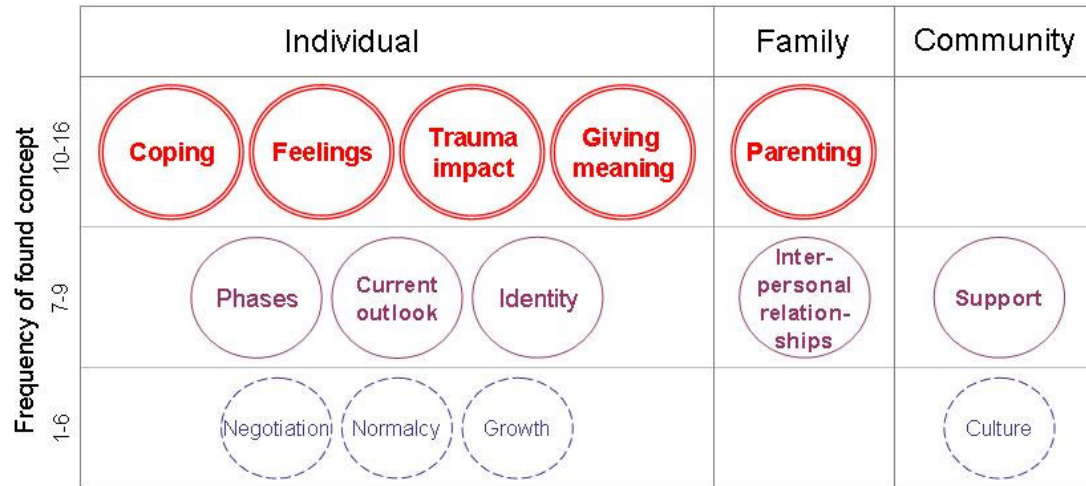
Figure 1 Theoretical model that emerged from the meta-synthesis on children and trauma
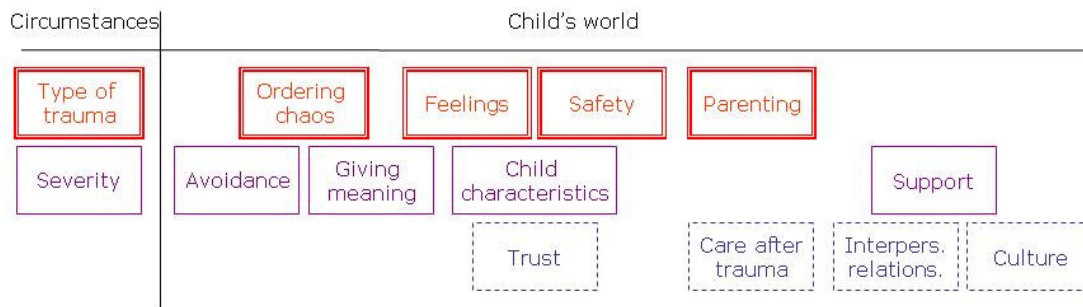

Figure 2 Results of the analysis of the expert interviews

Table 1 Variables associated with post traumatic stress three months after the traumatic event occurred, the total amount of participants (*N*), and studies (*k*) the weighted means effect size (weighted mean) and its 95% confidence interval lower bound (95% CI lb) and upper bound (95% CI ub)

Variable	*N*	*k*	weighted mean	95% CI lb	95% CI ub
Age	2940	29	-.0090	-.0716	.0536
Ethnicity	1308	13	-.0921	-.0494	.3200
SES	888	11	-.0733	-.1608	.0152
Injury severity	1381	18	.0884	.0121	.1637
Gender	3195	31	.1272	.0807	.1732
Heart rate	658	6	.1759	.0836	.2651
Days in hospital	889	8	.1813	.0267	.3275
PTS parents	515	9	.3377	.2409	.4279
Anxiety	745	6	.4449	.3060	.5652
Depression	813	9	.4750	.3193	.6058
Acute stress symptoms	1857	14	.5119	.4291	.5862
PTS (1,3) months	1196	12	.5606	.4399	.6613

Table 2 Descriptions of concepts arranged by domain and frequency and the articles in which the themes appeared

