Post-Traumatic Stress Reactions in Children and Their Parents/Caregivers Following Child Trauma: Understanding Prevalence, Risk Factors and Mediators Within the Parent-Child Relationship.

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Abstract

Background:

The experience of trauma in childhood occurs at a time when children are highly vulnerable due to their limited emotional, cognitive and psychological development and their sole dependence on their caregivers for protection. As such, trauma can have significant consequences for both the child and the parent, with strong associations reported in the co-occurring development of Post-Traumatic Stress Disorder (PTSD).

Methods:

Firstly, a systematic review of papers from three leading psychological databases was carried out, summarising the current evidence on the prevalence and risk factors for the development of PTSD in parents following their child's single-event trauma. Secondly, empirical analysis of a pre-existing data set from a longitudinal study of parents and young children's psychological reactions to a single-event trauma was conducted, exploring child and parent post-trauma cognition, and the mechanisms of with the relationship between child-parent PTSD operates.

Results:

Meta-analysis of 41 studies (n=4370) estimated the prevalence of PTSD in parents following their child's single-event trauma to be 17.0% (95% CI 14.1–20.0%). Pooled effect sizes of 32 risk factors were also found, relating to the trauma itself, the parent, the child and the family as a whole. The empirical study suggested the role of parental overprotectiveness as a mediator of the relationship between parent-child PTSD. Whilst also suggesting poorer fragmented memory, developmental age, parent-child separation, parenting behaviour and parents'

maladaptive appraisals each account for unique variance in child PTSD at 6 months post-trauma.

Conclusions:

Taken together, these papers suggest a multi-factorial model of PTSD in children and their parents; drawing on cognitive, behavioural, systemic and attachment theories. Clinical implications indicate the need to bear in mind the child's developmental age when assessing post-traumatic reactions, the need for screening parents most vulnerable to adverse responses to trauma, and tailoring interventions to include the family where necessary.

Table of Contents

List of Tables:

List of Figures:

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Chapter 1. Introduction to Thesis Portfolio

Psychological responses to traumatic events have been studied in adults and children for over 20 years, with Post-Traumatic Stress Disorder (PTSD) being the most commonly studied. New and interesting research is often emerging which adds important findings to the field, helping to advance our understanding of the presentation of PTSD. Most recently, the area of post-traumatic reactions in young children has seen significant growth, leading to advances in the diagnostic guidelines for PTSD in young children, with a new developmental subtype (preschool PTSD; age 6 and below) being added to the most recent publication of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Addition (DSM-5; American Psychiatric Association, 2013).

Research suggest that parents, alongside their children, are at risk of developing secondary post-traumatic stress following their child's trauma (Landolt, Vollrath, Ribi, Gnehm, & Sennhauser, 2003; Hiller et al., 2016). Theoretical models around understanding the context of PTSD in children consider the role of the family as significant (Kazak et al., 2006; Scheeringa & Zeanah, 2001). The models suggest the importance of the dyadic context of the parent-child distress following trauma, which are often highly associated. However, despite the understanding that parental PTSD can have significant effects on child functioning, this is a highly under researched area. In a recent review of the evidence of PTSD presentations in young children, De Young and Landolt (2018) call for further understanding for the developmentally sensitive dimensions of PTSD, with further exploration of the association between parent-child relationships factors.

Clinical guidance around the assessment and psychological treatment of PTSD in children suggests the need to involve parents, particularly with young

children (National Institute for Health and Care Excellence, 2018). From a systemic perspective, this seems logical, as the family system around a child plays a significant role in their distress, and their responses to treatment. As such, there is a clinical need to understand the impact of child trauma on parents in more depth. Having a greater understanding of this would allow for more extensive assessments of the needs of the family, leading to more idiosyncratic and tailored interventions. Furthermore, in order to adequately support families in the aftermath of child trauma, a greater understanding of the mechanisms through which the relationship between child and parent PTSD occurs is needed. This would add to current understandings of the specific areas of the system to target intervention, in turn supporting the long-term outcomes for children, young people and their parents. Lastly, in line with the growing research of developmentally sensitive PTSD diagnoses in young children, further research is needed to understand how developmental factors contribute to PTSD symptomology, within the context of a parent-child dynamic.

This thesis portfolio, therefore, aims to begin addressing some of the aforementioned gaps in the literature by exploring the post-traumatic stress reactions in children and their parents/caregivers following child trauma. Chapter 2 presents a comprehensive and systematic review of the literature around PTSD in parents following their child's single incident trauma. This review aims to develop an understanding current prevalence estimates of secondary PTSD in parents, whilst also exploring any possible factors which may place a parent at greater risk of developing PTSD. Following on from this Chapter 4 presents an empirical study of PTSD in young children and their parents following a motor vehicle accident. This study follows on from the meta-analytic review and explores the dyadic context of

the parent-child relationship, by considering the mechanisms through which parent-child PTSD operates. Alongside this, the empirical study explores the developmental nature of PTSD in young children, testing out the role of cognitive, behavioural, systemic and attachment focused variables in explaining the variance in PTSD symptomology. Chapter 3 aims to present the theoretical links between the second and fourth chapters, framing this within the wider context of research around the impact of PTSD in families. Chapters 5 and 6 present additional methodology and results for both the systematic review and empirical papers respectively. These chapters encompass supplementary details which are not included in the main paper due to restrictions on word counts for publication. The final Chapter (Chapter 7) provides an integration of the findings across both studies and offers a critical appraisal of the strengths and limitations of the thesis process as a whole. This chapter also provides discussion of the wider implications of the findings, whilst providing suggestions for future research in the field.

Chapter 1. References

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.

De Young, A, C., & Landolt, M, A. (2018). PTSD in children below the age of 6 years. *Disaster Psychiatry: Trauma, PTSD and Related Disorders, 20* (97), doi:10.1007/s11920-018-0966-z

Hiller, R, M., Halligan, S, L., Ariyanayagam, R., Dalgleish, T., Smith, P., Yule, W., … Meiser-Stedman, R. (2016). Predictors of posttraumatic stress symptom trajectories in parents of children exposed to motor vehicle collisions. *Journal of Pediatric Psychology, 41*(1), 108-116. doi: 10.1093/jpepsy/jsv068

Kazak, A, E., Kassam-Adams, N., Schneider, S., Zelikovsky, N., Alderfer, M, A., & Rouke, M. (2006). An integrative model of pediatric medical traumatic stress. *Journal of Pediatric Psychology, 31*(4), 343-355. doi:10.1093/jpepsy/jsj054

Landolt, M, A., Vollrath, M., Ribi, K., Gnehm, H, E., & Sennhauser, F, H. (2003). Incidence and associations of parental and child posttraumatic stress symptoms in pediatric patients. *Journal of Child Psychology and Psychiatry, 44* (8), 1199-1207.

National Institute for Health and Care Excellence. (2018). *Post-traumatic Stress Disorder.* (Guideline NG116), Retrieved from: https://www.nice.org.uk/guidance/ng116

Scheeringa, M, S., & Zeanah, C, H. (2001). A relational perspective on PTSD in early childhood. *Journal of Trauma Stress, 14,* 799–815.

Chapter 2. Systematic Review

Post-Traumatic Stress Disorder in Parents Following Their Child's single-event Trauma: A Meta-Analysis of Prevalence and Risk Factors

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(See Appendix A for Author Guidelines)

Abstract

Evidence suggests parents of children who experience a trauma may develop Post-Traumatic Stress Disorder (PTSD), which can have significant consequences for their own and their child's functioning. As such, identifying the prevalence and possible risk factors for the development of PTSD in parents is of clinical and theoretical importance, and would enhance our understanding of how best to support families in the aftermath of trauma. This meta-analysis of 41 studies (n=4370) estimated the prevalence of PTSD in parents following their child's single incident trauma to be 17.0% (95% CI 14.1–20.0%). Pooled effect sizes of 32 potential risk factors for parents developing PTSD were also identified. Medium to large effects were found for factors relating to the parent's post-traumatic cognition, psychological functioning and coping strategies alongside child PTSD. Small effects were found for pre-trauma factors, objective trauma related variables and demographic factors for both parent and child. Results are consistent with cognitive models of PTSD, suggesting peri and post-trauma factors are likely to play a substantial role in its development. These findings indicate the clinical need for screening parents most vulnerable to adverse post-traumatic reactions within the context of child trauma and tailoring interventions to include the family where necessary.

Keywords

Post-Traumatic Stress Disorder; Prevalence; Risk Factor; Parents; Children; Predictor

Highlights

- PTSD prevalence in parents following child's single trauma estimated to be 17%.
- Risk Factors associated with trauma itself, parent, child and whole family.
- Co-morbidity between parent PTSD and other psychological problems.
- Associations found between parent and child PTSD; familial context of PTSD.
- Support for cognitive models in the explaining the development of PTSD in parents.

Introduction

Psychological reactions to traumatic events have been studied in adults and children for decades, with the diagnosis of Post-Traumatic Stress Disorder (PTSD) being introduced to the 3rd edition of the Diagnostic and Statistical Manual in 1980 (DSM-III; American Psychiatric Association, 1980). Early research into the development of PTSD acknowledged that exposure to trauma alone was not sufficient to explain the complexity of this response (e.g. Yehuda & McFarlane, 1995). Instead, an amalgamation of research recognises the idiosyncratic nature of responses to trauma for both adults and children in which personal demographics, cognitive, behavioural and environmental factors all play a role (Brewin, Andrews & Valentine, 2000; Cox, Kenardy & Hendrikz, 2008; Trickey, Siddaway, Meiser-Stedman, Serpell & Field, 2012).

Whilst it is recognised that parents are also at risk of developing secondary PTSD following their child's trauma, whether or not they are involved in the incident themselves (Landolt, Vollrath, Ribi, Gnehm, & Sennhauser, 2003; Hiller et al., 2016), parental PTSD is under researched compared to adult and child populations. Kazak and colleagues (2006) present an integrative model of paediatric medical traumatic stress in which they highlight that child trauma exposure impacts the family system much more widely than just the child. They suggest the need for a systemic approach across all trauma types, in which assessing and understanding how trauma affects families as a whole is fundamental. Similar to results from meta-analyses of risk factors for the development of PTSD in adults (Brewin et al., 2000) and children (Trickey et al., 2012), the model considers the impact of trauma across three phases; the initial phase takes into account aspects of the trauma itself, and any pre-existing factors related to the individual; the second phase refers to the

immediate aftermath of the trauma; and the third phase describes the longer-term psychological effects of the trauma.

Parental PTSD is of particular clinical importance, both for clinicians working in adult and child mental health services, given the impact this has on both parties (Sheeringa & Zeanah, 2001). By nature of the diagnostic criteria, PTSD is a debilitating condition which impacts on general functioning, however, PTSD in parents is also associated with poorer functioning in their children, through higher incidence of child emotional and behavioural problems (Parsons et al., 2018). Detection of early identifiable risk factors could, if offered the appropriate treatment, reduce the likelihood of long-term adverse impacts for both parents and children. Therefore, services offering support in the aftermath of child trauma need to have a greater understanding of the commonness of parental PTSD, and the possible role this may play in the aetiology and maintenance of the child's presenting problems.

Whilst it may be reasonable to hypothesise that the risk factors for developing PTSD in parents may be similar to those outlined for adults (e.g. Brewin et al., 2000; Ozer, Best, Lipsey & Weiss, 2003), this fails to acknowledge the complexity of a parent role. Adult studies have focused on the development of PTSD in response to a trauma directly experienced by the individual. Within the context of parental PTSD in response to a child's trauma, there are added complications. The traumatic event may be indirectly experienced and thus traumatic responses must be understood within the context of secondary trauma (Banyard, Rozelle & Englung, 2001). Plus, parental PTSD needs to be considered through the nature of the dyadic parent-child relationship. In line with this, parents often have the added sense of responsibility through their role as a parent, and as such can often experience feelings of guilt (De Young, Hendrikz, Kenardy, Cobham & Kimble, 2014).

Scheeringa and Zeanah (2001) proposed a bidirectional model of PTSD between parent and child, termed “relational PTSD”. This frames PTSD within the context of the attachment relationship which is considered fundamental to child development and general functioning (Groh, Fearon, van IJzendoorn, Bakermans-Kranenburg & Roisman, 2017). The relational model suggests that child trauma effects both the parent and the child, with their subsequent distress impacting one another. Parents experiencing PTSD are presented with additional challenges to maintaining sensitively attuned parenting towards their children, given the debilitating impact of their own mental health. Research suggests they are more likely to display disconnected and insensitive parenting behaviours, which is in turn impacts on child attachment security (van Ee, Kleber, Jongmans, Mooren, & Out, 2016).

In studies of post-traumatic stress symptoms in parents following their child’s single-incident trauma, prevalence rates have been reported to range greatly, from 0% (Fukunishi, 1998) to 52% (Landolt, Boehler, Schwager, Schallberger, & Nuessli, 1998), and are often derived from different methods of assessment (e.g. clinical interview or self-report questionnaire). Furthermore, studies of risk factors for PTSD symptomology in parents have included multi-factorial assessments of pre-trauma factors, subjective and objective trauma characteristics, peri-traumatic factors and post-traumatic factors in relation to both the parent and child. Cognitive models of PTSD (Ehlers & Clarke, 2000; Dalgleish, 2004) suggest subjective peritraumatic experiences, such as perceived threat, play a significant role in the development of PTSD. This is supported by some studies of parental PTSD where factors such as parent perception of the trauma severity (Coakley et al., 2010), peri-traumatic dissociation (Hall et al., 2006), maladaptive cognitive appraisals and thought suppression (Hiller et al., 2016) are considered key. Other research suggests

demographics associated with the parent (e.g. female gender; Balluffi et al., 2004), or the child (e.g. male gender; Martin-Herz, Rivara, Wang, Russo & Zatzick, 2012) are important factors. Furthermore, some studies report factors associated with the trauma itself, such as severity (Rees, Gledhill, Garralda & Nadel, 2004), or with the post-trauma psychological reaction of the parent, such as depression (Kassam-Adams, Bakker, Marsac, Fein, & Winston, 2015) and anxiety (Hall et al., 2006), or the child, such as PTSD (Landolt, Vollrath, Ribi, Gnehm, & Sennhauser, 2003) and depression (Kassam-Adams et al., 2015), are key factors associated with parental PTSD. The literature indicates an array of possible risk factors for parental PTSD; all of which suggest greatly varied effect sizes between studies, meaning the generalisability of single results may be questionable.

Therefore, the present review aimed to conduct a comprehensive search and collation of empirical research around parental PTSD following a child's acute trauma. The review used a meta-analytic approach to estimate the prevalence of PTSD in parents following their child's acute single incident trauma, whilst also collating current understandings of factors which may increase a parent's risk of developing PTSD. The review also considers differences based on parental role, and the assessment method of PTSD to explore the impact this has on estimates. Developing a more reliable understanding of the current prevalence and risk factors for PTSD in parents following their child's trauma is of clinical importance, both for the parent and the child. Knowing about the factors which may increase a parent's risk of developing PTSD post-trauma could allow for better assessment, treatment and intervention for families, reducing the adverse outcomes for parents and children following traumatic events. The review will also have theoretical implications,

providing a more cognisant account of the current understanding of parental PTSD, with suggestions for future research where necessary.

Method

Prior to commencing the formal review searches, the protocol for this review was pre-registered on PROSPERO (Reference: CRD42018099578).

The initial stages of the searching and extraction process for this meta-analysis were conducted jointly with the third author (AB), with the interest of supporting the development of two individual projects, both exploring parental post-traumatic reactions to their child's trauma. The project presented here was solely focused on parents' post-traumatic reactions to acute/single incident trauma, whereas the other project was solely focused on parental reactions to trauma within the context of a child's long-term health condition. All quality assessments, data analysis and interpretation of the data was completed individually by the first author (LW). Twelve studies were included in both meta-analyses, as the type of trauma included were mixed, or were considered ambiguous (e.g. PICU admission). In order to account for any impact these articles may have on the results, sensitivity analyses were planned with these papers excluded.

Search Strategy

Articles in English-language, published in peer-review journals between 1980 (when PTSD was first defined as a diagnosis in the Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition (DSM-III); American Psychiatric Association, 1980) and June 2018 were considered for inclusion. Relevant studies were identified through a systematic search of leading psychological and medical databases, including MEDLINE (EBSCO), PsycINFO and Published International Literature on Traumatic Stress (PILOTS)

The search terms were developed by reviewing other literature and review articles to ensure all terminology were covered. Initially, the project aimed to focus on parents' psychological reactions to their child's trauma, including both depression and post-traumatic stress, however due to time constraints and the large number of articles returned with the inclusion of depression, the focus narrowed to just include post-traumatic stress reactions. As a result, the initial search term included depression and low mood, however, papers focused solely on depression were excluded at full text review. The following search terms were used: (Parent* OR carer* OR caregiver* OR "care giver" OR mother* OR father* OR Maternal* OR Paternal*) AND (Child* OR "young person*" OR adoles* OR teen* OR infant* OR toddler* OR "young adult" OR "school child*" OR kid* OR juvenile* OR youth* OR pre-school*) AND (PTSD OR post-trauma* OR post trauma* OR posttrauma* OR trauma* OR "traumatic stress" OR Depress* OR "mood disorder*") AND (Trauma* OR neglect* OR maltreat* OR abuse OR illness OR Disaster* OR violen* OR accident* OR war* OR assault* OR injur*)

All search terms were run by 'Abstract and Title' and Medical Subject Headings (MeSH Terms) were used for each individual search word. MeSH terms work similarly to a thesaurus to enhance the exploration of the vocabulary used within the searching to ensure a thorough, rigorous search strategy. Prevalence was operationalised as the number of participants reported that scored above clinical cut off on a validated measure of PTSD, or who met diagnostic criteria for PTSD through clinical interview. Risk factors were defined as any variable associated with PTSD symptoms or used to compare PTSD symptoms in two groups. Acute trauma was defined as a single incident trauma, not considered as part of a pre-existing condition, for example, accidental injury, or road traffic accident (RTA).

Inclusion and Exclusion Criteria

To be considered for inclusion in the review, studies had to present data on the prevalence and/or risk factors for parental PTSD, following their child's trauma. The age range for children within the samples was set at 0-18 years as although there is debate about the differing manifestation of PTSD in children at different ages and developmental levels (e.g. Dehon & Scheeringa, 2006; Fletcher, 1996; Meiser-Stedman, Smith, Glucksman, Yule, & Dalgleish, 2008; Scheeringa, Zeanah, Myers & Putnam, 2003), little is known about whether this has differing effect in a parent sample.

Articles were excluded from the review for any of the following reasons:

a) The studies measured acute responses to trauma within the first month post-trauma, rather than PTSD, which can only be diagnosed after one month (in line with DSM-5 criteria for PTSD).
b) Studies which did not use a validated measure of PTSD symptoms (such as diagnostic interview or a validated questionnaire measure which provides a cut-off score for clinical 'case-ness' based on either DSM or ICD symptoms criteria or a validated measure of clinical level of "post-traumatic stress").
c) The study presented data related to parents' PTSD symptoms which were not specifically related to their child's trauma (e.g. from their own trauma history).
d) Due to the complicating factors of grief in assessing PTSD in parents (Nakajima, Masaya, Akemi & Takako, 2012), studies in which children died before PTSD was assessed were excluded.
e) Although studies where the focus is around new-born children (e.g. trauma associated with neonatal intensive care) were included, those which focused

purely on birth trauma were excluded as birth was considered the adult's trauma.

f) If the sample included a parent who was the perpetrator of the traumatic incident (e.g. abuse) due to the added complications of being a perpetrator (e.g. added feelings of guilt/shame).

g) If the study reported insufficient data to calculate prevalence or effect sizes.

h) Where the aim of the study was to investigate the efficacy of treatment (e.g. randomised controlled trial) or where the sample used were bias (e.g. only recruiting parents or children with a PTSD diagnosis).

i) Review articles, single case studies, dissertations, books, or other systematic reviews.

j) Solely reviewed past research or purely qualitative methodology.

As previously mentioned, studies where the child's trauma was associated with a medical/long-term condition (e.g. diagnosis of cancer) were excluded as this meta-analysis was being conducted by the third author (AB). Some studies which had a mixed sample were included, as long as over 50% of the sample had experienced a single-incident trauma.

Data Extraction and coding

All papers were screened, and data was extracted by the two independent researchers (first author, LW and third author, AB). The benefit of having two researchers undertaking the review allows for a more thorough search process, as research suggests that when selection of records is done by a single author, papers can often be missed (Cuijpers, 2016). This was done in a systematic manner, in which any queries were discussed and resolved through joint agreement. On the few

occasions where further disagreement or uncertainty was evident, a third, more senior researcher (second author, R.M-S) was involved in making the final decision.

A data extraction database was used to record the following items of interest for inclusion in the meta-analysis; (a) article details (for example, author, publication year, title, journal), (b) study design setting and recruitment method, (c) sample description (including number eligible to take part, sample size), (d) demographic information (sample population description, mean age and age range of parents and children, percentage of the sample female), (e) type and detail of index trauma experienced, (f) time since trauma to PTSD assessment and follow up, (g) details of PTSD assessment method, (h) prevalence data (if reported), and (i) predictor/risk factor result statistics reported (effect sizes if provided, or alternative statistics necessary to compute effect sizes).

On extracting the data, a number of rules were adhered to in order to manage any uncertainty in the extraction and coding process and ensure consistency. If longitudinal studies presented assessment data on parental PTSD at multiple time points, effect sizes were derived from the time point nearest to the traumatic event, as long as it was more than one month after the event and subsequent assessments were excluded. Data was only extracted for current, not past PTSD. For the extraction of prevalence estimate data, when articles either used two measures of PTSD (e.g. questionnaire and interview) or reported both categorical (diagnosis) and continuous (symptoms severity) measures, the categorical measures were prioritised due to their accuracy. However, when only continuous measures of PTSD were reported, prevalence estimates extracted included the ‘moderately severe’ and ‘severe’ categories. For the risk factor analysis, continuous measures of PTSD symptoms severity were prioritised due to their statistical advantages in predictive

analyses. If studies had a mixed sample (including both acute/single incident trauma and long-term condition) efforts were made to extract the data just relating to parent PTSD following acute trauma. In one study (Ribi, Vollrath, Sennhauser, Gnehm, & Landolt, 2007) prevalence estimates for parental PTSD were reported separately for acute trauma and long-term injury, therefore just prevalence of the single trauma sample was extracted. Continuous measures of PTSD were prioritised for risk factor estimates but, in some studies, where continuous data was not presented categorical 'case-ness' was used.

In addition, data relating to risk factors for parental PTSD were only included if they were collected prior to or concurrently with the PTSD assessment. Different articles that reported results from the same data set were included in the review if the studies provided prevalence rates or effect size estimates for different risk-factors, this was to avoid any repetition resulting in biasing the sample. Data from the same sample was reported on four occasions, this is noted in the tables by merging those repeated samples together.

Data Synthesis

When prevalence data was presented for mothers and fathers individually this was merged to represent 'parent' PTSD. Effect sizes were merged using a Fishers z transformation as this allows collation of the weighted average of these numbers, to account for varying sample sizes (Borenstein, 2009). When risk factors data was presented for half of a sample (e.g. for mothers, but not for fathers) in a mixed parent sample, the missing effect size was coded as 0 and data was combined using the Fishers method to establish the transformed mean *r*. This method was also used where the same risk factors had been assessed using multiple measures within the same study (e.g. child PTSD measured by self-report and interview); these were not

included as two separate risk factor estimates as this would likely bias the results. Similarly, when studies reported data from the same sample, only one prevalence data was extracted from the most comprehensive, or largest sample, or from the earliest time point. Some risk factors, which were more rarely explored, could not be included in the meta-analysis as they were only reported by one study. Some studies by Landolt and colleagues (1998, 2003, 2012) were unclear in the direction of effect for the child gender estimate. However, based on previous research by the same author (e.g. Landolt, Vollrath, Laimbacher, Gnehm, & Sennhauser, 2005) where the coding strategy was clear, it was assumed PTSD was higher in boys than girls. Furthermore, when studies reported a non-significant result in the text, but did not report an effect size, an effect size of 0 was assigned, in order to reduce the risk of reporting bias. Whilst this strategy is sometimes considered conservative, and thus may result in underestimations of the actual effect sizes (Durlak & Lipsey, 1991), this approach is also considered more inclusive and thus favourable to simply excluding non-significant results from the analysis as this would likely bias the result by overestimating effect sizes (Rosenthal, 1995).

Data Coding

For the purpose of this review, Pearson's correlation coefficient, '*r*', was used as the effect size of interest for a number of reasons. Firstly, '*r*' was used as it was the most widely reported statistic by the final studies in their analysis of risk factors or predictors of parental PTSD. Secondly, as other studies which reported just *p*-values, *t*-tests, β, ANOVA's or odds ratios, standardised calculations for transforming effect sizes are easily used to create an '*r*'. Lastly, '*r*' was used as it is easily interpretable and therefore offers a practical benefit for its use (Field, 2001).

The majority of studies reported Pearson's *r* coefficients. However, where these coefficients were not reported, every effort was made to ensure data reported was included to ensure a more representative sample of results. This included computing effect sizes from means and sample sizes, *t*, *d*, eta, odds ratios, chi-squared and standardised regression (β) coefficients (Cohen, 1988; Rosenthal, 1994; Borstein, Hedges, Higgins & Rothstein, 2009). Whilst we acknowledge using the original coefficients would be the optimal method within a meta-analysis, it is argued that where this data is not available, it is more inclusive and provides more accurate estimates of population effect sizes to undertake statistical transformations (Peterson & Brown, 2005). Data was interpreted using the conventional approach in which a 'small' effect is approximately r=.1, medium effect is approximately r=.3 and a large effect is approximately r=.5 or higher (Cohen, 1988).

Effect sizes were computed so that positive correlation coefficients reflected higher PTSD symptomology, and negative correlation coefficients indicated lower PTSD symptomology; higher '*r*' values indicate stronger positive association with PTSD symptomology.

The risk factor estimates in each study were explored and grouped together based on articles measuring the same, or similar constructs. Risk factors were grouped based around objective trauma factors, factors relating to the child, factors relating to the parent and factors relating to the family.

Quality assessment of Risk and Bias

Assessments of study quality and risk of bias are considered one of the essential parts of a meta-analysis (Higgins & Greene, 2011) and are recommended as good practice in order to account for the variation in methodological quality of the studies included.

In order to assess the quality and risk of bias in the final included studies, a tool was developed based on the Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Heart Lung and Blood Institute, 2014) and Quality Appraisal Checklist for Studies Reporting Correlations and Associations (NICE, 2012). A combination of questions from both tools, alongside reviewing tools used in other prevalence and risk factors studies (e.g. Hoy et al., 2012; Munn, Moola, Riitana & Lisy, 2014) led to the development of our quality assessment checklist. A copy of the quality assessment tool used can be found in Appendix B. The assessment framework consisted of 12 items considering three areas of interest; the population (e.g. how well this was described and participation rates); the outcomes (e.g. whether measures of PTSD and risk factors were valid and reliable); and the analyses (e.g. were the correct statistical analyses used). Each item was given a score of 0-2, with 0 indicating low quality, and thus high bias, and 2 indicating high quality and thus low bias. Scores were summed to provide an overall quality score for each paper. For the papers where a question did not apply (e.g. those that did not report prevalence data) the total scores were pro-rated to ensure consistency. Papers with scores of 0-8 were considered low quality (high risk of bias), score of 9-16 were considered medium quality (moderate risk of bias) and scores of 17-24 were considered high quality (low risk of bias). The first author completed quality ratings for all studies and the third author acted as a second rater for a random selection of 15 studies (37%). Inter-rater reliability of the scale was assessed for agreement between the raters scores on each of the double-rated studies.

Meta-analytic Method

The meta-analysis of prevalence estimates was carried out using OpenMeta[Analyst] software (Wallace at al. 2012), whereas the meta-analysis of

risk factor estimates was conducted using interface software MAVIS (version 1.1.3) (Hamilton, 2017); both of which run the meta-analysis using 'R' (version 3.43) with the 'Metafor' (version 2.0.0) package (Viechtabauer, 2010).

Random effects models were used due to the presumed variance in effect sizes extracted from each study. This approach allows for differences in true effect sizes between studies, as it provides broader and more conservative 95% confidence intervals around a prevalence or effect size estimate than fixed effects models. A large amount of variation in effect sizes was expected, given the varied methodology, trauma types and participant characteristics in the included studies. Random effects models are also deemed most suitable, compared to fixed effects models, for meta-analyses in mental health research (Cuijpers, 2016).

Estimates of both prevalence and risk factors were arcsine transformed to prevent the confidence intervals of studies with low prevalence estimates falling below zero (Barendregt, Doi, Lee, Norman, & Vos, 2013). A separate meta-analysis was run for each risk factor, and *r* was used as the effect size reported as this is considered the most easily interpretable.

Moderator and sensitivity analyses were used to explore if the study characteristics and risk of bias impacted the strength of the effect sizes found. Moderator analyses for prevalence estimates were planned for assessment method of PTSD (interview vs questionnaire), trauma type, and parent role (mothers vs fathers). For both prevalence and risk factor estimates, sensitivity analyses were planned to assess the risk of bias and impact of mixed trauma samples on the results found. This included re-running the analyses whilst excluding studies with a high risk of bias, and again excluding those which were considered a mixed, or ambiguous, trauma sample and were also included in another meta-analysis. Meta-

regression analyses were conducted to test for statistical significance in any differences found.

Results

A total of 41studies were included in the final qualitative synthesis, however four articles were merged with others due to repeated samples, leaving total number of thirty-seven samples included in the review. See the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram (Figure 2) for the study selection, exclusion and inclusion process. Of these, 34 articles were included in the estimated prevalence analysis and 36 were used in the risk factor analysis. Table 1 provides details of the characteristics of each study included in the meta-analysis.

Risk of Bias Assessment

The overall risk of bias scores and category for each individual study can be seen in Table 1. Three studies were deemed to have high risk of bias, and thus low quality, 24 moderate risk of bias and ten were considered low risk of bias, and thus high quality. Figure 1 displays the proportion of studies rated low, moderate or high risk of bias for each of the individual quality assessment items. Inter-rater reliability for the quality scores was calculated with 37% of studies (n=15), which indicated 98.6% agreement on all items (Intraclass correlation = 0.98, 95% CI 0.96 – 0.99).

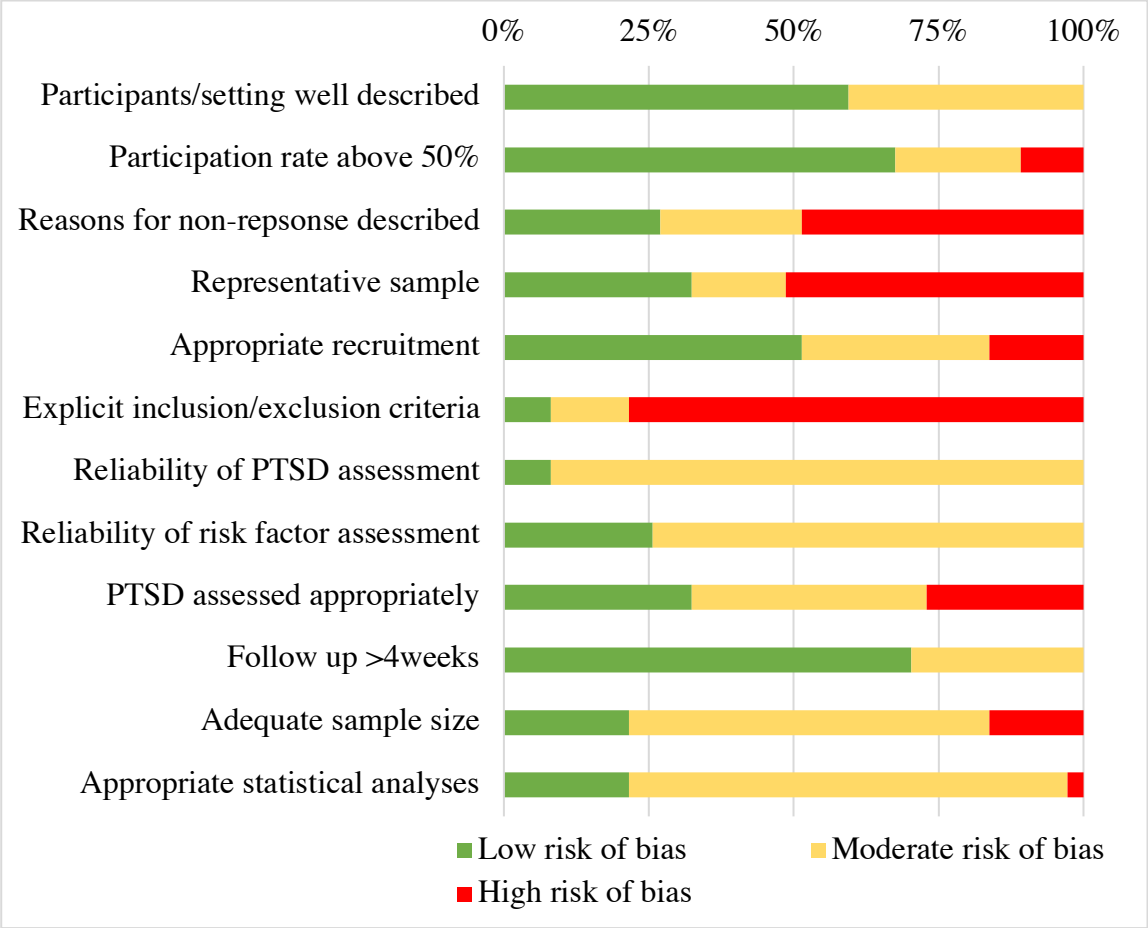

Figure 1. The proportion of studies rated low, moderate or high risk of bias on each of the quality assessment items

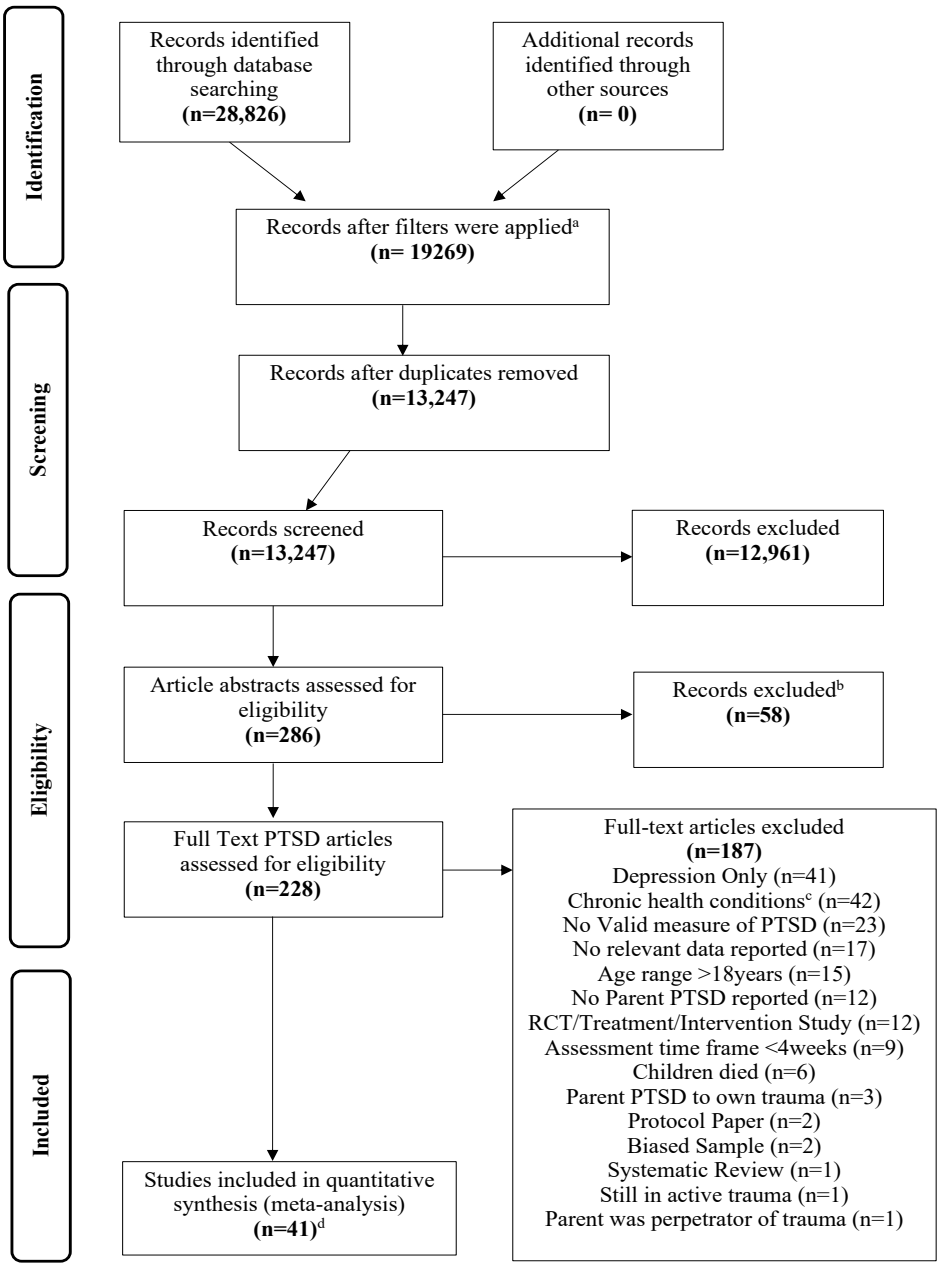

Figure 2. PRISMA diagram detailing the process of study selection

[a]Filters applied included; English Language, published in 1980 onwards; peer reviewed, Human studies only, exclude dissertations.
[b]Excluded as clearly did not meet study inclusion/exclusion criteria from the abstract
[c]These papers used within another meta-analysis
[d]Final studies include 4 papers merged with other papers due to replicated samples

Table 1. Included studies, sample characteristics, methods of assessment, quality ratings and prevalence of PTSD in the parent sample

Study	Trauma Type	Sample Size	PTSD Measure	Timing of PTSD Assessment	Method of assessment	Percentage of female parents	Location	PTSD Prevalence		Risk of Bias Score	Risk of Bias Category
								N	%		
Allenou et al. (2010)	RTA	100	PCL-S	5 w	Self-Report	42%	France	14	14	16	Moderate
Bakker et al. (2013)	Burn	279	IES	3 m	Self-Report	35%	Netherlands	59	21	18	Low
Balluffi et al. (2004)	PICU	161	PCL-S	Median = 4 m	Self-Report	82%	USA	33	21	15	Moderate
Binder et al. (2011)	NICU	40	IES-R	1 m	Self-Report	50%	USA	12	30	8	High
Bronner et al. (2008)	PICU	247	SRS-PTSD	3 m	Self-Report	57%	Netherlands	31	13	19	Low
Bryant et al. (2004)	RTA	80	PDS	3 m	Self-Report	99%	UK	2	3	18	Low
Chang et al. (2016)	NICU	102	IES-R	Mean = 21.5w	Self-Report	100%	Taiwan & China	26	26	14	Moderate
Coakley et al. (2010)*	Mixed	51	PCL	4 w	Self-Report	31%	USA	NR		17	Low
De Vries et al. (1999)	RTA	102	PCL	7-12 m	Self-Report	33 %	USA	15	15	14	Moderate
De Young et al. (2014)	Burn	120	PDS	1 m	Self-Report	93%	Australia	25	21	11	Moderate

Table 1. (Continued)

Study	Trauma Type	Sample Size	PTSD Measure	Timing of PTSD Assessment	Method of assessment	Percentage of female parents	Location	PTSD Prevalence		Risk of Bias Score	Risk of Bias Category
								N	%		
Egberts et al. (2016/2016)/ Pan et al. (2015)	Burn	202	IES	3 m	Self-Report	57%	Netherlands	36	22	16*	Moderate
Franck et al. (2015)	Mixed	107	IES-R	3 m	Self-Report	85%	UK	23	22	18	Low
Fukunishi (1998)	Burn	16	SCID	4 y	Interview	100%	Japan	0	0	11**	Moderate
Hall et al. (2006)	Burn	62	PCL-C	3 m	Self-Report	87%	USA	6	10	15	Moderate
Kassam-Adams et al. (2009)	Mixed	251	PCL	Mean=6.5 m	Self-Report	90%	USA	19	8	18	Low
Kassam-Adams et al. (2015)	Mixed	170	PCL	Mean=5.3 m	Self-Report	74%	USA	8	5	12	Moderate
Kubota (2016)	Neonatal Surgery	72	IES-R	NR	Self-Report	100%	Japan	14	19	13	Moderate
Landolt et al. (1998)	Mixed	29	PSS	6 – 8 w	Self-Report	NR	Switzerland	15	52	15	Moderate
Landolt et al. (2003)	Mixed	355	PDS	5 – 6 w	Self-Report	51%	Switzerland	71	20	16	Moderate
Landolt et al. (2012)	Mixed	460	PDS	5-6 w	Self-Report	52%	Switzerland	111	24	17	Low

Table 1. (Continued)

Study	Trauma Type	Sample Size	PTSD Measure	Timing of PTSD Assessment	Method of assessment	Percentage of female parents	Location	PTSD Prevalence		Risk of Bias Score	Risk of Bias Category
								N	%		
LeDoux et al. (1998)	Burn	35	IES	1 – 5 y	Self-Report	91%	USA	4	11	5	High
Lefkowitz et al. (2010)	NICU	85	PCL	>30 d	Self-Report	71%	USA	11	13	14	Moderate
Martin-Herz et al. (2012)	Injury	92	PCL-C	2 m	Self-Report	78%	USA	14	15	15	Moderate
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	RTA	108/56	PDS	6 m	Self-Report	83%	UK	13	11	17	Low
Mirzamani & Bolton (2002)	Disaster	37	PSS	3m	Self-Report	100%	Greece	13	35	12	Moderate
Nugent et al. (2007)	Injury	82	IES-R	6 w	Self-Report	95%	USA	8	10	16	Moderate
Ostrowski et al. (2007)	ED	61	CAPS	6 w	Interview	100%	USA	1	2	17	Low
Ostrowski et al. (2011)*	ED	54	CAPS	6 w	Interview	99%	USA	NR		16	Moderate
Rees et al. (2004)	PICU	35	IES	6–12 m	Self-Report	NR	UK	9	26	16	Moderate
Ribi et al. (2007)	Mixed	139	PDS	4-6 w	Self-Report	0%	Switzerland	26	19	13	Moderate

Table 1. (Continued)

Study	Trauma Type	Sample Size	PTSD Measure	Timing of PTSD Assessment	Method of assessment	Percentage of female parents	Location	PTSD Prevalence		Risk of Bias Score	Risk of Bias Category
								N	%		
Rizzone et al. (1994)	Burn	25	SCID	Mean=7.32y	Interview	96%	USA	4	16	6	High
Rodriguez-Rey & Alsonso-Tapia (2017)	PICU	143	DTS	6 m	Self-Report	64%	Spain	33	23	13	Moderate
Scheeringa et al. (2015)*	Mixed	62	DTS	Mean=11.2m	Self-Report	100%	USA	NR		15	Moderate
Sturms et al. (2005)	RTA	79	IES	3 m	Self-Report	NR	Netherlands	22	44	13	Moderate
Van Meijel et al. (2015)	Injury	135	IES-R	3 m	Self-Report	77%	Netherlands	13	10	20**	Low
Willebrand & Sveen (2016/2016)	Burn	106	IES-R	4 y	Self-Report	74%	Sweden	21	20	13*	Moderate
Winston et al. (2003)	Injury	162	PCL	6.5 m	Self-Report	NR	America	25	15	12	Moderate

Note. RTA = Road Traffic Accident; PICU = Paediatric Intensive Care; NICU = Neonatal Intensive Care; ED = Emergency Department; PCL-S = Post-traumatic Stress Disorder Checklist Specific; IES = Impact of Events Scale; SRS-PTSD = Self-Rating Scale for Post-traumatic Stress Disorder; PDS = Post-traumatic Diagnostic Scale; PCL =Post-traumatic Stress Disorder Checklist; IES-R = Impact of Events Scale-Revised; SCID = Structured Clinical Interview for DSM; PSS = Post-traumatic Stress Disorder Symptom Scale; CAPS = Clinician Administered Post-traumatic Stress Disorder Scale; DTS = Davidson Trauma Scale; NR = Not Reported

*Aggregated quality score, due to merged papers, **Pro-rata scores due to some quality questions not being applicable

Prevalence

With all 34 studies included in the prevalence analysis (n=4158), the pooled prevalence estimates of PTSD in parents of children who have experienced a single-incident trauma was 17.0% (95% CI 14.1–20.0%) with considerable heterogeneity found between studies (Q (33) = 202.62, p<0.001, I^2 =83.71%). Analyses of the prevalence estimates grouped by method of PTSD assessment were conducted. A total of 30 studies assessed parent PTSD using a variety of self-report questionnaires, when considering these alone, the estimated prevalence was 18.0% (95% CI 15.0-21.2%) with considerable levels of heterogeneity (Q (29) = 176.178, p<0.001, I^2 =85.54%). The remaining 4 studies assessed parent PTSD using an interview format. The estimated prevalence from these studies was 7.7% (95% CI 1.4- 18.4%) with considerable heterogeneity (Q (3) = 13.27, p=0.004, I^2 =77.38%). See Figure 3 for forest plot of total and assessment method subgroup prevalence estimates.