Concept	Description
Individual domain	
Feelings	Emotions that are directly linked to the traumatic event, like fear, anxiety, helplessness, loneliness and guilt.
Trauma impact	Secondary trauma and all consequences of the disruption of daily life such as the perceived sense of uncertain threat, behavior resulting directly from the trauma, copy-cat behavior and taking refuge.
Coping	Strategies used for dealing with trauma, like denial, acting tough and taking control.
Giving meaning	The process of reflection upon what happened including how the trauma is given a place in life.
Identity	How children see themselves, how they think and feel about themselves, their sense of self, self-esteem, self-awareness and knowing themselves.
Current outlook	Traumatized children's views on the post-trauma-world and in particular their future development.
Phases	Several phenomena that develop in stages, for instance aging of children, children's level of development and the processing of trauma through time.
Normalcy	What used to be self-evident in daily life and includes looking normal, being like peers and normal child behavior.
Growth	Positive outcomes of a trauma experience such as the development of cognitive and emotional skills and maturation.
Negotiation	The process of constant interchange between normalcy and difference because of the traumatic event happening.
Family domain	
Parenting	The parents' observations of the child and interference with the child, their relationship with the child and their efforts of raising a child with trauma, such as taking away their worries, disciplining, listening, protecting and answering questions.
Interpersonal relations	Interaction of traumatized children with others like peers and acquaintances.
Community domain	
Support	All kinds of help, for instance, given by family, friends, school and the community in general.
Culture	The nature of the community in terms of cohesion and openness, as well as

aspects linked to the trauma experience, religious beliefs, and political and ideological views.

Table 3: Concepts and their descriptions illustrated with a quote arranged by domain

Concept	Description	Quote
Circumstances		
Type of trauma	Single or multiple trauma, trauma caused by human against human violence or natural disasters and the amount of loss of control	`One factor is whether the child has previous traumatic experiences. The more a child has gone through, the more vulnerable it is to developing PTSD. There is a cumulative effect.' (p2)
Severity	The level of gravity of the trauma that is experienced by a child	`Severity is the fierceness in which the trauma is experienced by the child.' (p4)
Child's world		
Ordering chaos	How well a child is able to reorganize the chaos of feelings, experiences and memories that are left by the trauma	`A child needs to structure everything again. The trauma left such a chaos, structuring it again gives grip on the world.' (p3)
Feelings	The absence or presence of emotions such as guilt, shame, loneliness, fear and anger	`It has a positive influence to get over the trauma when a child is able to talk about its feelings. And to be able the recognize all these kinds of feelings.' (p3)
Safety	The sense of safety a child experiences after the traumatic event	`When a trauma occurs, your system is overruled and therefore your basic assumption of feeling safe is affected.' (p5)
Parenting	How the parents handle the traumatized child in terms of protecting it, helping it cope, giving a good example of how to react, being available and attachment	`Parents should give the child a sense of security. They need to explain the situation to the child and help it make sense of the trauma.' (p6)
Avoidance	Is a certain coping strategy. How well is a child able to avoid situations that remind it of the traumatic event?	`Some children try to avoid anything that has to do with the trauma, they ignore it or put it away. They have found a way to survive that works for quite a long time.'

		(p1)
Giving meaning	The place a trauma gets when working through it. It involves giving meaning to what happened	*`The explanation children get and their understanding of what happened to them, this is the key to giving meaning to the trauma.'* (p6)
Child characteristics	Properties of a child such as age, temperament, cognitive and social intelligence, development and self-image	*`Smarter children are better able to understand what happened and are better able to bring order in the chaos. They get a better grip on the situation. For less smart children this is harder and goes much slower.'* (p5)
Support	All kinds of help offered and understanding shown by friends, family and the community	*`You need people you can trust, who will listen to your story. Such a form of support will teach you to trust again.'* (p4)
Trust	The child having faith in the people around him or her	*`The image they have of other people not being trustworthy. The world has become unpredictable.'*(p2)
Care after trauma	The consolation a child receives during or shortly after the traumatic event occurred	*`When the parents are not there when the trauma occurs, it is much more frightening, it increases the level* of stress a child experiences.' (p5)
Culture	The influence of the amount of collectiveness of the community and the conventions of the community on experiencing trauma	*`In some cultures sexual abuse has a different impact than in another. Culture can decide whether someone is able to talk about the trauma.'*(p1)
Interpersonal relationships	The interactions a child has with other people such as friends, teachers and family	*`When a child has a better relationship with its peers, this relationship can replace the parental support.'* (p5)