Meta-regression analyses identified prevalence estimates of PTSD in parents following their child's trauma was significantly higher when assessed by self-report questionnaire than by interview *(b*=-0.16, (95% CI -0.30, -0.02), *p*=0.03).

Moderator Analyses

Further subgroup moderator analyses were conducted to explore any differences in prevalence based on trauma type and parent role; see Table 2 for estimates.

With reference to trauma type, PTSD prevalence estimates appear highest in parents of children who had been admitted to a Neonatal Intensive Care Unit (NICU). In order to explore this further, a meta-regression was performed comparing parents in the NICU group, compared to all other trauma types. This identified that

the difference in prevalence estimates was not significant *(b*=0.06, (95% CI -0.07, 0.20), *p*=0.371). See Figure 4 for the forest plot.

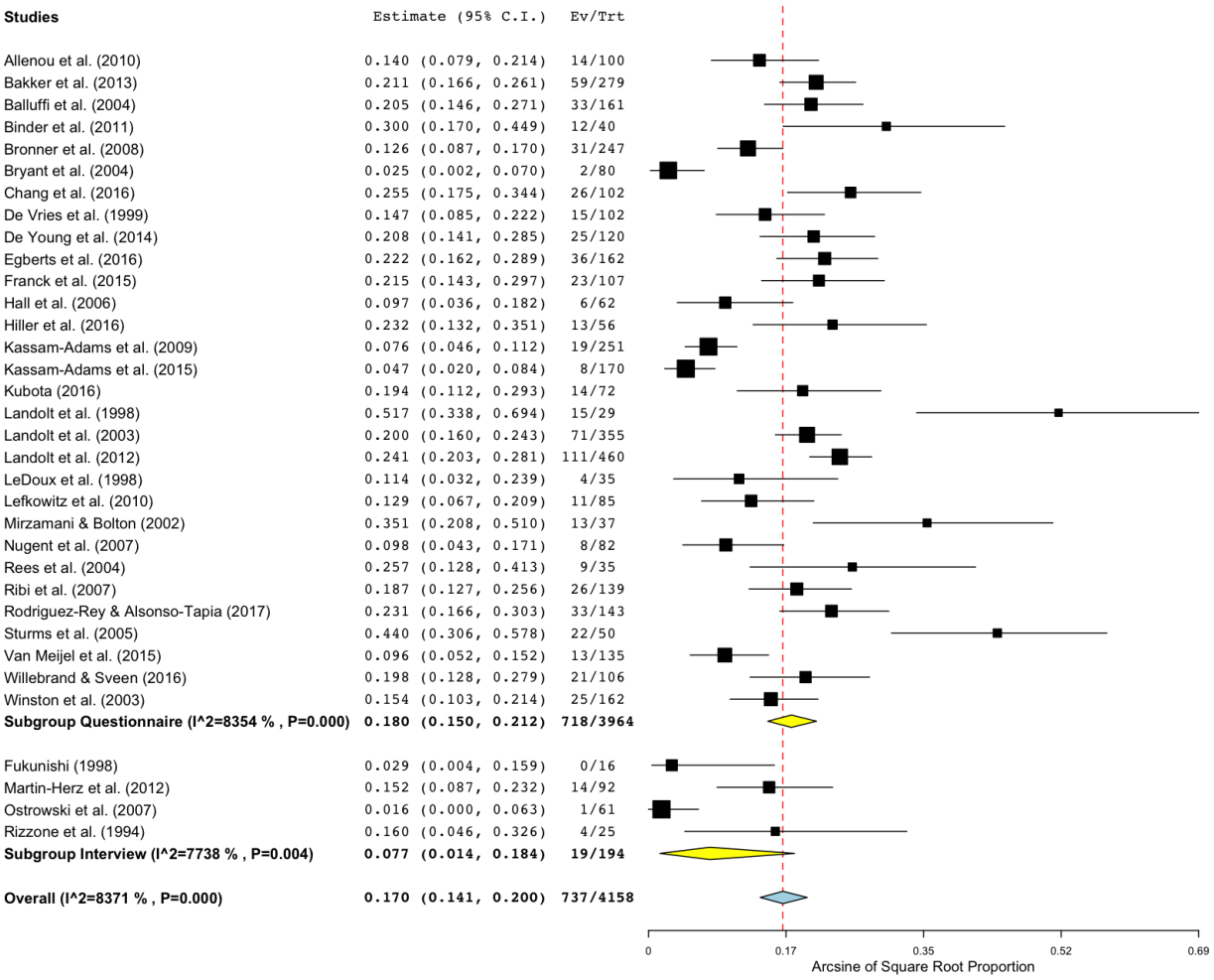

Figure 3. PTSD prevalence estimates for parents following their child's trauma grouped by PTSD assessment method.

When considering parent role, mothers appear to have relatively higher prevalence estimates than fathers. Whilst there is an apparent difference in prevalence estimates, meta-regression analyses suggest they are not significantly different (b=-0.092, (95% CI -0.20, 0.01), p=0.087). See Figure 5 for the forest plot.

Table 2. Prevalence of PTSD in parents following their child's trauma grouped by trauma type.

			95% CI								
Subgroup	*k*	Prevalence %	LL	UL	SE	*p*	z	Q	df	*p*	I^2
Trauma Type											
RTA	5	17.3	0.07	0.31	0.08	0.001	5.13	42.27	4	<0.001	90.54
Burn	8	17.5	0.14	0.22	0.03	<0.001	15.74	13.64	7	0.058	48.69
PICU	4	19.2	0.13	0.26	0.04	<0.001	11.26	9.84	3	0.020	69.50
NICU	4	21.1	0.14	0.29	0.05	<0.001	10.61	6.94	3	0.074	56.75
Injury	4	12.6	0.10	0.16	0.03	<0.001	14.49	3.49	3	0.322	14.02
Mixed	6	18.0	0.10	0.28	0.06	<0.001	7.56	87.75	5	<0.001	94.03
Other	3	16.1	0.02	0.40	0.14	0.003	2.95	29.01	2	<0.001	93.10
Parent Role											
Mother	14	20.1	0.15	0.26	0.04	<0.001	12.49	94.70	13	<0.001	86.27
Father	9	13.7	0.10	0.17	0.03	<0.001	14.70	16.64	8	0.034	51.93

Note. RTA = Road Traffic Accident; PICU = Paediatric Intensive Care Unit; NICU = Neonatal Intensive Care Unit.

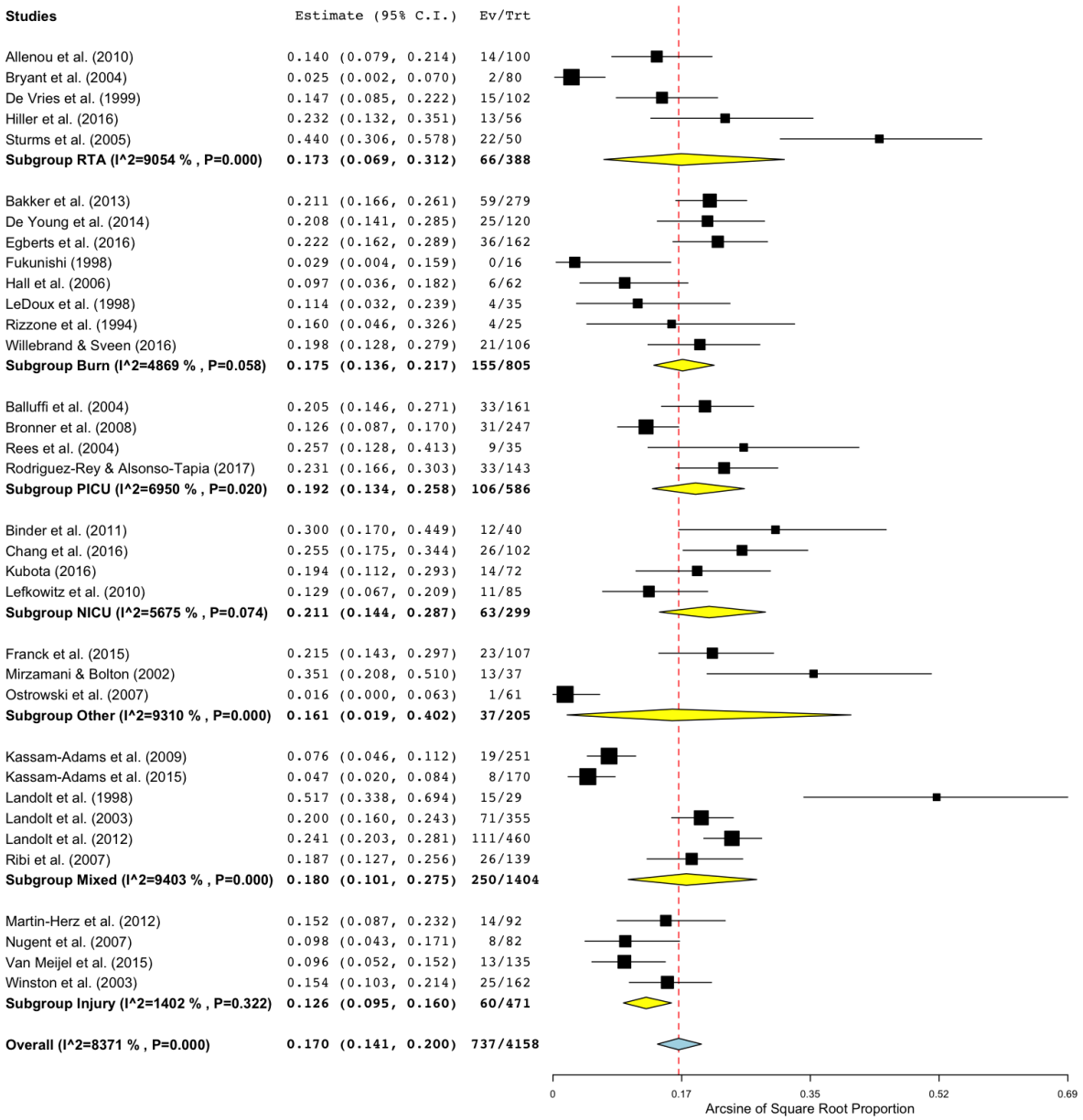

Figure 4. PTSD prevalence estimates for parents following their child's trauma grouped by trauma type.

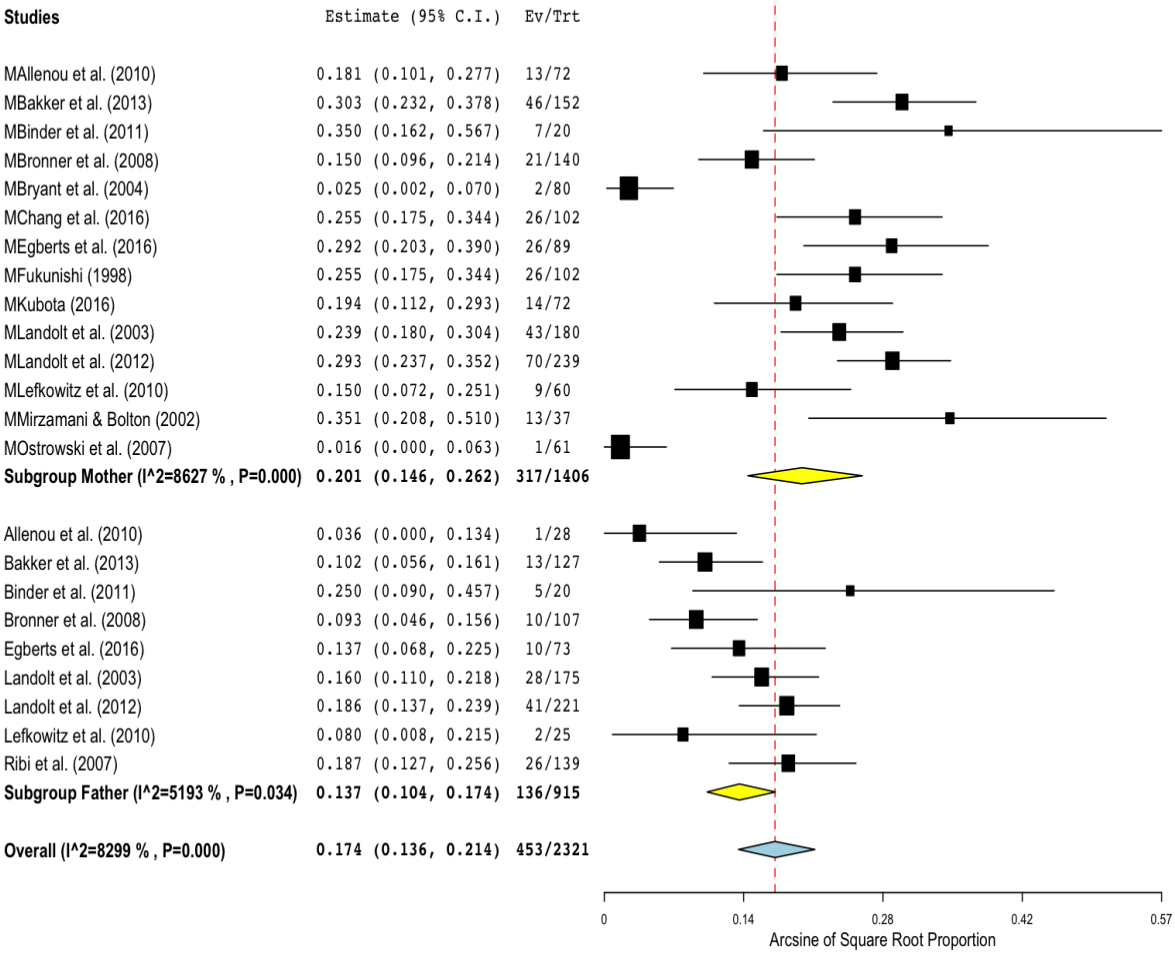

Figure 5. PTSD prevalence estimates for parents following their child's trauma grouped by parent role (mothers/fathers).

Sensitivity analyses

Due to the high heterogeneity between studies, sensitivity analyses were conducted to consider the impact of risk of bias on the prevalence estimates. When removing the three studies with high risk of bias (Binder et al, 2011; Le Doux et al, 1998; Rizzone et al, 1994), the estimated prevalence of parental PTSD was not dissimilar (16.8%, CI 13.9 – 20.0%) with heterogeneity hardly affected (Q (29) = 197.84, p<0.001, I^2 =84.84%). Therefore, the quality of the studies did not affect the prevalence estimate results.

Further sensitivity analysis was conducted to explore the impact of studies in which the trauma type in the sample was mixed (e.g. Landolt et al. 2012), or where the trauma may not exclusively be considered as a single-incident, for example NICU/PICU sample. This was conducted because it was unclear if the trauma type entirely met the criteria for this meta-analysis or could be considered within the aforementioned long-term conditions meta-analysis, as being conducted by the third author (AB). As a result, sensitivity analyses were conducted where all 12 papers included in both meta-analyses were excluded to assess for possible bias. The sensitivity analysis revealed that PTSD prevalence estimate reduced to 14.4%, (95% CI 10.8 – 18.5%) with heterogeneity remaining significant and large in size (Q (21) = 138.68, p<0.001, I^2 =84.86%). Meta-regression analyses indicated the difference in PTSD prevalence between exclusively acute/single incident trauma sample and mixed samples was significantly different, *(b*=-0.071, (95% CI 0.012, 0.129), *p*=0.018). Therefore, further sensitivity analyses with these papers excluded for the risk factors of parent's PTSD were conducted.

Publication Bias

Publication bias refers to the problem that not all research results within a given area are published (Cuijpers, 2016). If present, publication bias may influence the results of a meta-analysis given that the non-reporting of non-significant results may lead to an overestimation in the pooled effect sizes. In the present review, publication bias was assessed via visual inspection of the aforementioned forest plots (Figure 3 and 4) and the funnel plot (see Appendix D). Observations suggest that the distribution of papers is asymmetrical, however, negative prevalence rates would be needed to get a symmetrical distribution. It seems that studies with larger samples tend to have smaller prevalence rates, and larger prevalence estimates come from

those with smaller samples. This may be because the studies are less representative of the wider population and are thus likely to produce less reliable and more bias results. This may suggest the asymmetry in the funnel plot represents a small sample bias, rather than a publication bias (Cuijpers, 2016).

Risk Factors

Exploration of the 35 samples included in the risk factor analysis generated a total of 194 effect sizes which were grouped to identify 32 risk factors that were explored by two or more studies. The pooled sample size was 3874, with individual studies ranging from 25 to 355. Appendix C provides a full list of the data extracted from each study for each risk factor.

The main results of the estimates for each risk factor can be seen in Table 3. These are grouped into objective trauma factors, factors relating to the child, factors relating to the parent and factors relating to the family. The table contains the number of studies (*k*), the pooled sample size (n), the pooled effect size (r), 95% confidence intervals, and heterogeneity.

The majority (n=24) of risk factors yielded a small effect size estimate (i.e. >0.3, explaining up to 9% of the variance in parent PTSD symptoms), with 21 of these demonstrating statistical significance (trauma severity, length of hospital admission, female parent, parent BME race, parent previous trauma/mental health difficulty, parent peri-traumatic dissociation, parental avoidance, parental sense of blame/guilt, younger child, male child gender, child previous trauma, child's medical complications, child externalising behaviour, child poorer recovery and overall family functioning). Seven risk factors were found to yield a medium effect size (approximately 0.3–0.5, explaining between 9 and 25% of the variance in parent PTSD), with all of these displaying statistical significance (parent perceived trauma

severity, parent ASD, parent anxiety, parent stress, parent negative coping, parent neuroticism, and child PTSD). Furthermore, one risk factor, parent depression, yielded a large effect size (greater than 0.5, explaining over 25% of the variance in parent PTSD), which was statistically significant.

There are some noteworthy points to acknowledge when considering these results, mostly that many of the risk factors are based on small number of studies. The two risk factors with a large effect (parent ASD and parent depression) were both based on relatively small number of studies (k=5 and k=7 respectively), and both had high heterogeneity. As such, these effect sizes may reflect idiosyncrasies in the studies which may impact on their generalisability. It is important also to note the variability in heterogeneity across the risk factor estimates (range 0%-93.2%) with the majority of risk factors (n=19) showing significant heterogeneity across effect sizes from individual studies. However, this is similar to other studies of risk factors for PTSD (Brewin et al., 2000; Cox et al., 2008; Trickey et al., 2012).

Sensitivity Analysis

Due to the high heterogeneity between studies, further sensitivity analyses were conducted to consider the impact of risk of bias and mixed sample studies on the risk factor estimates. Each risk factor meta-analysis was rerun with studies rated high risk of bias excluded. The estimate for parent direct exposure to trauma increased and became statistically significant. The risk factor estimate for female parent gender was reduced and was no longer significant. The sensitivity analyses for high risk of bias did not change the significance of any other risk factors.

Sensitivity analyses were also performed removing the mixed sample studies which were also included in another meta-analysis around long-term conditions. This revealed a decrease in the risk factor estimate for length of hospital admission,

female parent gender and parent anxiety, which were no longer statistically significant. The statistical significance of all other variables was not changed based on the sensitivity analysis. Four variables (parent stress, parent negative coping style, poor child recovery and lack of social support) were no longer able to be meta-analysed due to too few studies.

Table 3. Individual meta-analyses of individual risk factors for parent PTSD

Risk Factor	*k*	n	r	95% CI's LL	95% CI's UL	z	*p*	Q	df	*p*	I^2
Objective Trauma Factors											
Trauma Severity	18	1976	0.10	0.02	0.18	2.50	0.0125	49.24	17	<0.001	65.5
Hospital Admission	3	359	0.10	-0.08	0.28	1.09	0.2756	5.81	2	0.0548	65.6
Length of Hospital Admission	9	1252	0.16	0.03	0.28	2.49	0.0129	36.84	8	<0.001	78.3
Parent direct exposure to trauma	7	748	0.17	-0.02	0.35	1.78	0.0749	36.95	6	<0.001	83.8
Parent Factors											
Parent pre-trauma characteristics											
Older Age	3	279	0.05	-0.07	0.17	0.84	0.40	0.28	2	0.87	0.0
Female Gender	8	1536	0.15	0.02	0.28	2.19	0.0287	43.82	7	<0.001	84.0
Race (BME)	6	747	0.19	0.02	0.35	2.16	0.03	26.25	5	<0.001	80.9
Low SES	5	691	-0.05	-0.18	0.09	-0.68	0.5	11.91	4	0.02	66.4
Previous trauma or Mental Health Difficulty	7	1061	0.23	0.09	0.36	3.21	0.001	28.80	6	<0.001	79.2
Parent peri-trauma variables											
Perceived Severity of trauma	7	807	0.29	0.16	0.40	4.43	<0.001	18.52	6	0.005	67.6
Peritraumatic Dissociation	3	218	0.23	0.03	0.41	2.24	0.0252	4.27	2	0.118	53.2

Table 3. (Continued)

Parent post-trauma variables											
Acute Stress Disorder	5	791	0.49	0.32	0.63	5.13	<0.001	32.43	4	<0.001	87.7
Depression	7	769	0.59	0.38	0.74	4.79	<0.001	88.08	6	<0.001	93.2
Anxiety	4	368	0.45	0.17	0.66	3.01	0.0026	25.63	3	<0.001	88.3
Stress	4	289	0.35	0.12	0.54	2.92	0.0035	10.56	3	0.0144	71.6
Psychological Distress	5	413	0.29	-0.02	0.55	1.82	0.0687	41.05	4	<0.001	90.3
Negative Coping Style	2	246	0.43	0.78	0.57	5.05	<0.001	1.99	1	0.1581	49.8
Avoidance	2	162	0.27	0.07	0.45	2.60	0.0094	1.61	1	0.2046	37.9
Alcohol Use	2	199	0.09	-0.05	0.23	1.27	0.2036	0.46	1	0.4959	0.0
Sense of Blame/Guilt	2	176	0.16	-0.10	0.41	1.20	0.2299	2.85	1	0.0913	64.9
Neuroticism	2	241	0.40	0.05	0.67	2.23	0.0257	8.04	1	0.0046	87.6
Child Factors											
Child pre-trauma characteristics											
Younger Age	13	1750	-0.08	-0.13	-0.02	-2.49	0.0128	17.35	12	0.137	30.8
Male Gender	13	1589	0.07	0.01	0.14	2.08	0.0375	21.19	12	0.0476	43.4
Previous Trauma/Hospital Admission	7	800	0.17	0.08	0.25	3.82	<0.001	8.45	6	0.2069	29.0
Child trauma related variables											
Medical complications	6	750	0.23	0.14	0.32	5.04	<0.001	7.37	5	0.1947	32.1

Table 3. (Continued)

Child post-trauma variables											
Acute Stress Disorder	3	423	0.12	-0.09	0.31	1.11	0.2689	7.75	2	0.0207	74.2
Post-traumatic Stress Disorder	15	1707	0.36	0.22	0.46	5.08	<0.001	108.64	14	<0.001	87.1
Externalising problems	5	551	0.20	0.10	0.30	3.95	<0.001	5.47	4	0.2422	26.9
Poorer Recovery	6	1012	0.27	0.21	0.33	8.79	<0.001	2.15	5	0.8287	0.0
Co-morbid Psychological Problem	4	538	0.21	-0.01	0.42	1.83	0.0666	21.07	3	<0.001	85.8
Family Factors											
Poor Family Functioning	8	829	0.23	0.07	0.37	2.77	0.0057	36.76	7	<0.001	81.0
Lack of Social Support	3	238	-0.08	-0.21	0.05	-1.22	0.2241	1.23	2	0.54	0.0

Note. k= Number of studies; LL = Lower Limit; UL = Upper Limit.

Discussion

This meta-analytic review provided a summary of the currently available research pertaining to parental PTSD following their child's single-incident acute trauma; exploring both prevalence estimates and risk factors for parental PTSD development. Thirty-seven studies published since the introduction of PTSD diagnosis in 1980 were identified for inclusion in the review, thirty-four of which were used to derive an accurate and up to date estimate of the prevalence of PTSD in parents following their child's acute trauma. Effect size estimates from thirty-six studies were used to explore a number of idiosyncratic, psychological, cognitive and behavioural factors which may increase a parent risk of developing PTSD.

Prevalence

The pooled samples of prevalence data, totalling 4158 participants, resulted in a prevalence estimate of 17.0% (95% CI 14.1–20.0%). However, prevalence estimates were found to be significantly higher when assessed through self-report questionnaires compared to clinical interview. Whilst small differences were also found in the prevalence of PTSD in mothers compared to fathers (20.1% and 13.7% respectively), these were not found to be significant, suggesting that PTSD prevalence is similar in both mothers and fathers following their child's trauma. However, this difference may be associated with the lead caregiving role of mothers, and thus the greater number of mothers participating in research studies relating to their child's trauma; in the present review 14 studies reported mother's PTSD (total of 1167 participants), compared to 9 (total of 694 participants) for father's PTSD. Therefore, our estimate for mother's PTSD could be considered more representative than that for fathers.

Risk Factors

The sample size of the pooled studies for the assessment of risk factors was large (3874 parents) which yielded a total of 194 effect sizes. These were grouped into 32 risk factors across the following 8 categories; objective trauma factors, parent pre-trauma, parent peri-trauma and parent post-trauma factors, child pre-trauma, trauma specific and post-trauma factors, and factors associated with the family as a whole. Whilst the majority of variables assessed resulted in small effect sizes, a medium effect was found for parent perceived trauma severity, parent ASD, parent anxiety, parent stress, parent negative coping, parent neuroticism, and child PTSD. A large effect was found only for parent depression. These results, particularly that individual characteristics and objective trauma variables do not play a significant role in the development of PTSD are consistent with results from other meta-analyses of risk factors in children (Trickey et al., 2012) and adults (Brewin et al., 2000; Ozer et al., 2003). Instead, cognitive, behavioural and social/familial factors were more strongly associated with PTSD development.

Also, the results provide ongoing support for the association between child and parent PTSD which is based on a relatively large number of studies. Interestingly, other child psychological factors (e.g. acute stress disorder and comorbid psychological problems) were not significant correlates of parental PTSD. Whilst this may relate to differences in the number of studies exploring these topics, it would be interesting for future research to further explore the complexity of PTSD across the parent-child relationship in comparison to other mental health presentations. In particular, research which explores the mechanisms through which this relationship operates would provide a greater understanding of the most effective way at targeting systemic interventions post-trauma.

Whilst adding significantly to the current understanding of parental PTSD, the results should be considered with caution as only four out of the 32 variables examined were assessed by more than 10 studies. This is similar to other meta-analytic reviews of risk factors for PTSD in children (Trickey et al., 2012) who highlighted a lack in routine examination of the same variables in multiple studies. In contrast, adult populations show much more routine assessment (e.g. Brewin et al., 2000), which is likely to reflect the immaturity of the PTSD literature in children and parents. In addition, for many of the identified risk factors in this review, the effects were often not consistent across studies. This suggests that there is an apparent need for further investigation of the presented risk factors which our present knowledge is limited. Given this, the results of the meta-analysis need to be considered within the wider context of variability of effect sizes both within and between the studies for each risk factor, which limits the generalisability of the findings. This provides clear avenues for future research into the impact of child trauma on parents.

Limitations

To the best of our knowledge, this is the first meta-analytic review focused on the prevalence and risk factors of PTSD in parents following their child's single-incident acute trauma, which substantially adds to the current literature in this growing area of interest. However, this review does present with some limitations. Firstly, it is important to acknowledge the high heterogeneity across studies both for the estimates of PTSD prevalence and risk factors, with both sensitivity and moderator analyses failing to decrease this. Whilst random effect models were used to increase generalizability, high heterogeneity across studies impacts our confidence in the conclusions drawn from the results. This is likely to be attributed to the

various ways PTSD and risk factor variables were measured, the variability of trauma types included, the broad age range of the children, and variability in time between the traumatic event and assessment of PTSD across studies.

Secondly, whilst a strength of this review is the amalgamation of available research on parental PTSD following a child's single trauma, we recognize the impact of the heterogeneity of studies, particularly given the impact of assessment of risk of bias on the results. Sensitivity analyses by removal of studies with a high risk of bias did not significantly alter the prevalence estimates but made some changes to risk factor estimates. The risk of bias tool assigned equal weighting to all items despite some being associated with prevalence and other associated with risk factors. Some items may have been more pertinent than others; however, this is likely to reflect a methodological difficulty with assessing risk of bias for both risk factor and prevalence estimates in one meta-analysis; traditionally these would be separated into two discrete reviews.

Thirdly, it is important to be cautious when interpreting the pooled risk factor data for child psychological factors as most of the variables from these studies comprised parent-report measures. Whilst this is often the only way to explore risk factors related to children (particularly young children), it is acknowledged this may bias the results of the child related variables; a gold standard approach would be to collect self-report data from the child. Alongside this, many of the risk factors included in the study were only assessed by a small number of studies, which means conclusions drawn about these are limited. As previously mentioned, this is likely to be associated with the immaturity of this area of research, and with a lack of routine assessment of possible risk factor variables across studies. However, Valentine, Piggott and Rothstein (2010) argue that meta-analyses, even with 'small n', are more

informative than not synthesizing the results. Therefore, we acknowledge that reasonable consideration of the limitations of this review is appropriate but conclude that the results still add significant value to the field. It is hoped this review may provide some direction for further research to expand our understanding of possible risk factors.

Clinical Implications and Suggestions for Future Research

The results from this review pose implications for both the theoretical and clinical understandings of PTSD in parents following their child's single-incident acute trauma. Firstly, the results provide significant support for the dyadic relational impact of child trauma on both children and parents; supporting both Kazak and colleagues' (2006) integrative model of paediatric traumatic stress and Scheeringa and Zeanah's (2001) model of relational-PTSD. This suggests that clinically, services offering support to children following an acute trauma should not be solely focused on the child, at the expense of the parents, given the impact of child trauma on parents psychological functioning, and the subsequent relationship this has with child functioning. Similarly, to recommendations made by Scheeringa and Zeanah (2001), this review suggests the need for assessing and treating the family system as a whole, with an initial focus on supporting parent mental health prior to child mental health. This is important as changes in the relationship between the parent and child is fundamental to a change in child symptomology (Crockenberg & Leerkes, 2000), and change in parental symptomology is likely to contextually change their interaction and ability to attune to the needs of their child. As has been highlighted in Kazak's (2006) model, trauma occurs to children in family systems, therefore we argue that assessment and treatment of child PTSD should occur within the context of these systems also. Further research into appropriate, and clinically

accessible, ways of assessing indicators of adverse reactions in the early stages post-trauma is recommended.

Similar to what has been found in other explorations of risk factors of PTSD, our results suggest that demographic, pre-trauma and objective trauma factors are not sufficient as screening tools for PTSD (Trickey et al., 2012; Brewin et al., 2000; Cox et al., 2008). Instead, the results point towards a systemically informed psychosocial account of PTSD development. Whilst cognitive and behavioural models of PTSD are already well-established in other populations (Ehlers & Clarke, 2000; Dalgleish, 2004), our results suggest support for this area within the realm of parental PTSD. However, post-trauma cognitive processing and parenting behaviour were only considered by a very small number of studies (e.g. Hiller et al., 2016; Meiser-Stedman, Smith, Yule, Glucksman, & Dalgleish, 2017). Therefore, we strongly encourage further exploration of cognitive and behavioural aspects of post-trauma processing, the relational nature of these processes and the impact this has on both parent and child psychological functioning.

The present study excluded studies which solely focused on post-traumatic depression in parents. Given our finding of parent depression as a significantly risk factor for PTSD, with a large effect size, future research should look to exploring this further, to investigate prevalence and risk factors for post-traumatic depression in parents. Alongside this, explorations of possible differences in outcomes for parents who were bereaved would be welcome as this may have clinical implications in considering the ongoing support offered to families following the traumatic event of their child. Furthermore, whilst this study provides an up-to date amalgamation of the current research on parental PTSD following their child's trauma, what isn't

known is the directionality of this effect; longitudinal research is needed to explore trajectory of child-parent PTSD relationship.

Conclusion

This meta-analysis provides evidence that parents of children who experience a single-incident trauma are at risk of developing PTSD. It provides estimates for various risk factors, associated with the trauma itself, the parent and the child. Whilst a range of effects were found, the evidence points towards a systemic, cognitive and behaviourally informed model of parental PTSD, in which objective trauma variables and individual demographics play a less significant role. Despite this, the research in this area is limited, and thus further research in this clinically and theoretically important field is necessary, with particular attention paid to the exploration of cognitive and behavioural elements of parental PTSD.

Chapter 2. References

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.

*Ballufi, A., Kassam-Adams, N., Kazak, A., Ticker, M., Dominguez, T., & Helfaer, M. (2004). Traumatic stress in parents of children admitted to the pediatric intensive care unit. *Pediatric Critical Care Medicine, 5*(6), 547-553. DOI:10.1097/01.PCC.0000137354.19807.44

Barendregt, J. J., Doi, S. A., Lee, Y. Y., Norman, R. E., & Vos, T. (2013). Meta-analysis of prevalence. *Journal of Epidemiology and Community Health, 67*(11), 974–978. https://doi.org/10.1136/jech-2013-203104

Banyard, V. L., Rozelle, D., & Englund, D. W. (2001). Parenting the traumatized child: Attending to the needs of nonoffending caregivers of traumatized children. *Psychotherapy: Theory, Research, Practice, Training, 38*(1), 74-87. http://dx.doi.org/10.1037/0033-3204.38.1.74

*Binder, W, S., Zeltzer, L, K., Simmons, C, F., Mirocha, J., & Pandya, A. (2011). The father in the hallways: Posttraumatic stress reactions in fathers of NICU babies. *Psychiatric Annuals, 41*(8), 396-402.

Borenstein, M. (2009). *Introduction to meta-analysis.* Chichester, U.K.: John Wiley & Sons.

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2009). *Introduction to Meta-Analysis, Chapter 7: Converting Among Effect Sizes* (pp. 45–49). Chichester: West Sussex, UK: Wiley.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. J*ournal of Consulting and Clinical Psychology, 68*, 748–766.

*Coakley, R, M., Forber, P, W., Kelley, S, D., LeBovidge, J., Beaslley, P., DeMaso, D, R., & Waber, D, P. (2010). Family functioning and posttraumtic stress symptoms in youth and their parents after unintentional pediatric injury. *Journal of Traumatic Stress, 23*(6), 807-810.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hilllsdale, NJ: Erlbaum.

Cox, C. M., Kenardy, J. A., & Hendrikz, J. K. (2008). A meta-analysis of risk factors that predict psychopathology following accidental trauma. *Journal for Specialists in Pediatric Nursing, 13*, 98–110.

Crockenberg, S., & Leerkes, E. (2000). Infant social and emotional development in family context. In C. H. Zeanah (Ed.), *Handbook of infant mental health* (2nd ed., pp. 60-90). New York: Guilford Press.

Cuijpers, P. (2016). *Meta-analyses in mental health research: A practical guide*. Amsterdam, Netherlands: VU University

Dalgleish, T. (2004). Cognitive approaches to posttraumatic stress disorder: the evolution of multi-representational theorizing. *Psychological Bulletin, 130*(2), 228–260.

Dehon, C., & Scheeringa, M. (2006). Screening for preschool posttraumatic stress disorder with the Child Behavior Checklist. *Journal of Pediatric Psychology, 31*, 431–435.

*De Young, A, C., Hendrikz, J., Kenardy, J, A., Cobham, V, E., & Kimble, R, M., (2014). Prospective evaluation of parent distress following pediatric burns

and identification of risk factors for young child and parent posttraumatic stress disorder. *Journal of Child and Adolescent Psychopharmacology, 24* (1), 9-17. DOI:10.1089/cap.2013.0066

Durlak, J. A., & Lipsey, M. W. (1991). A practitioner's guide to meta-analysis. *American Journal of Community Psychology, 19*, 291–332.

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy, 38*, 319–345.

Field, A. P. (2001). Meta-analysis of correlation coefficients: A Monte Carlo comparison of fixed and random-effects methods. *Psychological Methods, 6,* 161–180.

Fletcher, K. E. (1996). Childhood posttraumatic stress disorder. In E. J. Mash, & R. Barkley (Eds.), *Child psychopathology* (pp. 242–276). New York, NY: Guilford Press.

*Fukunishi, I. (1998). Posttraumatic stress symptoms and depression in mothers of children with severe burn injuries. *Psychological Reports, 83*, 331-335.

Groh, A, M., Fearon, R, M, P., van IJzendoorn, M, H., Bakermans-Kranenburg, M, J., & Roisman, G, I. (2017). Attachment in the early life course: meta-analytic evidence for its role in socioemotional development. *Child Development Perspectives, 11*(1), 70-76. DOI: 10.1111/cdep.12213

*Hall, E., Saxe, G., Stoddard, F., Kaplow, J., Koenen, K., Chawla, N., … King, D. (2006). Posttrauamtic stress symptoms in parents of children with acute burns. *Journal of Pediatric Psychology, 31*(4), 403-412. doi:10.1093/jpepsy/jsj016

Hamilton, W. K. (2017). MAVIS: Meta-Analysis via Shiny (R Package, Version 1.1.3) [Computer software]. Retrieved from http://kylehamilton.net/shiny/MAVIS/

Higgins J., & Green, S. (2011). *Cochrane handbook for systematic reviews of interventions: Version 5.1.0*. The Cochrane Collaboration, http://handbook.cochrane.org

*Hiller, R, M., Halligan, S, L., Ariyanayagam, R., Dalgleish, T., Smith, P., Yule, W., … Meiser-Stedman, R. (2016). Predictors of posttraumatic stress symptom trajectories in parents of children exposed to motor vehicle collisions. *Journal of Pediatric Psychology, 41*(1), 108-116. doi: 10.1093/jpepsy/jsv068

Hoy, D., Brooks, P., Woolf, A., Blyth, F., March, L., Bain, C., … Buchbinder, R. (2012). Assessing risk of bias in prevalence studies: Modification of an existing tool and evidence of interrater agreement. *Journal of Clinical Epidemiology*, *65*(9), 934– 939. https://doi.org/10.1016/j.jclinepi.2011.11.014

*Kassam-Adams, N., Bakker, A., Marsac, M, L., Fein, J, A., & Winston, F, K. (2015). Traumatic stress, depression, and recovery: Child and parent responses after emergency medical care for unintentional injury. *Pediatric Emergency Care, 32*(11), 737-742.

Kazak, A, E., Kassam-Adams, N., Schneider, S., Zelikovsky, N., Alderfer, M, A., & Rouke, M. (2006). An integrative model of pediatric medical traumatic stress. *Journal of Pediatric Psychology, 31*(4), 343-355. doi:10.1093/jpepsy/jsj054

*Landolt, M. A., Boehler, U., Schwager, C., Schallberger, U., & Nuessli, R. (1998). Post-traumatic stress disorder in paediatric patients and their parents: an exploratory study. *Journal of Pediatric Child Health, 34*, 539-543.

*Landolt, M, A., Vollrath, M., Ribi, K., Gnehm, H, E., & Sennhauser, F, H. (2003). Incidence and associations of parental and child posttraumatic stress symptoms in pediatric patients. *Journal of Child Psychology and Psychiatry, 44* (8), 1199-1207.

Landolt, M, A., Vollrath, M., Laimbacher, H., Gnehm, H, E., & Sennhauser, F, H. (2005). Prospective study of posttraumatic stress disorder in parents of children with newly diagnosed type 1 diabetes. *Journal of the American Academy of Child and Adolescent Psychiatry, 44* (7), 682-689, DOI: 10.1097/01.chi.0000161645.98022.35

*Landolt, M, A., Ystrom, E., Sennhauser, F, H., Gnehm, H, E., & Vollrath, M, E. (2012). The mutual prospective influence of child and parental post-traumatic stress symptoms in pediatric patients. *Journal of Child Psychology and Psychiatry, 53*(7), 767-774. doi:10.1111/j.1469-7610.2011.02520.x

*LeDoux, J., Meyer, W, J., Blakeney, P, E., & Herdon, D, N. (1998). Relationships between parental emotional states, family environment and the behavioural adjustment of pediatric burn survivors. *Burns, 24*, 425-432.

*Martin-Herz, A, P., Rivara, F, P., Wang, J., Russo, J., & Zatzick, D. (2012). Predictors of parental posttraumatic stress disorder symptoms in the year after adolescent traumatic injury. *Academic Pediatric Association, 12*(3), 198-204.

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. *The American Journal of Psychiatry, 165*, 1326–1337. doi: 10.1176/appi.ajp.2008.07081282

*Meiser-Stedman, R., Smith, P., Yule, W., Glucksman, E., & Dalgleish, T. (2017). Posttraumatic stress disorder in young children 3 years post trauma: Prevalence and Longitudinal Predictors. *Journal of Clinical Psychiatry, 78* (3), 334-339.

Munn, Z., Moola, S., Riitano, D., & Lisy, K. (2014). The development of a critical appraisal tool for use in systematic reviews addressing questions of prevalence. *International Journal of Health Policy and Management, 3*(3), 123–128. https://doi.org/10.15171/ijhpm.2014.71

National Heart Lung and Blood Institute. (2014). *Quality assessment tool for observational, cohort and cross-sectional studies.* Retrieved from https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/cohort

NICE. (2012). *Methods for the development of NICE public health guidance.* Retrieved from https://www.nice.org.uk/process/pmg4/chapter/appendix-g-quality-appraisal-checklist-quantitative-studies-reporting-correlations-and

Nakajima, S., Masaya, I., Akemi, S., & Takako, K. (2012). Complicated grief in those bereaved by violent death; the effects of post-traumatic stress disorder on complicated grief. *Dialogues in Clinical Neuroscience, 14*, 210-214.

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weis, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Bulletin, 129,* 52–73.

Parsons, A., Knopp, K., Rhoades, G, K., Allen, A, S., Markman, H, J., & Stanley, S, M. (2018). Associations of army fathers' PTSD symptoms and child functioning: within- and between – family effects. *Family Process, 57*(4), 915-926.

Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology, 90*(1), 175-181. doi:10.1037/0021-9010.90.1.175

*Rees, G., Gledhill, J., Garralda, M. E., & Nadel, S. (2004). Psychiatric outcome following pediatric intensive care unit (PICU) admission: a cohort study. *Intensive Care Medicine, 30*, 1607-1614.

*Ribi, K., Vollrath, M, E., Sennhauser, F, H., Gnehm, H, E., & Landolt, M, A. (2007). Prediction of posttraumatic stress in fathers of children with chronic diseases or unintentional injuries: a six-months follow-up study. *Child and Adolescent Psychiatry and Mental Health, 1*(16). doi:10.1186/1753-2000-1-16

*Rizzone, L, P., Stoddard, F, J., Murphy, M., & Kruger, L, J. (1994). Posttraumatic stress disorder in mothers of children and adolescents with burns. *Journal of Burn Care and Rehabilitation, 15* (2), 158-163.

Rosenthal, R. (1994). Parametric measures of effect size. In H. Cooper & L. V. Hedges (Eds.), *The Handbook of Research Synthesis.* New York, NY: Sage.

Rosenthal, R. (1995). Writing meta-analytic reviews. *Psychological Bulletin, 118,* 183–192.

Scheeringa, M, S., & Zeanah, C, H. (2001). A relational perspective on PTSD in early childhood. *Journal of Trauma Stress, 14,* 799–815.

Scheeringa, M, S., Zeanah, C, H., Myers, L., & Putnam, F, W., (2003). New findings for alternative criteria for PTSD in preschool children. *Journal of the American Academy of Child and Adolescent Psychiatry, 42*(5), 561-570. DOI: 10.1097/01.CHI.0000046822.95464.14

Trickey, D., Siddaway, A. P., Meiser-Stedman, R., Serpell, L., & Field, A. P. (2012). A meta-analysis of risk factors for post-traumatic stress disorder in children and adolescents. *Clinical Psychology Review*, *32*(2), 122–138. https://doi.org/10.1016/j.cpr.2011.12.001

van Ee, E., Kleber, R, J., Jongmans, M, J., Mooren, T, T, M., & Out, D. (2016). Parental PTSD, adverse parenting and child attachment in a refugee sample. *Attachment and Human Development, 13*(3), 273-291. DOI: 10.1080/14616734.2016.1148748

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software, 36*(3), 1–48.

Wallace, B. C., Dahabreh, I. J., Trikalinos, T. A., Lau, J., Trow, P & Schmid, C. H. (2012). Closing the gap between methodologists and end-users: R as a computational back-end. *Journal of Statistical Software*, *49*(5), 1-15. https://doi.org/10.18637/jss.v049.i05

Yehuda, R., & McFarlane, A. C. (1995). Conflict between current knowledge about posttraumatic stress disorder and its original conceptual basis. *American Journal of Psychiatry, 152,* 1705-1713.

References included in the meta-analysis, but not cited in the text

*Allenou, C., Olliac, B., Bourdet-Loube're, S., Brunet, A., David, A, C., Claudet, I., Lecoules, N., Roulet, P., Bui, E., & Birmes, P. (2010). Symptoms of traumatic stress in mothers of children victims of a motor vehicle accident. *Depression and Anxiety 27,* 652-657.

*Bakker, A., Van der Heijden, P, G, M., Van Son, M, J, M., & Van Loey, N, E, E. (2013). Course of traumatic stress reactions in couples after a burn event to their young child. *Health Psychology 32*(10), 1076-1083. http://dx.doi.org/10.1037/a0033983

*Bronner, M, B., Knoester, H., Bos, A, P., Last, B, F., & Grootenhuis, M, A. (2008). Follow-up after paediatric intensive care treatment: parental posttraumtic stress. *Acta Paediatrica, 97*, 181-186. DOI:10.1111/j.1651-2227.2007.00600.x

*Bryant, B., Mayou, R., Wiggs, L., Ehlers, A., & Stories, G. (2004). Psychological consequences of road traffic accidents for children and their mothers. *Psychological Medicine, 34*, 335-346. DOI: 10.1017/S0033291703001053

*Chang, H, P., Chen, J, Y., Huang, C, J., Huang, J, Y., Su, P, H., & Chen, V, C, H. (2016). Factors associated with post-traumatic symptoms in mothers of preterm infants. *Archives of Psychiatric Nursing, 30,* 96-101. http://dx.doi.org/10.1016/j.apnu.2015.08.019

*De Vries, A, P, J., Kassam-Adams, N., Cnaan, A., Sherman-Slate, E., Gallagher, P, R., & Winston, F, K. (1999). Looking beyond the physical injury: posttraumatic stress disorder in children and parents after pediatric traffic injury. *Pediatrics, 104*(6), 1293-1299. DOI: 10.1542/peds.104.6.1293

*Egberts, M, R., van de Schoot, R., Boekelaar, A., Hendrickx, H., Geenen, R., & Van Loey, N, E, E. (2016). Child and adolescent internalizing and externalizing problems 12 months postburn: the potential role of preburn functioning, parental posttraumatic stress, and informant bias. *European Journal of Child and Adolescent Psychiatry, 25*, 791-803. DOI 10.1007/s00787-015-0788-z

*Egberts, M, R., van de Schoot, R., Hendrickx, H., Geenen, R., & Van Loey, N, E, E. (2017). Parents' posttraumatic stress after burns in their school-aged child: a prospective study. *Health Psychology 36*(5), 419-428. http://dx.doi.org/10.1037/hea0000448

*Franck, L, S., Wray, J., Gay, G., Dearmun, A, K., Lee, K., & Cooper, B, A. (2015). Predictors of parent post-traumatic stress symptoms after child hospitalisation on general pediatric wards: a prospective cohort study. *International Journal of Nursing Studies, 52,* 10-21. http://dx.doi.org/10.1016/j.ijnurstu.2014.06.011

*Kassam-Adams, N., Fleisher, C, L., & Winston, F, K. (2009). Acute stress disorder and posttraumatic stress disorder in parents of injured children. *Journal of Traumatic Stress, 22*(4), 294-302. DOI: 10.1002/jts.20424

*Kubota, A., Yamakawa, S., Yamamoto, E., Kosugi, M., Hirano, S., Shiraishi, J., … Yamaue, H. (2016). Major neonatal surgery: psychosocial consequences of the patient and mothers. *Journal of Pediatric Surgery, 51*, 364-367. http://dx.doi.org/10.1016/j.jpedsurg.2015.09.017

*Lefkowitz, D, S., Baxt, C., & Evans, J, R. (2010). Prevalence and correlates of posttraumatic stress and postpartum depression in parents of infants in the neonatal intensive care unit (NICU). *Journal of Clinical Psychology in Medical Settings, 17*, 230-237. DOI 10.1007/s10880-010-9202-7

*Mirzamani, M., & Bolton, D. (2002). PTSD symptoms of mothers following occurrence of a disaster affecting their children. *Psychological Reports, 90*, 431-438.

*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*(3), 309-318. doi:10.1093/jpepsy/jsl005

*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 posttraumatic stress disorder symptoms in child trauma victims. *Journal of Pediatric Psychology, 32*(3), 338-342. doi:10.1093/jpepsy/jsl003

*Ostrowski, S, A., Ciesla, J, A., Lee, T, J., Irish, L., Christopher, N, C., & Delahanty, D, L. (2011). The impact of caregiver distress on the longitudinal development of child acute posttraumatic stress disorder symptoms in pediatric injury victims. *Journal of Pediatric Psychology, 36* (7), 806-815. doi:10.1093/jpepsy/jsq113

*Pan, R., Egberts, M, R., Castanheira Nascimento, L., Aparecida Rossi, L., Vandermeulen, E., Geenen, R., & Van Loey, N, E. (2015). Health-related quality of life in adolescent survivors of burns: agreement on self-reported and mother' ad fathers' perspectives. *Burns, 41*, 1107-1113. http://dx.doi.org/10.1016/j.burns.2014.12.011

*Rodriguez-Rey, R., & Alonso-Tapia, J. (2017). Relation between parental psychopathology and posttraumatic growth after a child's admission to intensive car: two faces of the same coin? *Intensive and Critical Care Nursing, 43*, 156-161. http://dx.doi.org/10.1016/j.iccn.2017.08.005

*Scheeringa, M, S., Myers, L., Putnam, F, W., & Zeanah, C, H. (2015). Maternal factors as moderators or mediators of PTSD symptoms in very young children: a two-year prospective study. *Journal of Family Violence, 30*, 633-642.

*Sturms, L, M., van der Sluis, C, K., Stewart, R, E., Groothoff, J, W., Jan ten Duis, H., & Eisma, W, H. (2005). A prospective study on paediatric traffic injuries: health-related quality of life and post-traumatic stress. *Clinical Rehabilitation, 19*, 312-322. DOI: 10.1 191/026921 5505cr867oa

*Van Meijel, E, P, M., Gigengack, M, R., Verlinden, E., Opmeer, B, C., Heij, H, A., Goslings, J, C., … Lindauer, R, J, L. (2015). Predicting posttraumatic stress disorder in children and parents following accidental child injury: evaluation of the screening tool for early predictors of posttraumatic stress disorder (STEPP). *BMC Psychiatry, 15* (113). DOI 10.1186/s12888-015-0492-z

*Willebrand, M., & Sveen, J. (2016). Injury-related fear-avoidance and symptoms of posttraumatic stress in parents of children with burns. *Burns, 42*, 414-420. http://dx.doi.org/10.1016/j.burns.2015.08.004

*Willebrand, M., & Sveen, J. (2016). Perceived support in parents of children with burns. *General Hospital Psychiatry, 38*, 105-108. http://dx.doi.org/10.1016/j.genhosppsych.2015.10.004

*Winston, F, K., Kassam-Adams, N., Garcia-Espana, F., Ittenbach, R., & Cnaan, A. (2003). Screening for risk of persistent posttraumatic stress in injured children and their parents. *Journal of the American Medical Association, 290*(5), 643-649.

Chapter 3. Bridging Chapter

The meta-analytic review outlined in Chapter 2 provided a systematic overview of the available evidence in relation to post-traumatic stress reactions in parents following their child's experience of a single incident trauma. To the best of our knowledge, this was the first review to provide a pooled prevalence estimate, and to identify possible risk factors for the development of PTSD in this population of parents. As such, the evidence presents a significant addition to the current literature surrounding the context of PTSD in parents, something which has recently been highlighted as a gap in current research (De Young & Landolt, 2018).

Based on a large pooled sample the review estimated that 17.0% (95% CI 14.1–20.0%) of parents develop PTSD following their child's single incident trauma. Thus, suggesting almost a fifth of parents whose child has been involved in a traumatic event could have long-lasting and complex psychological difficulties as a result. Given the literature around family systems and the relational impact of parent mental health on child social, emotional and psychological development (Scheeringa & Zeanah, 2001; Salmon & Bryant, 2002), this raises concerns about the clinical implications parental PTSD has for both the parent and the child.

The review also explored the possible factors which may place a parent at an increased risk of developing PTSD. Pooled effect sizes revealed 32 potential risk factors, relating to the trauma itself, to the parent and to the child. Medium to large effects were found for many factors relating to the parent's post-traumatic cognition, psychological functioning and coping strategies. Alongside this, similar to what has been found in previous literature (e.g. De Young, Hendrikz, Kenardy, Cobham, & Kimble, 2014; Meiser-Stedman, Smith, Yule, Glucksman & Dalgleish, 2017; Scheeringa, Myers, Putnam, & Zeanah, 2015) a moderate effect was found for the

relationship between parent and child PTSD. Thus, the results add to previous literature suggesting when a parent has PTSD following a child's trauma, the child also has an increased likelihood of significant post-traumatic symptomology, and vice versa (Scheeringa & Zeanah, 2001). Similar to understandings of PTSD in adults (Brewin, Andrews & Valentine, 2000) and children (Trickey, Siddaway, Meiser-Stedman, Serpell & Field, 2012), the review provided evidence for cognitive models of PTSD (Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clarke, 2000; Dalgleish, 2004) in which cognitive and post-trauma variables play a major role in the development of PTSD in parents.

Whilst this review provides evidence for the need to consider parental mental health within the context of child acute trauma, our understanding of this relationship is still in its infancy. Theoretically, we can consider how parent and child post-traumatic reactions may be associated, given the shared environment between most parents and children and the proximity of exposure to each other's ongoing distress. By drawing on attachment and systemic theories (Bowlby, 1969, 1973; Ainsworth, 1968; Crittenden, 2000, 2006), we can hypothesize that the reciprocity within the parent-child relationship, which is considered fundamental for child development, plays a significant role. Scheeringa and Zeanah's (2001) model of relational PTSD highlights this clearly. They found that a mother's ability to accurately read and understand her child's symptomology plays a significant role in the strength of the relationship between the experience of trauma and the child's post-traumatic symptomology. If a parent is experiencing PTSD symptoms, characterised by avoidance of the reminders of the trauma and re-experiencing, their ability to remain attuned to the needs of the child are likely to be impacted.

Despite this theoretical picture, our understanding of the mechanisms in which the relationship between parent and child trauma operates is unclear. Research into the role of parent cognition suggests that parents with higher PTSD symptomology also report more maladaptive trauma appraisals (e.g. subjective sense of threat), increased rumination and thought suppression and poorer family functioning (Hiller et al., 2016). Furthermore, research into parent post-trauma behaviour suggest PTSD is associated with more avoidant and maladaptive coping (e.g. Williamson et al., 2017). However, current understanding of cognitive and behavioural factors associated with parental PTSD and the subsequent influence this has on the child's PTSD is based on a small number of studies.

Recent additions to the National Institute for Clinical Excellence (NICE, 2018) guidance for post-traumatic stress disorder in children and adults highlights the need to involve families and carers in the assessment process. This is with the aim to improve the care of the individual who experienced the trauma, but also to recognise the needs, and possible adverse psychological reactions of the family. Alongside this, the NICE (2018) guidance offers suggestions for delivering aspects of post-trauma treatment jointly (e.g. psychoeducation) for parents/carers who may have also developed PTSD after experiencing the same event. Whilst these guidelines are welcomed, further understanding of the most effective ways to target interventions with a systemic nature is needed. Exploration of possible differences based on the child's developmental age are also important to be considered.

The aims of the empirical study, which will be outlined in chapter 3, serve to address some of the areas of need highlighted in the conclusions of the review, and also from the aforementioned literature. The study hopes to further build on our understanding of the role of the family in child post-traumatic adjustment by

considering the mediating role of parental cognitive and behavioural factors in the relationship between child and parent PTSD. It also hopes to expand on current understandings of the role of child cognitive processing within PTSD (e.g. Meiser-Stedman, 2002) by considering this from a developmental lens with a sample of young children. Lastly, the empirical study hopes to draw these concepts together and explore a model of PTSD in children which incorporates factors associated with the cognitive and behavioural functioning of both the parent and the child, whilst also considering the parent-child relationship.

We were presented with an opportunity to source data from a pre-existing study of the post-traumatic reactions of young children and their parents following a motor vehicle accident (Meiser-Stedman, Smith, Glucksman, Yule & Dalgleish, 2008; Hiller et al., 2016; Meiser-Stedman et al., 2017). This study was a 3 yearlong prospective study of young children (aged 2-10 years) from which some of the data has already been reported. The data also presented an opportunity to explore the developmental component of child cognitive processing and consider the mediating role of parental cognitive and behaviour factors. These are important areas to explore for multiple reasons; firstly, exploring the developmental context of child cognitive processing following an acute trauma would add to the current understanding of PTSD in young children, which is a growing area of interest (De Young & Landolt, 2018). Secondly, exploring the mechanisms of the relationship between parent and child PTSD would allow for appropriately targeted interventions which may improve outcomes for both parent and child. Thirdly, by exploring these constructs together, alongside the role of the parent-child relationship, may add to current understandings of PTSD in young children which consider the role of cognitive, behavioural, and familial factors together.

Chapter 3: References

Ainsworth, M. D. S. (1968), Object relations, dependency, and attachment: A theoretical review of the infant mother relationship. *Child Development, 40,* 969-1025.

Bowlby, J. (1969), *Attachment and loss, Vol. 1: Attachment.* New York: Basic Books.

Bowlby, J. (1973). *Attachment and loss, Vol. 2: Separation.* New York: Basic Books.

Brewin, C, R., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of post-traumatic stress disorder. *Psychological Review, 103*(4), 670-686.

Crittenden, P. M. (2000). A dynamic-maturational approach to continuity and change in patterns of attachment. In P. M. Crittenden & A. H. Claussen (Eds.), *The organization of attachment relationships: Maturation, culture, and context* (1st ed., pp. 343-357). New York, NY: Cambridge University Press

Crittenden, P. M. (2006). A Dynamic-Maturational Model of Attachment. *ANZJFT Australian and New Zealand Journal of Family Therapy*, *27*(2), 105-115. doi:10.1002/j.1467- 8438.2006.tb00704.x

Dalgleish, T. (2004). Cognitive approaches to posttraumatic stress disorder: the evolution of multi-representational theorizing. *Psychological Bulletin, 130*(2), 228–260.

De Young, A, C., Hendrikz, J., Kenardy, J, A., Cobham, V, E., & Kimble, R, M., (2014). Prospective evaluation of parent distress following pediatric burns and identification of risk factors for young child and parent posttraumatic

stress disorder. *Journal of Child and Adolescent Psychopharmacology, 24* (1), 9-17. DOI:10.1089/cap.2013.0066

De Young, A, C., & Landolt, M, A. (2018). PTSD in children below the age of 6 years. *Disaster Psychiatry: Trauma, PTSD and Related Disorders, 20* (97), doi:10.1007/s11920-018-0966-z

Ehlers, A., & Clark, D. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy, 38*(4), 319–345.

Hiller, R, M., Halligan, S, L., Ariyanayagam, R., Dalgleish, T., Smith, P., Yule, W., … Meiser-Stedman, R. (2016). Predictors of posttraumatic stress symptom trajectories in parents of children exposed to motor vehicle collisions. *Journal of Pediatric Psychology, 41*(1), 108-116. doi: 10.1093/jpepsy/jsv068

Meiser-Stedman, R., (2002). Towards a cognitive-behavioural model of PTSD in children and adolescents. *Clinical Child and Family Psychology Review, 5*(4), 217-232.

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. *The American Journal of Psychiatry, 165*, 1326–1337. doi: 10.1176/ appi.ajp.2008.07081282

Meiser-Stedman, R., Smith, P., Yule, W., Glucksman, E., & Dalgleish, T. (2017). Posttraumatic stress disorder in young children 3 years posttrauma: Prevalence and Longitudinal Predictors. *Journal of Clinical Psychiatry, 78* (3), 334-339.

National Institute for Health and Care Excellence. (2018). *Post-traumatic Stress Disorder.* (Guideline NG116), Retrieved from: https://www.nice.org.uk/guidance/ng116

Scheeringa, M, S., Myers, L., Putnam, F, W., & Zeanah, C, H. (2015). Maternal factors as moderators or mediators of PTSD symptoms in very young children: a two-year prospective study. *Journal of Family Violence, 30*, 633-642.

Scheeringa, M, S., & Zeanah, C, H. (2001). A relational perspective on PTSD in early childhood. *Journal of Trauma Stress, 14,* 799–815.

Williamson, V., Creswell, C., Fearon, P., Hiller, R, M., Walker, J. & Halligan, S, L. (2017). The role of parenting behaviours in childhood post-traumatic stress disorder: a meta-analytic review. *Clinical Psychology Review, 54* 1-13. http://dx.doi.org/10.1016/j.cpr.2017.01.005

Chapter 4. Empirical Paper

Post-Traumatic Stress Disorder in Young Children Exposed to Road Traffic Accidents: Understanding the Role of the Family

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(See Appendix E for Author Guidelines)

Abstract

Young childhood is a time when exposure to trauma occurs most frequently, and when children are highly vulnerable due to their limited emotional, cognitive and psychological development and their sole dependence on their caregivers. Strong associations have been reported between parent and child post-traumatic reactions to acute trauma. The present study aimed to explore the role of parent cognition and behaviour as possible mechanisms through which this association occurs, alongside the role of child demographic, developmental and post-trauma processing in explaining child post-traumatic stress disorder (PTSD). 114 parents of young children (aged 2-10 years) who had experienced a road traffic accident were recruited from three hospital Emergency Departments. Parents completed self-report questionnaires assessing their cognitive processing, parenting behaviour and their child's cognitive processing in the acute period post-trauma (2-4weeks). Child PTSD was later assessed through parent-report measures at six months post-trauma. Results suggested poorer fragmented memory, developmental age, parent-child separation, parenting behaviour and parents' maladaptive appraisals each account for unique variance in child PTSD at six months post-trauma. However, only parental overprotectiveness was found to play a mediating role between parent acute post-traumatic stress symptomology and child PTSD at six months. These findings add to earlier work in this area to suggesting a multi-factorial model of PTSD in children; drawing on cognitive, behavioural, systemic and attachment theories. The results suggest a clinical need for including parents within the assessment and interventions offered to children following exposure to a single-incident trauma.

Keywords: Post-Traumatic Stress Disorder; Children; Parents; Risk Factor; Trauma; Cognitive

Introduction

Whilst Post-Traumatic Stress Disorder (PTSD) in children and adolescents has been studied for over thirty years, reactions to traumatic events in young children have only relatively recently become an area of interest (e.g. Scheeringa, Zeanah, Myers & Putman, 2003a; De Young & Landolt, 2018). The area of childhood trauma is of particular interest given that childhood is a time where exposure to trauma occurs most frequently (De Young, Kenardy, & Cobham, 2011); with estimates of approximately a third of people experiencing trauma before the age of 18 (Lewis et al, 2019). Compared to the adult population, children have additional vulnerabilities which mean they are at greater risk of adverse psychological outcomes following a trauma. These include their limited emotional, physical and cognitive development, which impacts their ability to process, understand and regulate their affect, their ultimate dependence on their parents/caregivers to ensure their safety, and their limited understanding of the world in which they live (Salmon & Bryant, 2002).

Increasing acknowledgements of the developmental component of child PTSD (e.g. Meiser-Stedman, Smith, Glucksman, Yule & Dalgleish, 2008; Scheeringa, Zeanah & Cohen, 2011) led to advances in the diagnostic guidelines for PTSD in young children, with a new developmental subtype (preschool PTSD; age 6 and below) being added to the most recent publication of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Addition (DSM-5; American Psychiatric Association, 2013). Whilst original considerations of children's reactions to trauma reported that child PTSD was not significant enough to warrant separate diagnoses (Garmezy & Rutter, 1985), criticisms highlighted the inappropriateness of the measures used to assess responses to trauma in children (e.g. Galante & Foa, 1986). These criticisms, alongside further research into adapting current PTSD

criteria to appropriately measure child reactions (e.g. Meiser-Stedman et al., 2008), have led to an acceptance of the validity of developmentally adapted PTSD diagnoses in children. Unlike general PTSD diagnoses, the developmentally sensitive criteria for preschool PTSD does not require a peritraumatic affective response but is instead characterised by experiencing one re-experiencing symptom one avoidance symptom, and two hyperarousal symptoms, alongside displaying clinically significant distress or impairment in their relationships.

Within the adult PTSD literature, the dominant models for understanding PTSD draw on cognitive theory to explain its aetiology and maintenance (Brewin, Dalgleish & Joseph, 1996; Ehlers & Clarke, 2000; Dalgleish, 2004). Central to these cognitive models is emphasis on the subjectivity in psychological responses to trauma; idiosyncratic peri-traumatic appraisals (e.g. perceived threat to life), data-driven processing (e.g. overwhelming sensory confusion when processing the trauma) and dissociation are considered key to psychological outcomes following trauma. Furthermore, ongoing negative cognitive processing following the trauma, such as fragmented memory, rumination and avoidance, are considered as processes involved in the maintenance of PTSD symptoms. This model is supported by extensive research, in which subjective, psychological and cognitive factors are considered stronger predictors of subsequent PTSD development compared to objective or demographic factors (Brewin, Andrews & Valentine, 2000).

Within the child literature, considerations have been made for the role of cognitive mechanisms in PTSD (Meiser-Stedman 2002). A recent meta-analysis provided compelling evidence for the association between negative appraisals of trauma and PTSD symptomology in children and adolescents (Mitchell, Brennan, Curran, Hanna & Dyer, 2017). However, much research points to a psychosocial

account of child PTSD, in which cognitive factors are part of a wider multifaceted context (see Trickey, Siddaway, Meiser-Stedman, Serpell & Field, 2012 for a meta-analytic review). Systemic psycho-social models for exploring PTSD in children often aim to account for the additional vulnerabilities faced by children by drawing on systemic and developmental theories. These acknowledge children's developing cognitive and perceptual capacities and maintain the outlook that children's understanding of the world is shaped by those around them. Models of paediatric traumatic stress emphasise the importance of viewing child post-traumatic stress symptomology from a family perspective, as child traumas happen to a child embedded in family systems (Scheeringa & Zeanah, 2001; Kazak et al., 2006); this is particularly true for young children who are very reliant on their caregivers (Scheeringa & Zeanah, 2001).

Whilst there are a range of normative responses to trauma, given that all families will go through a period of adjustment, not all lead to the development of PTSD. Research exploring possible associations with ongoing psychological difficulties suggest elements of the psychological environment (e.g. low social support, parent psychological problem, poor family functioning) around a child can influence their risk of developing PTSD (Trickey et al., 2012), alongside possible underlying early developmental factors (Falmuro & Fenton, 1984), cognitive processing (Ehlers, Mayou & Bryant, 2003), and pre-trauma behaviour (Scheeringa, Wright, Hunt & Zeanah, 2006).

It is recognised that following a child's traumatic event, parents are at risk of developing secondary PTSD, whether or not they are directly involved in the incident themselves (Landolt, Vollrath, Ribi, Gnehm, & Sennhauser, 2003; Hiller, et al., 2016). This has been observed across a variety of trauma types, including: burns

(Bakker, Ven der Heijen, Van Son, & Van Loey, 2013; De Young, Cobham & Kenardy, 2014) , accidental injuries (Kassam-Adams, Marsac, Bakker & Fein, 2015), natural disasters (Mirzamani & Bolton, 2002), and chronic or serious illnesses, such as cancer (Pierce et al., 2017), and diabetes (Landolt, Vollrath, Liambacher, Gnehm & Sennhauser, 2005). Whilst symptom recovery in parents is shown to occur over time (Le Brocque, Hendrikz & Kenardy, 2010; Hiller et al., 2016), parental PTSD is of clinical concern as it poses the risk of increased adverse outcomes for both the parent and the child. Higher parent PTSD symptomology significantly predicts child PTSD symptomology following the child's trauma (Meiser-Stedman, Smith, Yule, Glucksman & Dalgleish, 2017). As with the child and adult PTSD literature, the parent PTSD literature suggests that psychological factors are more important in explaining the aetiology and maintenance of parental PTSD (e.g. Hiller et al., 2016). Given the role of the family environment on child functioning, it seems logical to consider the impact of parental PTSD on subsequent parenting behaviour. The research into the role of parenting behaviour in post-trauma adaptation is contradictory; some studies suggest this plays a significant role in the severity of child PTSD symptomology (Belsky & de Haan, 2011; Dekel & Goldblatt, 2008) and others arguing the need for caution when making these assumptions (Scheeringa, Myers, Putman & Zeanah, 2015; van Ee, Kleber, Jongmans, Mooren, & Out, 2016). A recent review, of the literature suggests parenting behaviour plays a significant but small role in child PTSD development (Williamson et al., 2017). However, the review highlighted the limited number of high-quality studies in examining child Post-Traumatic Stress Symptomology (PTSS) and parenting behaviour, as such they call for future research in this area. Other studies have noticed the importance of the parent-child relationship in the

immediate aftermath of the trauma; separation between parent and child has also been found to be significantly associated with child PTSD, providing further evidence of the role of families in the development of adverse psychological responses to trauma (Meiser-Stedman et al., 2017).

Given the widespread acceptance of developmental and attachment theorists' views that early social and emotional development in children occurs within the context of the parent-child relationship, it is reasonable to consider this relationship as important in a child's adaption to acute trauma. Whilst the relationship between child and parent PTSD symptomology is well established, recent reviews have called for further consideration of the dyadic context of the parent-child relationship when considering the impact of trauma on children (De Young & Landolt, 2018). We need to understand the nature of this relationship in more detail through further exploring the mechanisms through which it operates. Understanding the systemic context around the child involves exploring parent's cognitive appraisals, parenting behaviour, disruption of secure attachment-bonds and factors relating to the child. By expanding on data drawn from a study of young children exposed to road traffic accidents (Hiller et al., 2016; Meiser-Stedman et al., 2017), the present study aims to explore possible cognitive and behavioural mediators of the relationship between parent and child PTSD, whilst also further exploring the developmental nature of PTSD in young children. In order to test out previously mentioned models from a cognitive, behavioural, systemic, and attachment-focused perspective.

Research Questions

The present study therefore aims to build on these previous findings by exploring the mechanisms by which parental and child PTSD operate. This is of clinical importance as it is essential for clinicians to be able to use this information to

inform the support offered to families following a trauma. It will also add to the growing literature and theoretical understanding of PTSD in young children, by exploring individual and familial cognitive and behavioural predictors. The study therefore aims to address the following questions:

1. Do parental cognitive and/or behavioural factors mediate the relationship between acute phase parental PTSS and child PTSD at six months post-trauma?
2. Are child development, pre-trauma temperament or post-trauma cognitive processing in the acute phase associated with PTSD symptomology in children six months post-trauma?
3. Do variables associated with the child (e.g. age, temperament, cognitive processing of the trauma), the severity of the trauma, the parent-child relationship during the trauma (e.g. separation for >1hour) and the parent post-trauma processing (e.g. maladaptive appraisals and overprotective parenting behaviour) account for unique variance in child PTSD at six months post-trauma?

Method

Design

This study uses data from a wider research project exploring PTSD in young children. The original study employed a prospective longitudinal design using quantitative methodology.

Participants

Participants were the parents of children aged 2-10 years old who were admitted to one of three London Hospitals' Emergency Departments (ED) following

the child's involvement in a Road Traffic Accident (RTA). Exclusion criteria were; parents lacking proficiency in English Language (as individuals would not necessarily be able to comprehend the consent procedure and complete the measures); presence of moderate-to-severe intellectual disabilities; or if the child had experienced moderate-to-severe brain injury.

Parents of a total of 312 children were considered eligible to participate in the study, however 120 (38.5%) families could not be re-contacted following incorrect contact details. Therefore, of the 192 families who could be contacted, 114 families consented to participate (59.4% participation rate), with 108 families included in the analysis due to incomplete data. Reasons for non-participation were as follows; 72 (37.5%) families chose not to participate due to not having the time or not wanting to participate in the study and 6 (3.1%) feared they would upset their child if they participated. There were no significant differences in age, sex, or severity of child's injury between families who participated and those who chose not to participate or could not be contacted ($p>0.05$).

Measures

Data was collected through both interview and questionnaire formats in which all data was reported by the parent, both about themselves and their child.

Child Factors

Demographic and trauma related variables: These were collected from medical records accessed through the hospital's emergency department, or at parent interviews at T1. This included the time of separation between parent and child immediately after the motor-vehicle accident. As previous analyses have indicated this as a correlate of child PTSD (Meiser-Stedman et al., 2017), this was included in

the present study as a marker of peri-traumatic subjective distress/unavailability of caregiver.

Child PTSD: The Semi-Structured Interview and Observational Record for Infants and Young Children (IORYC; Scheeringa, Peebles, Cook & Zeanah, 2001; Scheeringa, Zeanah, Myers & Putnam, 2003b; Scheeringa, Zeanah, Drell & Larrieu, 1995) was used to assess parent-report Child PTSD at each time point. This provides a DSM-IV PTSD Diagnosis and has been shown to have good interrater reliability (Scheeringa, Wright, Hunt & Zeanah, 2006; Scheeringa et al., 2001) and good construct validity (Meiser-Stedman, Smith, Glucksman, Yule, & Dalgleish, 2008).

Child Temperament: Parents completed the EASI Temperament Survey for children: Parental Ratings (Buss & Plomin, 1984) to assess child pre-trauma temperament. The measure contains 20 items, rated on a 5-point-Likert scale from 1 'not typical of your child', to 5 'very characteristic of your child' which parents were asked to rate in relation to their child's temperament in the six months prior to the trauma. The EASI provides parents perceptions of child pre-trauma temperament within five subscales; emotionality, activity, shyness, sociability and impulsivity. Previous research has shown the EASI to have good psychometric properties (e.g., Buss & Plomin, 1986; Hubert, Wachs, Peters-Martin, & Gandour, 1982) and provide accurate measure of child temperament through parent report (Slabach, Morrow, & Wachs, 1991)

Developmental History: As part of the interview process, parents were asked about their child's early developmental history. Developmental variables of interest were created based on the possible impact of these on PTSD in children (Famularo & Fenton, 1994) and included factors relating to their new-born, infant and young child history.

Cognitive Processing: At T1, parent-report items were used to assess the child's cognitive processing, through their memory quality and play behaviours. As no formal measure of child memory quality or play following trauma was available, the researchers developed a short, parent-report measure. Parents reported on each statement on a 1 (*don't agree at all*) to 4 (*completely agree*) scale. Memory quality was assessed by agreement with the following three items; 'my child appears confused about what happened in the accident'; 'my child gets the order of what happened jumbled up'; and 'my child can remember what happened but is not very good at putting it in to words'. Post-traumatic play behaviour was assessed by agreement with the following four items; 'my child draws pictures about the accident'; 'my child often plays with toys that are related to the accident (e.g. cars, bike etc.)'; 'my child often talks about the accident'; and 'my child plays in a way similar to things he or she did during the accident'. Higher scores indicated more fragmented memories, or more fragmented play behaviour. Internal consistencies for the memory quality and play items were Cronbach's α=.66 and Cronbach's α=.67, respectively.

Parental Factors

Post-traumatic Stress Symptomology (PTSS): The Post Traumatic Diagnostic Scale (PDS; Foa, Cashman, Jaycox & Perry, 1997) was used to measure parental PTSS in relation to the event their child was involved in. The PDS is a 17-item self-report questionnaire which is widely used to assess PTSS. Scores range from 0 to 51, a score between 1 and 10 is considered mild, a score between 11 and 20 is considered moderate, scores between 21 and 35 are considered moderate to severe and scores of >36 are considered severe. Internal consistency for the PDS items was high (Cronbach's α =.92).

Parental maladaptive cognitions: Parental post-traumatic appraisals were assessed using a modified version of the Post-Traumatic Cognitions Inventory (PTCI; Foa, Ehlers, Clark, Tolin & Orsillo, 1999). This measured parent's negative cognitions about themselves being permanently changed by the event (4 items), feeling to blame for the event occurring (2 items), about the world as a scary place (4 items), and about their perception of damage to their child and family (4 items). Parents responded using a 1 (*don't agree at all)* to 5 (*agree a lot*) scale. At T1, the internal consistency for each of the subscales were as follows; oneself, α =.82; the world, α =.81; and damage to the child, α =.64.

*Parental Overprotection***:** Parental overprotection was assessed using a subscale of the 12-item self-report Family Functioning Questionnaire (FFQ; McFarlane, 1987). This subscale is derived from two items aimed to address parenting behaviour following a child trauma (e.g. "Do you need to know where your children are more than before?"). In the present sample, internal consistency for this sub-scale was found to be α = .73.

Procedure

Parents/caregivers of children who met the inclusion criteria were initially contacted via letter shortly after their child's attendance at an ED. This invitation to participate was later followed up by a telephone call to arrange a suitable time for the initial face-to-face assessment (T1; 2 – 4 weeks following the trauma). See Appendix F for a copy of the information sheet and consent form. Following this, assessments of child PTSD were then carried out at six months post-trauma (T2). Written informed consent was received from all participating parents at the initial assessment. At Time 1 and 2, parents completed the interview and questionnaire battery relating to their own and their child's traumatic reactions in either a clinic or

at their home with the lead researcher (co-author, R. M-S). Additional information relating to the medical status of the child were collected through medical records accessed via the ED's.

All data was collected by the principal investigator, a post-doctoral research fellow. Any children who were identified as having PTSD were referred to a local traumatic stress clinic, and parents were offered support through the research institute or via the same clinic. The study was granted original ethical approval by the Institute of Psychiatry and South London and Maudsley NHS Trust Research Ethics Committee. Please see Appendix G for a copy of the original ethical review form.

Data Analyses

The primary model of interest was the mediating role of parental cognitive and behavioural factors in the relationship between parent acute phase PTSS and child PSTD at six months post-trauma. Regression analyses used the indirect model (Preacher & Hayes, 2008) which estimates indirect and specific indirect effects, whilst also using bootstrapping confidence intervals within a single-step mediator model. Following this, correlations were carried out to test for relationships between child PTSD and child pre and post trauma variables, all denoted by Pearson's *r* correlation co-efficient. Effect sizes for Pearson's *r* are categorised as small (0.1), medium (0.3) and large (0.5).

The second model of interest was exploring the role of particular variables in accounting for variance in child PTSD symptomology. This involved entering variables of interest into a stepwise regression model, with each variable entered after the other, following guidance from Darlington and Hayes (2016). The variables were entered into the model in the following order; i) child demographics, ii) child

temperament, iii) trauma severity, in particular parent-child separation of >1hour, iv) parent overprotectiveness; and v) child memory quality.

Parent-child separation during the trauma was included in the regression modelling as this had previously been found to be predictive of child PTSD (Meiser-Stedman et al., 2017), therefore it was considered important to include this when testing whether the familial or parental factors play a role in child PTSD development. The reported order of variables was chosen as the model aimed to test if parenting factors and child cognitive processing accounted for variance in child PTSD over and above demographic and temperament factors.

Post-hoc power calculations indicate that with our sample, we achieved 81% power to detect a medium effect size (r=.3). For the regression analyses, with 5 predictors entered into the model we achieved 76% power to detect a medium effect size. All data analysis was carried out using SPSS (version 25) with a significance level of 0.05 used throughout.

Results

Descriptive statistics

Descriptive statistics of the demographic and trauma related variables for this sample are presented in Table 4. The majority of the parents who took part were mothers (84.3%). Details of prevalence for PTSD symptomology in this parent sample have been reported elsewhere (Hiller et al., 2016) so will not be repeated here. However, the mean PTSS score (on the PDS) for parents in the acute phase was 10.4 (S.D = 9.95; range = 0-47). For children, the mean PTSD Score (on the IORYC) at six months was 3.36 (S.D. = 4.3; range = 0-19).

Table 4. Descriptive statistics of Demographic and trauma-related variables for both parents and children

Demographic Characteristics	n (%)
Child Demographics	
Gender	
Female	49 (45.4)
Males	59 (54.6)
Age Group	
Younger (2-6years)	60 (55.6)
Older (7-10 years)	48 (44.4)
Ethnicity	
Caucasian	41 (38.0)
Ethnic Minority	67 (62.0)
Parent Variables	
Parent Type	
Mother	91 (84.3)
Father	9 (8.3)
Other	8 (7.4)
Marital Status	
Married/Cohabiting	65 (60.2)
Divorced/Single	43 (39.8)
Trauma Related variables	
RTA Type	
Pedestrian	45 (41.7)
Car Passenger	50 (46.3)
Cyclist	6 (5.6)
Bus Passenger	6 (5.6)
Moped	1 (0.8)
Injury included a fracture	6 (5.6)
Child Admitted to hospital	18 (16.7)
Triage rating[a]	
Immediate triage	11 (10.3)
Very Urgent triage	15 (14.2)
Urgent	20 (18.9)
Standard	60 (56.6)

Note. RTA=Road Traffic Accident

[a]missing data for 2 cases

The role of parental cognitive and behavioural styles in mediating the relationship between parental acute phase PTSS and child PTSD six months post-trauma.

Initially, correlations between the presumed mediators, parental acute PTSS and child PTSD at six months were performed (See Table 5). As these were all statistically significant, all variables were included in the mediation analyses.

To assess whether parental cognitive appraisals or parenting behaviour act as a mediator between acute phase parental PTSS and child PTSD at six months post trauma a series of mediation analyses were performed, following the criteria of Baron and Kenny (1986). This allows us to explore the extent to which cognitive and behavioural factors account for the relationship between parent and child PTSD symptoms.

Table 5. Correlations between presumed mediator variables and independent (parent acute PTSS) and dependant (child PTSD 6 months post-trauma) variables.

	Parental PTSS (acute phase, 2-4 weeks)	Child PTSD (6 months)
Self-blame	0.23*	0.08
Self as permanently changed	0.50***	0.29**
World is scary	0.45***	0.31**
Child and family permanently damaged	0.51***	0.41***
Parental overprotectiveness	0.38***	0.37***

Note. *p<0.05, **p<0.01, ***p<0.001

PTSS = Post-Traumatic Stress Symptomology, PTSD = Post-Traumatic Stress Disorder

According to Baron and Kenny (1986) the first criterion that the independent variable (in this case acute phase parental PTSS) affects the presumed mediator (the various measures of parental cognitive and behavioural response), was met by all variables except self-blame. The second criterion, that the presumed mediator variables affect the dependent variable (in this case child PTSD at six months) was also met by all cognitive and behavioural factors. The third criterion, that there be an indirect effect of the independent variable on the dependent variable via the mediator was only met for the behavioural variable parental overprotectiveness. This criterion was met because a) parental overprotectiveness was related to child PTSD when parent PTSS was controlled for and b) the relationship between parent PTSS and child PTSD decreased when parental overprotectiveness was accounted for (i.e. β coefficient decreased from .2403 to .2067). See Table 6 for mediation coefficients.

In order to test the indirect effect, the bootstrapping method (Bollen & Stine, 1990; Shrout & Bolger, 2002) was used. This is a non-parametric technique that uses resampling with replacement to generate a number of random samples from the initial data set, in the present study the resampling was run 1000 times. Bootstrapping was chosen as the preferred methodology as is reported to hold higher power, and the best Type 1 error control compared to competing tests (Hayes, 2009). For this mediation model, the bias corrected upper and lower 95% confidence intervals did not cross zero (.0065, .0734), therefore suggesting a partial mediation effect of parental overprotectiveness on the relationship between parent acute PTSS and child PTSD six months post-trauma. The final mediation model is presented in Figure 6.

Table 6. Mediation analyses for each possible mediator of the relationship between acute parent PTSS and child PTSD 6 months post-trauma.

Mediator	a path	b path	c path	c'path	Indirect Effect	95% CI of indirect effect		R^2
						LL	UL	
Self-blame	0.04	-0.13	0.24***	0.24***	-0.01	-0.03	0.02	0.28***
Self as permanently changed	0.15***	0.05	0.24***	0.23***	0.01	-0.05	0.08	0.28***
World is scary	0.22***	0.09	0.24***	0.22***	0.02	-0.02	0.06	0.29***
Child and family permanently damaged	0.15***	0.05	0.24***	0.23***	0.01	-0.04	0.08	0.28***
Parental overprotectiveness	0.05**	0.72*	0.24***	0.21***	0.03	0.01	0.07	0.32***

Note. a path = independent variable (IV; Acute phase parent PTSS) to mediator; b path = direct effect of mediator on dependent variable (DV; Child PTSD at 6 months post-trauma); c path = total effect of IV on DV; c' path = direct effect of IV on DV. Mediation is indicated where the 95% confidence intervals of the indirect effect do not cross zero.

*p<.05, **p<.01, ***p<.001

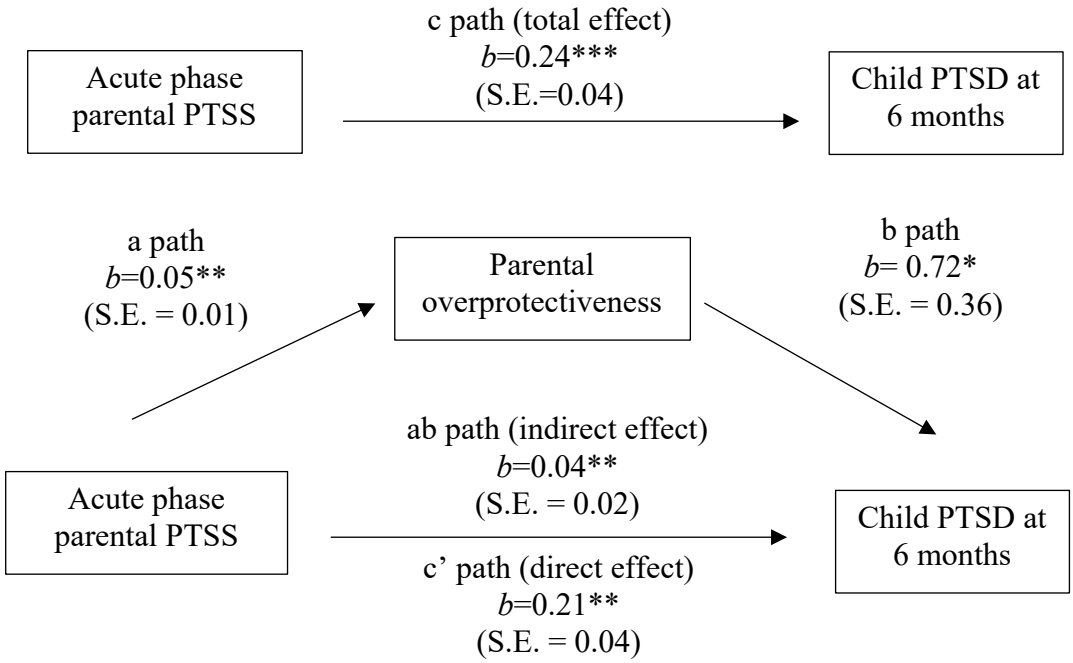

Figure 6. The presumed mediational role of parental overprotectiveness in the relationship between acute phase parental PTSS and child PTSD at 6 months.

*p<0.05, **p<0.01, ***p<0.001

PTSS = Post-Traumatic Stress Symptomology

Exploration of other possible variables associated with child PTSD at six months

Correlations between child PTSD and child individual factors, including temperament, cognitive processing and early development can be found in Table 7. Child pre-trauma temperament factors were not found to correlate with PTSD symptomology in children six months following an acute trauma. A small correlation was shown between Emotionality and child PTSD, which fell just above the cut off for statistical significance (p=0.051). Given this trend, Emotionality was included in further exploratory analyses, despite not being significant.

When considering post trauma variables, child play was not associated with PTSD symptomology, whereas child memory quality was found to be a significant

correlate of child PTSD at six months. The age of the child did not correlate with their PTSD symptomology at six months. However, it is important to note developmental factors influencing child memory quality. In the younger age group (2-6 year olds) a significant, negative correlation was found between age and child memory fragmentation (r = -0.357, p=.022); thus, suggesting a developmental element to memory quality as younger age is associated with having more fragmented memories. In the older age group (7-10year olds) the relationship was non-significant (r = -0.210, p=.192).

Table 7. Correlations between child pre and post trauma variables and child PTSD symptomology 6 months post-trauma

	Child PTSD at 6 months	
Variable	*r*	n
Child Pre-trauma Variables		
Child Age	0.13	108
Younger (2-6years)	-0.07	60
Older (7-10years)	-0.16	48
Temperament		
EASI - Emotionality	0.22	79
EASI - Activity	<0.01	81
EASI - Shyness	-0.06	81
EASI - Sociability	-0.02	80
EASI - Impulsivity	0.10	80
Child Post-trauma Variables		
Child's Memory Quality	0.35*	81
Child's Play	<0.01	83

*p≤0.001; EASI = Emotionality, Activity, Sociability and Impulsivity Survey

Exploratory analyses of the variance explained in Child PTSD by child pre and post trauma variables, and post-trauma parenting behaviour

With the aim of further exploration of the data, hierarchical linear regression modelling of child PTSD Scores at six months was carried out in order to explore whether any variables uniquely accounted for the variance in post-traumatic stress severity. The predictor variables were entered in the following steps: i) child demographics (age group); ii) child personality (Emotionality); iii) parent-child separation (separation for greater than 1 hour); iv) parenting behaviour (parental overprotectiveness); and v) child cognitive processing (memory quality). See Table 8 for details of the coefficients. All predictor variables were assessed in the acute phase post-trauma (2-4 weeks). At every step, the model was significantly improved as each variable accounted for unique variance in child's post-traumatic stress symptoms six months after the trauma. Overall, the model including demographic, personality, relational, parent behaviour and child cognitive processing accounted for 42.9% of the variance in child PTSD. However, at the final step, child emotionality no longer accounted for unique variance, suggesting separation from parent during the trauma, parent overprotectiveness and child cognitive processing account for unique variance in child PTSD over and above child emotionality. Taken together, this supports a developmental, cognitive, behavioural and relational based model for child PTSD six months post-trauma, highlighting the role of both parent and child variables.

Table 8. Regression model predicting child post-traumatic stress symptomology 6 months post-trauma.

Predictor variable	Model		Step		Step 5		
	R^2	*F* test	ΔR^2	*F* test	B	β	P
Step 1: Child Demographic factors	0.08	$F_{1,75} = 6.52$, p=.013	0.08	$F_{1,75} = 6.52$, p=.013			
Age group (2-6 years, 7-10 years)					2.08	0.25	0.01
Step 2: Child Personality Factors	0.15	$F_{2,74} = 6.27$, p=.003	0.07	$F_{1,74} = 5.61$, p=.021			
Emotionality (EASI)					0.15	0.13	0.108
Step 3: Parent-Child Separation	0.31	$F_{3,73} = 11.16$, p<.001	0.17	$F_{1,73} = 18.05$, p<.001			
Separation for >1hour					4.77	0.34	<0.001
Step 4: Parenting behaviour	0.38	$F_{4,72}$=11.20, p<.001	0.07	$F_{1,72} = 8.07$, p=.006			
Parental Overprotectiveness					0.86	0.25	0.009
Step 5: Child Cognitive Processing	0.43	$F_{5,71} = 10.68$, p<.001	0.05	$F_{1,71} = 5.71$, p=.02			
Memory quality					0.43	0.23	0.02

Δ=change, EASI – Emotionality, Activity, Sociability and Impulsivity Survey

Discussion

The present study aimed to expand on current knowledge of the presentation of post-traumatic stress symptomology in children six months after an acute trauma. The analyses were exploratory, across three main areas. Firstly, we aimed to investigate possible mediators of the relationship between acute phase parental PTSS and child PTSD at six months. The results suggest a mediating role of parental overprotectiveness, between child PTSD and parent acute PTSS. However, whilst cognitive factors such as self-blame, seeing the world as a scary place, and seeing the self, child and family as permanently damaged were associated with both parental PTSS in the acute phase, and child PTSD six months later, these factors were not found to play a *mediating* role between acute parental PTSS and later child PTSD. This suggests that parents who have increased PTSS in the immediate aftermath of their child's trauma display higher levels of overprotectiveness in their parenting behaviour, which is in turn associated with higher levels of PTSD in their children. These results add to the earlier disagreements in the literature about the role of parenting behaviour in child PTSD (Scheeringa, Myers, Putman & Zeanah, 2015; van Ee, Kleber, Jongmans, Mooren, & Out, 2016; Belsky & de Haan, 2011; Dekel & Goldblatt, 2008) and support the findings from a recent review that parenting behaviour does play a role (Williamson et al., 2017).

Secondly, the study aimed to explore the role of child development, temperament and cognitive processing in subsequent PTSD. The results are supportive of the role of cognitive processing but did not suggest a relationship between pre-trauma temperament and later PTSD development. A small to medium effect was found for the emotionality aspect of a child's pre-trauma temperament, with a trend towards significance. Importantly, the results highlighted the developmental component of a

child's cognitive processing, with young children displaying more fragmented memories. Thus, providing support to the growing literature which suggests the need for developmentally sensitive assessments of post-traumatic symptomology in young children (Meiser-Stedman, Smith, Glucksman, Yule & Dalgleish, 2008; Scheeringa, Zeanah & Cohen, 2011). Overall, this aspect of our results present tentative support for cognitive models of PTSD in young children (Brewin et al., 1996; Ehlers & Clarke, 2000; Dalgleish, 2004), in which post-trauma processing is considered to be fundamental to the aetiology and maintenance of PTSD.

Lastly, the present study aimed to draw the aforementioned findings together and consider the role both these parent and child factors together in explaining the variance in child PTSD symptomology. Child demographic and temperament factors were initially explored, followed by parent-child separation, parenting behaviour and child cognitive processing of the event. Overall, the analyses suggest all variables accounted for some variance in child PTSD symptomology at six months post-trauma, however pre-trauma emotionality temperament was not found to be a unique contributor. The results add to earlier work in this area to suggesting a multi-factorial model of PTSD in children; drawing on cognitive, behavioural, systemic and attachment theories. Whilst cognitive models of PTSD (e.g. Ehlers & Clarke, 2000) appear to be important for understand PTSD in children, these results suggest the need to also consider the relational, and familial context (Scheeringa & Zeanah, 2001; Kazak et al., 2006).

Limitations

Whilst the present study provides a novel contribution to the current child PTSD literature, there are some limitations which are important to be acknowledged when interpreting the findings. The assessment of child PTSD was based on parent-

report, and research has suggested that parent-child agreement on child PTSD symptomology is no better than chance (Meiser-Stedman, Smith, Yule, Glucksman & Dalgleish, 2017), suggesting this may not the most reliable method of assessing PTSD in children. However, in this sample, parent report was necessary and the most ethically appropriate method for data collection as over half of the sample of children were very young (between 2-6years of age). Alongside this, the brief measures of memory quality and post-trauma play used in the study lack more detailed validation. To the best of our knowledge, there was no valid measure of memory quality in children available at the time of data collection; further research around this may help to develop a more reliable measure and would be important considering the purported theoretical importance of this construct.

We also recognise the limitations of the study given the relatively small sample size; this is likely to impact the generalisability of the results. Whilst the sample was moderately powered for the analyses used, caution should be had over the external validity of the results. In order to draw more substantial conclusions from the findings, and be more confident in the theoretical implications, further research exploring the cognitive and relational elements of child PTSD would be needed.

There are also some caveats to our statistical analyses. Given the multiple mediation analyses undertaken, we recognise that this increases the risk of a type 1 error, often referred to as a ‘false positive’ (Simmons, Nelson & Simonsohn, 2011). The aforementioned dispute in the current literature about the role of parenting behaviour in child PTSD (Scheeringa et al., 2015; van Ee et al., 2016; Belsky & de Haan, 2011; Dekel & Goldblatt, 2008) suggests that further research is therefore

needed to ensure a more robust understanding of mediating factors between child and parent PTSD.

Clinical implications and future research

Taken together, the results from the present study have presented evidence which strengthens the case for considering the impact of parental mental health on child functioning in the aftermath of child trauma. Whilst recognising the relational context of the parent-child relationship, the results also pose the need to consider cognitive models when understanding the development of PTSD in children. The findings suggest that each of these factors alone, do not solely account for child PTSD development, but that neither must be dismissed. In particular, the results suggest that interventions which target supporting the parenting behaviours, whilst also supporting the child's processing of the event in the early stage post-trauma may have an impact on child long-term outcomes. Future research would be needed to explore this further and to be able draw more substantial conclusions from the findings and be more confident in the theoretical and clinical implications. Despite this, tentative support is provided for both the cognitive (e.g. Ehlers & Clarke) and familial (Scheeringa & Zeanah, 2001; Kazak et al., 2006) models of PTSD and suggests that future research should move towards creating a holistic model of PTSD in young children drawing on cognitive, behavioural, systemic and attachment theories.

Conclusion

In conclusion, this study suggests the importance of considering multiple aspects, including developmental, cognitive and systemic factors, in understanding the development of PTSD in children following a single-event trauma. We suggest that parents' own post-traumatic symptomology in the acute phase post-trauma may

contribute, through parenting behaviour, to their child's ongoing PTSD. Alongside this, we identify the need to consider the role of separation from parent, and child cognitive processing of the event, particularly when assessing the impact of traumatic events in early childhood.

References

American Psychiatric Association (2013). *Diagnostic and statistical manual or mental disorders, 5th edition (DSM-5)*. American Psychiatric Press, Washington, DC

Bakker, A., Van der Heijden, P, G, M., Van Son, M, J, M., & Van Loey, N, E, E. (2013). Course of traumatic stress reactions in couples after a burn event to their young child. *Health Psychology 32*(10), 1076-1083. http://dx.doi.org/10.1037/a0033983

Baron, R.M., & Kenny, D.A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173-1182.

Belsky, J., & de Haan, M. (2011). Annual research review: parenting and children's brain development: the end of the beginning. J*ournal of Child Psychology and Psychiatry, 52*(4), 409–428. doi:10.1111/j.1469-7610.2010.02281.x.

Bollen, K. A., & Stine, R., (1990). Direct and indirect effects: Classical and bootstrap estimates of variability. *Sociological Methodology, 20*, 115-40.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. J*ournal of Consulting and Clinical Psychology, 68*, 748–766.

Brewin, C, R., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of post-traumatic stress disorder. *Psychological Review, 103*(4), 670-686.

Buss, A., & Plomin, R. (1984). *Temperament: Early developing personality traits*. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Buss, A. H., & Plomin, R. (1986). The EAS approach to temperament. In R. Plomin & J. Dunn (Eds.), *The study of temperament: Changes, continuities and challenges*. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Dalgleish, T. (2004). Cognitive approaches to posttraumatic stress disorder: the evolution of multi-representational theorizing. *Psychological Bulletin, 130*(2), 228–260.

Darlington, R, B., & Hayes, A, F. (2016). *Regression Analysis and Linear Models; Concepts, Applications and Implementation*. New York, NY: The Guildford Press.

Dekel, R., & Goldblatt, H. (2008). Is there intergenerational transmission of trauma? The case of combat veterans' children. *American Journal of Orthopsychiatry, 78*(3), 281–289. doi:10.1037/a0013955.

De Young, A, C., Cobham, V., & Kenardy, J. (2014). Prospective Evaluation of parent distress following pediatric burns and identification of risk factors for young child and parent posttraumatic stress disorder. *Journal of Child and Adolescent Psychopharmacology, 24* (1), 9-17. DOI: 10.1089/cap.2013.0066

De Young, A, C., Kenardy, J, A., & Cobham, V, E. (2011). Trauma in early childhood: a neglected population. *Clinical Child and Family Psychological Review, 14* (3), 231 – 150. DOI: 10.1007/s10567-011-0094-3.

De Young, A, C., & Landolt, M, A. (2018). PTSD in children below the age of 6 years. *Disaster Psychiatry: Trauma, PTSD and Related Disorders, 20* (97), doi:10.1007/s11920-018-0966-z

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy, 38*, 319–345.

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

Famularo, R., & Fenton T. (1994). Early Developmental history and pediatric posttraumatic stress disorder. *Archives of Pediatric Adolescent Medicine, 148*, 1032-1038.

Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment, 9,* 445–451.

Foa, E. B., Ehlers, A., Clark, D. M., Tolin, D. F., & Orsillo, S. M. (1999). The Posttraumatic Cognitions Inventory (PTCI): Development and validation. *Psychological Assessment, 11,* 303.

Galante, R., & Foa, D. (1986). An epidemiological study of psychic trauma and treatment effectiveness after a natural disaster. *Journal of the American Academy of Child and Adolescent Psychiatry, 25*, 357-363.

Garmezy, N., & Rutter, M. (1985). *Acute reactions to stress*. In M. Rutter & L. Hersov (Eds.), Child and Adolescent Psychiatry: Modern Approaches (2nd Edition) (pp. 152-176). Oxford: Blackwell.

Hayes, A.F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, *76,* 408-420.

Hiller, R, M., Halligan, S, L., Ariyanayagam, R., Dalgleish, T., Smith, P., Yule, W., … Meiser-Stedman, R. (2016). Predictors of posttraumatic stress symptom trajectories in parents of children exposed to motor vehicle collisions. *Journal of Pediatric Psychology, 41*(1), 108-116. DOI: 10.1093/jpepsy/jsv068

Hubert, N. C., Wachs, T. D., Peters-Martin, P., & Gandour, M. J. (1982). The study of early temperament: Measurement and conceptual issues. *Child Development, 53*, 571–600.

Kassam-Adams, N., Marsac, M, L., Bakker, A., & Fein, J, A. (2015). Traumatic stress, depression and recovery: child and parent responses after emergency medical care for unintentional injury. *Pediatric Emergency Care, 31* (11), 737-742.

Kazak, A, E., Kassam-Adams, N., Schneider, S., Zelikovsky, N., Alderfer, M, A., & Rouke, M. (2006). An integrative model of pediatric medical traumatic stress. *Journal of Pediatric Psychology, 31*(4), 343-355. doi:10.1093/jpepsy/jsj054

Landolt, M., Vollrath, M., Liambacher, J., Gnehm, H, E., & Sennhauser, F. (2005). Prospective study of posttraumatic stress disorder in parents of children with newly diagnosed type 1 diabetes. *American Journal of Child and Adolescent Psychiatry, 44* (7), 682 - 689. DOI: 10.1097/01.chi.0000161645.98022.35

Landolt, M, A., Vollrath, M., Ribi, K., Gnehm, H, E., & Sennhauser, F, H. (2003). Incidence and associations of parental and child posttraumatic stress symptoms in pediatric patients. *Journal of Child Psychology and Psychiatry, 44* (8), 1199-1207.

Le Brocque, R. M., Hendrikz, J., & Kenardy, J. A. (2010). Parental response to child injury: Examination of parental posttraumatic stress symptom trajectories following child accidental injury. *Journal of Pediatric Psychology, 35*, 646–655.

Lewis, S, J., Arseneault, L., Caspi, A., Fisher, H., Matthews, T., Moffitt, T., … Danese, A. (2019). The epidemiology of trauma and posttraumatic stress

disorder in a representative cohort of young people in England and Wales. *Lancet Psychiatry, 6,* 247-256.

McFarlane, A. C. (1987). Family functioning and overprotection following a natural disaster: the longitudinal effects of post-traumatic morbidity. *Australian and New Zealand Journal of Psychiatry, 21*, 210-218.

Meiser-Stedman, R., (2002). Towards a cognitive-behavioural model of PTSD in children and adolescents. *Clinical Child and Family Psychology Review, 5*(4), 217-232.

Meiser-Stedman, R., Smith, P., Yule, W., Glucksman, E., & Dalgleish, T. (2017). Posttraumatic stress disorder in young children 3 years posttrauma: Prevalence and Longitudinal Predictors. *Journal of Clinical Psychiatry, 78* (3), 334-339.

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. *The American Journal of Psychiatry, 165*, 1326–1337. doi: 10.1176/ appi.ajp.2008.07081282

Mirzamani, M., & Bolton, D. (2002). PTSD Symptoms of mothers following occurrence of a disaster affecting their children. *Psychological Reports, 90,* 431-483.

Mitchell, R., Brennan, K., Curran, D., Hanna, D., & Dyer, K. F. (2017). A Meta-Analysis of the Association Between Appraisals of Trauma and Posttraumatic Stress in Children and Adolescents. *Journal of Traumatic Stress, 30*, 88-93.

Pierce, L., Hocking, M, C., Schwartz, L, A., Alderfer, M, A., Kazak, A, E., & Barakat, L, P. (2017). Caregiver distress and patient health-related quality of life: psychosocial screening during pediatric cancer treatment. *Psycho-Oncology, 26,* 1555-1561. DOI: 10.1002/pon.4171

Preacher, K.J., & Hayes, A.F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879–891.

Salmon, K., & Bryant, R, A., (2002). Posttraumatic stress disorder in children: the influence of developmental factors. *Clinical Psychology Review, 22* (2), 163-188. https://doi.org/10.1016/S0272-7358(01)00086-1

Scheeringa, M, S., Myers, L., Putman, F, W., & Zeanah, C, H. (2015). Maternal factors as moderators or mediators of PTSD symptoms in very young children: a two-year prospective study. *Journal of Family Violence, 30,* 633-642, DOI: 10.1007/s10896-015-9695-9

Scheeringa, M, S., Peebles, C, D., Cook, C, A., & Zeanah, C, H. (2001). Toward establishing procedural, criterion, and discriminant validity for PTSD in early childhood. *Journal of the American Academy of Child and Adolescent Psychiatry, 40,* 52–60.

Scheeringa, M, S., Wright, M, J., Hunt, J, P., & Zeanah, C, H. (2006). Factors affecting the diagnosis and prediction of PTSD symptomatology in children and adolescents. *American Journal of Psychiatry, 163*, 644-652.

Scheeringa, M, S., & Zeanah, C, H. (2001). A relational perspective on PTSD in early childhood. *Journal of Trauma Stress, 14,* 799–815.

Scheeringa, M, S., Zeanah, C, H., & Cohen, J, A. (2011). PTSD in children and adolescents: toward an empirically based algorithm. *Depress Anxiety, 28* (9):770–82. https://doi.org/10.1002/da.20736.

Scheeringa, M, S., Zeanah, C, H., Drell, M, J., & Larrieu, J, A. (1995). Two approaches to the diagnosis of posttraumatic stress disorder in infancy and early childhood. *Journal of the American Academy of Child and Adolescent Psychiatry, 34,* 191–200.

Scheeringa, M, S., Zeanah, C, H., Myers, L., & Putnam, F, W. (2003a). New findings on alternative criteria for PTSD in preschool children. *Journal of the American Academy of Child and Adolescent Psychiatry, 42,* 561–570.

Scheeringa, M, S., Zeanah, C, H., Myers, L., & Putnam, F, W. (2003b). Predictive validity in a prospective follow-up of PTSD in preschool children. *Journal of the American Academy of Child and Adolescent Psychiatry, 44,* 899–906

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7*, 422-445.

Simmons, J, P., Nelson, L, D., & Simonsohn, U. (2011). False-positive psychology: undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science, 22*(11), 1359-1366. DOI:10.1177/0956797611417632

Slabach, E. H., Morrow, J., & Wachs, T. D. (1991). Questionnaire measurement of infant and child temperament: Current status and future directions. In J. Strelau & A. Angleitner (Eds.), *Explorations in temperament.* New York: Plenum Press.

Trickey, D., Siddaway, A, P., Meiser-Stedman, R., Serpell, L., & Field, A. (2012). A Meta-analysis of risk factors for post-traumatic stress disorder in children and adolescents. *Clinical Psychology Review, 32,* 122-138.

van Ee, E., Kleber, R, J., Jongmans, M, J., Mooren, T, T, M., & Out, D. (2016). Parental PTSD, adverse parenting and child attachment in a refugee sample. *Attachment and Human Development, 13*(3), 273-291. DOI: 10.1080/14616734.2016.1148748

Williamson, V., Creswell, C., Fearon, P., Hiller, R, M., Walker, J. & Halligan, S, L. (2017). The role of parenting behaviours in childhood post-traumatic stress disorder: a meta-analytic review. *Clinical Psychology Review, 54* 1-13. http://dx.doi.org/10.1016/j.cpr.2017.01.005

Chapter 5. Additional Methodology

This chapter provides additional details of the methodological processes from both the systematic review, presented in Chapter 2, and the empirical study, presented in Chapter 4. All information necessary to understand the processes involved in undertaking each study is included in the main chapter, the information presented here is considered supplementary.

Additional Methodology for Systematic Review

This section includes further details of the methodology used for the systematic review paper outlined in Chapter 2.

Search Strategy

As referred to in the methods section of the meta-analytic paper, this review was completed alongside the third author (AB) in order to support one another with research projects as part of the doctorate in Clinical Psychology (ClinPsyD). The initial stages of the searching and extraction were done jointly with the third author. This involved dividing the total number of papers for review into two, and both excluding papers which did not meet the inclusion criteria. As such, the inclusion and exclusion criteria for both studies was largely the same, with some minor differences related to the type of trauma included in each review. Both authors extracted data from the final review papers, which were later divided into two groups based on the trauma type categories, for use in two separate meta-analyses of child trauma; single incident/acute trauma and trauma within the context of a long-term health condition. These were divided based on reviewing the trauma type included in each study and jointly agreeing which meta-analysis the paper should be included in. Twelve studies were included in both meta-analyses, as the type of trauma included were mixed, or were considered ambiguous where the traumatic event could be a

single incident or associated with a long-term condition (e.g. PICU admission). These were agreed to be included in both analyses as to exclude them from both would not allow representation of all trauma types. As mentioned in the main text, we acknowledge the possible impact these papers may have on biasing the overall results. As such, sensitivity analyses for both prevalence and risk factor estimates were performed with these papers excluded.

Working in a research team allowed for enhanced quality of the review as it involved scrutiny and consistency of the systematic process. All queries were discussed, with justifications presented to one another and agreed on as a pair, any queries which could not be resolved were consulted by the supervisor, and third author (RMS) who is a much senior researcher. All quality assessments, data analysis and interpretation of the data was completed individually by the first author.

Converting effect sizes when r was not reported

As mentioned in the main methods section of the meta-analysis, many of the papers included in the review did not report *r*'s, and therefore every effort was made to compute effect sizes from the available statistics. All conversions were made to compute a Pearson's *r* using formulae in Excel; this was used as the statistic of interest as most studies reported *r*'s and was therefore the most suitable statistic to use for comparison and synthesis across samples. Where just means and sample sizes were reported, a Cohen's d was computed through extracting the means and variances of each group. The Cohen's d was then computed to r using an equation outlines by Borstein, Hedges, Higgins and Rothstein, (2009). When a *t* statistic and the associated degrees of freedom were reported, this could be easily calculated to *r* using the formula outlined by Cohen (1965). Similarly, if an ANOVA *F* statistic was reported to identify differences between groups, the *F* was converted to a Cohen's d

using the formula outlined by Rosnow and Rosenthal (1996), which was then converted to a *r* using the aforementioned formula. When odds ratios were presented, these were again converted to Cohen's d using a strategy outlined by Borstein et al. (2009). Finally, an effect size was computed from standardised regression coefficients (β) using a formula outlined by Peterson and Brown (2005).

This rigorous and inclusive process ensured that all available analyses were included in the review, allowing for more accurate estimates of population effect sizes. Converting all statistics to a *r* also ensured that the analyses were interpretable and comparable across risk factor types.

Additional Methodology for Empirical Paper

This section includes further brief details of the methodology used for the empirical study outlined in Chapter 4.

Pre-existing Database

As previously mentioned, the empirical study was only made possible through the use of a pre-existing database from a longitudinal study of the post-traumatic reactions of young children and their parents following a motor vehicle accident (Meiser-Stedman, Smith, Glucksman, Yule & Dalgleish, 2008; Hiller et al., 2016; Meiser-Stedman et al., 2017). In order to retain the anonymity of the participants in the original study, and to ensure the confidentiality of the data was upheld, the data set was received in an anonymised format. This included removal of any remotely identifying information, such as names, date-of-birth, NHS numbers and recruitment site. As such, there were limited ethical considerations needed for the project. The initial young child study underwent full ethical review for each aspect of the data collect process, and this was later added to with further review for

a three year follow up. By utilising this pre-existing data set, we are able to enhance the contributions made by the participants by providing even further meaningful contributions to our understandings of family psychological responses to trauma.

Chapter 5. References

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2009). Introduction to Meta-Analysis, Chapter 7: Converting Among Effect Sizes (pp. 45–49). Chichester: West Sussex, UK: Wiley.

Cohen, J. (1965). Some statistical issues in psychological research. *Handbook of clinical psychology*, 95-121.

Hiller, R, M., Halligan, S, L., Ariyanayagam, R., Dalgleish, T., Smith, P., Yule, W., … Meiser-Stedman, R. (2016). Predictors of posttraumatic stress symptom trajectories in parents of children exposed to motor vehicle collisions. *Journal of Pediatric Psychology, 41*(1), 108-116. doi: 10.1093/jpepsy/jsv068

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. *The American Journal of Psychiatry, 165*, 1326–1337. doi: 10.1176/appi.ajp.2008.07081282

Meiser-Stedman, R., Smith, P., Yule, W., Glucksman, E., & Dalgleish, T. (2017). Posttraumatic stress disorder in young children 3 years post trauma: Prevalence and Longitudinal Predictors. *Journal of Clinical Psychiatry, 78* (3), 334-339.

Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology, 90*(1), 175-181. doi:10.1037/0021-9010.90.1.175

Rosnow, R. L., & Rosenthal, R. (1996). Computing contrasts, effect sizes, and counter nulls on other people's published data: General procedures for research consumers. *Psychological Methods, 1*(4), 331.

Chapter 6. Additional Results

This chapter provides details of additional results from both the systematic review, presented in Chapter 2, and the empirical study, presented in Chapter 4.

Additional Results for Systematic Review

This section will discuss further analyses and results from the systematic review outlined in Chapter 2.

Quality Assessment

As mentioned in the main body of the methodology in Chapter 2, assessments of quality were undertaken for each paper included in the review. Overall quality scores are reported in the main chapter, however a detailed consideration of the risk of bias assessment for each study is presented in Table 9 below. Green denotes a score of 2, reflecting the quality item was well addressed by the study, yellow indicates a score of 1 meaning the item was partially addressed and red denotes a score of 0 meaning the item was poorly addressed, or not reported at all in the paper. Summed total scores are also presented, most of which are out of 24, however studies that just reported prevalence or risk factor data were scored out of 22, and their final scores were prorated to ensure all quality scores were comparable. For studies where two individual papers utilising data from the same sample were included, each paper was quality rated individually, and final scores were combined to present one quality score for both papers.

Table 9. Quality scores for each individual item for all papers included in the review

	Risk of Bias Criteria												Total Score /24	Risk of bias Category
	Population						Outcomes				Analyses			
Study	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2		
Allenou et al. (2010)													16	Moderate
Bakker et al. (2013)													18	Low
Balluffi et al. (2004)													15	Moderate
Binder et al. (2011)													8	High
Bronner et al. (2008)													19	Low
Bryant et al. (2004)													18	Low
Chang et al. (2016)													14	Moderate
Coakley et al. (2010)													17	Low
De Vries et al. (1999)													14	Moderate
De Young et al. (2014)													11	Moderate
Egberts et al. (2016/2016)/ Pan et al. (2015)													16**	Moderate
Franck et al. (2015)													18	Low
Fukunishi (1998)								-					11*	Moderate
Hall et al. (2006)													15	Moderate
Meiser-Stedman et al. (2017)/Hiller et al. (2016)													17**	Moderate

Study	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	Total Score /24	Risk of bias Category
Kassam-Adams et al. (2009)													18	Low
Kassam-Adams et al. (2015)													12	Moderate
Kubota (2016)													13	Moderate
Landolt et al. (1998)													15	Moderate
Landolt et al. (2003)													16	Moderate
Landolt et al. (2012)													17	Low
LeDoux et al. (1998)													5	High
Lefkowitz et al. (2010)													14	Moderate
Martin-Herz et al. (2012)													15	Moderate
Mirzamani & Bolton (2002)													12	Moderate
Nugent et al. (2007)													16	Moderate
Ostrowski et al. (2007)													17	Low
Ostrowski et al. (2011)													16	Moderate
Rees et al. (2004)													16	Moderate
Ribi et al. (2007)													13	Moderate
Rizzone et al. (1994)													6	High

Study	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	Total Score /24	Risk of bias Category
Rodriguez-Rey & Alsonso-Tapia (2017)													13	Moderate
Scheeringa et al. (2015)													15	Moderate
Sturms et al. (2005)													13	Moderate
Van Meijel et al. (2015)								-					20*	Low
Willebrand & Sveen (2016/2016)													13**	Moderate
Winston et al. (2003)													12	Moderate

*Pro-rated score (due to one item on the scale not being relevant to the study) **Average score across combined papers

Risk Factors not included in the analysis

As described in the method section of Chapter 2, some variables associated with parental PTSD reported in the studies could not be included in the meta-analysis as they were only reported by one study. Guidance on completion of meta-analyses indicate the need for at least two effect sizes in order to meta-analyse the results (Cuijpers, 2016). As such, the details of the single risk factors reported in the studies, but not included in the analysis can be found in Table 10. In order to understand the role of these variables in more detail and draw more firm conclusions further research is needed.

Sensitivity Analyses for Risk Factors

As mentioned in the main body of the systematic review in Chapter 2, sensitivity analyses were carried out for both the prevalence and risk factor data. Table 11 presents the details of the changes to risk factor estimates when sensitivity analyses were conducted to remove studies that were high risk of bias or reported data from mixed trauma samples. The exact changes to parent direct exposure to trauma, female parent gender, length of hospital admission, and parent anxiety are displayed. As previously mentioned, parent stress, parent negative coping style, poor child recovery and lack of social support could no were no longer able to be meta-analysed due to too few studies (k=1 or less).

Table 10. Single risk factors reported in the studies, which were able to be meta-analysed

Study	Risk Factor	N	r
Balluffi et al. (2004)	Unexpected Admission	161	0.29
	New traumatic event in the family		0.21
Bronner et al. (2008)	Length of artificial Ventilation	247	0.01
	Pre-PICU Morbidity		0.20
	Acquired PICU Morbidity		0.28
Chang et al. (2016)	Previous IVF	102	0.07
	Caesarean delivery Method		-0.10
	Ventilation		-0.04
	Neonatal Therapeutic Intervention Scoring System		-0.01
	Pre-term birth complications		-0.20
	Post-partum duration		0.03
	Previous abortion		0.45
	Preterm Premature Rupture of Membranes		0.28
Coakley et al. (2010)	Child event related distress	51	0.35
	Motor vehicle Accident		0.31
De Vries et al. (1999)	Child Race	102	0.00
Egberts et al. (2016/2016)/ Pan et al. (2015)	Pre-trauma behavioural problems	162	0.09
Franck et al. (2015)	Single parent	107	0.25
	Distraction/Humour		0.06
	Optimism		-0.27
	Number of other children		0.00
	Prior hospitalisation of other children		0.00
	Distance between family home and hospital		0.00
Hall et al. (2006)	Child dissociation	62	0.33

Kassam-Adams et al. (2009)	Parent direct exposure	251	0.06
	Child pain within the first month post-injury		0.21
	Interim trauma		0.27
Kassam-Adams et al. (2015)	Child primary Injury Diagnosis	178	0.00
Kubota (2016)	Child IQ	72	0.20
	Maternal Quality of Life		-0.61
	Feeling of 'economic burden'		0.45
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Positive beliefs about worry	56	0.03
	Permanent Change to self		0.04
	Appraisal of the world as scary		0.02
	Appraisal of the child as permanently damaged		0.06
Ostrowski et al. (2007)	Urinary free cortisol response	61	0.02
	Urinary free cortisol response (excluding prior trauma)		-0.29
Rees et al. (2004)	Hospital ward (PICU vs general ward)	60	0.42
Ribi et al. (2007)	Extraversion	139	0.16
	Openness		0.02
	Agreeableness		0.04
	Conscientiousness		0.12
Scheeringa et al. (2015)	Observed Emotional Sensitivity	62	0.11
	Observed Discipline		0.22
Sturms et al. (2005)	Other people injured	50	0.34
Willebrand & Sveen (2016/2016)	Time since injury	106	-0.14
	Pre-existing medical/developmental/ psychological comorbidity		0.08

Winston et al. (2003)	STEPP Score	162	0.67
	Parent with child in ambulance/helicopter		0.09

Table 11. Changes to risk factor estimates following sensitivity analyses

	All studies included				High risk of bias studies removed				Mixed sample studies removed			
Risk Factors	*k*	N	r	*p*	*k*	N	r	*p*	*k*	N	r	*p*
Objective trauma factors												
Trauma severity	18	1976	0.10	0.0125	15	1876	0.09	0.0313	12	1240	0.12	0.01
Length of admission	9	1252	0.16	0.0129					**2**	**208**	**0.14**	**0.1437**
Parent direct exposure	7	748	0.17	0.0749	**6**	**723**	**0.22**	**0.046**				
Parent Factors												
Parent older	3	279	0.05	0.40					2	194	0.43	0.558
Female Parent	8	1536	0.15	0.0287	**7**	**1496**	**0.134**	**0.063**	**2**	**429**	**0.13**	**0.0822**
Parent Race (BME)	6	747	0.19	0.03					3	394	0.32	0.004
Parent Low SES	5	691	-0.05	0.5					3	404	-0.12	0.1815
Parent Prev. trauma	7	1061	0.23	0.001					4	514	0.28	0.004
Parent perceived trauma severity	7	807	0.29	<0.001					3	358	0.34	0.018
Parent Acute Stress Disorder	5	791	0.49	<0.001					3	545	0.40	0.0076
Parent Depression	7	769	0.59	<0.001					4	434	0.55	0.020
Parent Anxiety	4	368	0.45	0.0026					**2**	**118**	**0.26**	**0.3037**
Parent Stress	4	289	0.35	0.0035	2	224	0.46	0.003	0*			
Parent Psychological Distress	5	413	0.29	0.0687	4	373	0.35	0.0524	4	373	0.35	0.0524
Parent Negative Coping Style	2	246	0.43	<0.001					0*			

Child Factors												
Child Younger Age	13	1750	-0.08	0.0128					8	851	-0.14	0.003
Child Male Gender	13	1589	0.07	0.0375					8	690	0.13	0.0126
Child previous Trauma/Hospital Admission	7	800	0.17	<0.001					4	460	0.12	<0.001
Child Medical complications	6	750	0.23	<0.001	5	710	0.24	<0.001	4	463	0.28	<0.001
Child Post-traumatic Stress Disorder	15	1707	0.36	<0.001					13	1292	0.37	<0.001
Child Externalising problems	5	551	0.20	<0.001	4	516	0.22	<0.001	4	479	0.17	0.001
Child Poorer Recovery	6	1012	0.27	<0.001					1*			
Family Factors												
Poor Family Functioning	8	829	0.23	0.0057					4	331	0.36	0.0012
Lack of Social Support	3	238	-0.08	0.2241	2	213	-0.07	0.329	1*			

Note. *Risk factors could no longer be meta-analyses due to too few studies. Numbers in bold highlight the risk factor estimates where the sensitivity analysis changed the significance value.

Additional Results for Empirical Paper

This section will discuss further analyses and results from the empirical paper outlined in chapter 4.

Assumptions of the regression model

As discussed in chapter 4, a stepwise regression analysis was to explore the role of child and parent variables in accounting for variance in child PTSD symptomology. Prior to completing this analysis, a series of data screening methods were used to check the data met the assumptions of the statistical test. According to Field (2009) the assumptions of regression modelling are as follows; all predictor variables must be quantitative or categorical; the predictors should have some variability; there should be no perfect multicollinearity between two or more of the predictors; predictors are uncorrelated with 'external variables'; the residuals at each level of the predictor should have homoscedasticity; the residual items should be uncorrelated; the data must be normally distributed; the outcome values are all independent; and there must be linearity in the assumed relationship.

Scatterplots with lines of best fit were generated to observe whether there the relationships between all predictor variables and the outcome variable were linear or not. Histograms were also generated for all predictor variables to assess the distribution of the data. All scatterplots indicated a linear relationship between the predictor and outcome variables. Histograms indicated the data to be normally distributed. Multicollinearity between predictor variables was assessed by generating pairwise correlation coefficients between all predictor variables included in the model. The rule that any correlation where $r > .7$ was used to determine if a correlation was high, and therefore variables could not be included in the subsequent regression modelling. None of the correlation coefficients indicated a high

correlation, and thus all could be used within the model. In addition, the Durbin-Watson test (Durbin & Watson, 1950/1951) was used to assess for serial correlations between residuals. By using Field's (2009) rule of thumb that values less than 1 or greater than 3 are of concern, we conclude that the residuals were independent from one another. As such, the assumptions of the multiple linear regression modelling were met.

Additional exploratory analyses

Furthermore, additional exploratory analyses were undertaken as part of the empirical project. Whilst the main body of the empirical paper discusses the role of child memory quality and child play during the acute phase in the role of child PTSD six months following a trauma, Table 12 shows the breakdown of each of the sub-items for the child memory quality measure and the correlation with child PTSD at T2 (six months post-trauma) and parent PTSD at T1 (acute phase 2-4weeks post-trauma). The variables that display significant correlations with child PTSD at six months appear to be those which are associated with cognitive processing, memory, and strong emotional reactions. These findings may add further to the argument discussed in the main chapter presenting towards a cognitive model of PTSD. However, these constructs require further exploration with large samples and the development of a valid measure is necessary to further conclusions.

Table 12. Correlations between child cognitive variables and acute phase parent PTSS and child PTSD at 6 months

	Parent PTSS at T1		**Child PTSD at T2**	
Child cognitive processing subscales	r	n	r	n
Child draws pictures about the accident	.30**	82	.10	82
Child plays with toys that are related to the accident	.37**	83	.11	83
Child often talks about the accident	.15	82	-.05	82
Child appears confused about what happened in the accident	.32**	81	.27*	81
Child can't remember bits of what happened	.17	81	.2	81
Child gets the order of what happened jumbled	.26*	82	.35**	82
Child can remember what happened but cannot verbalise it easily.	.19	82	.23*	82
Child plays in a similar way to the accident	.12	82	-.09	82
Child feels ashamed about the accident	.12	83	.36**	83
Child feels angry towards the people responsible for the accident	.27*	82	.28**	83
Child gets angry at himself/herself for the accident	-.02	83	.12	83

Note. *p<0.05, ** p<0.01***p<0.001
T1 = 2-4weeks post-trauma, T2 = 6 months post-trauma.

Chapter 6. References

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2009). Introduction to Meta-Analysis, Chapter 7: Converting Among Effect Sizes (pp. 45–49). Chichester: West Sussex, UK: Wiley.

Cuijpers, P. (2016). *Meta-analyses in mental health research: A practical guide*. Amsterdam, Netherlands: VU University

Durbin, J., & Watson, G, S. (1950). Testing for serial correlation in least squares regression. I *Biometrica 37*(3-4) 409-428

Durbin, J., & Watson, G, S. (1951). Testing for serial correlation in least squares regression. II. *Biometrica 38*(1-2) 159-179.

Field, A. (2009). *Discovering Statistics using SPSS*. London: Sage Publications Ltd.

Chapter 7. Discussion & Critical Evaluation

This chapter presents a discussion of the findings from both the systematic review and empirical paper together and provides an evaluation of the thesis process as a whole. Both papers explored post-traumatic stress reactions in children and their parents/caregivers following the child experience of a single traumatic event.

Overview

Meta-Analysis

Firstly, the meta-analysis provided an outlook on the secondary impact of child single incident trauma on the parent's psychological functioning. The review offered a systematic and comprehensive review of relevant literature and produced an estimate of the prevalence of PTSD experienced by parents, alongside highlighting possible factors associated with the parent, the child and the trauma which may place a parent more at risk of developing PTSD. Estimates suggested around 17.0% (95% CI 14.1–20.0%) of parents may develop PTSD following their child's traumatic event; a significant number of parents who may have long-lasting and complex psychological difficulties as a result of secondary trauma. Moderator and sensitivity analyses of the prevalence estimate found that estimates were higher when assessed through self-report measures compared to clinical interviews, but no significant differences in mothers compared to fathers were found. Estimates were significantly higher than those reported for PTSD in adults (4.0%; Lui et al., 2017; and 5.5% Frissa, Hatch, Gazard, Fear & Hotopf, 2012) and children/adolescents (7.8%; Lewis et al., 2019). Perhaps this relates to something different about the complexity of the parental role, such as the impact of trauma being secondary (Banyard, Rozelle & Englung, 2001) and the within the context of a dyadic parent-child relationship.

Further analyses through the risk factor estimates provided evidence consistent with the understandings of risk factors for PTSD from meta-analytic reviews in children (Trickey, Siddaway, Meiser-Stedman, Serpell & field, 2012) and adults (Brewin, Andrews & Valentine, 2000; Ozer, Best, Lipsey & Weis, 2003) which highlight the role of cognitive, behavioural and social/family factors as more strongly associated with PTSD than individual characteristics and objective trauma variables. The results also revealed the multidimensional nature of PTSD in parents, as factors associated with the parent, the child, the family and the trauma itself all play a role. In particular, medium effects were found for parent perceived trauma severity, parent acute stress disorder, parent anxiety, parent stress, parent negative coping, parent neuroticism, and child PTSD. A large effect was found only for parent depression.

Overall, the results from the meta-analytic review the review provided evidence for cognitive models of PTSD (Brewin, Dalgleish & Joseph, 1996; Ehlers & Clarke, 2000; Dalgleish, 2004) in which cognitive and post-trauma variables play a major role in the development of PTSD in parents. It also provides ongoing evidence for the wider systemic impact of child trauma, highlighting the need for whole family approaches to assessment and treatment of adverse post-traumatic reactions.

Empirical Study

Following on from the meta-analytic review, the empirical paper presented an exploratory analysis of PTSD in young children, considering the role of the family. The analyses covered three areas; i) exploring the *mediating* role of parental cognitive and behavioural factors in the relationship between parent and child PTSD; ii) exploring whether there are other factors associated with the child PTSD

including temperament, cognitive processing and early development; and iii) exploring the contribution of the aforementioned parent and child variables in explaining the variance in child PTSD. The results identified that although parent cognition and behaviour were both associated with parent and child PTSD, only overprotective behaviour was found to play a mediating role. Additionally, child pre-trauma temperament was not found to be associated with child PTSD six months after a trauma, however memory quality and developmental factors were. Taken together as a model for explaining child PTSD, each variable (child demographics, child temperament, parent-child separation, parenting behaviour and child cognitive processing of the event) contributed uniquely to the variance.

Similarly, to the meta-analytic review of PTSD in parents, the empirical study provides evidence in support of cognitive models for the explanation of PTSD in young children, however, the results also indicate the need to consider wider familial factors as highlighted in systemic models of PTSD for children (Kazak et al., 2006; Scheeringa & Zeanah, 2001). Taken together, the two papers have produced some interesting findings within a developing field of psychology. They provide important points which require further consideration.

Strengths and Limitations

The meta-analytic review process: The process of conducting a thorough search strategy and screening of a vast number of studies led to the development of a highly comprehensive consolidation of the currently available literature. A much larger number of studies exploring parental PTSD following their child's trauma were identified than initially expected, however, working with a colleague on the screening process made it possible to complete such a broad review. Having two researchers undertaking this part of the review process was a real benefit to the

methodology; this allowed for a more thorough search process, reducing the risk of suitable papers being missed (Cuijpers. 2016). It also encouraged working as a research team which allowed for systematic decision making around queries related to papers for inclusion or exclusion, ensuring all decisions were made jointly. This is reflective of the general process of research, in which research projects are rarely completed alone; each researcher had a clear role which complemented that of the other. This collaborative process also enabled joint supervision sessions in which reflections and thoughts on the process could be shared and challenged within a team framework; ensuring the quality of the research process was maintained throughout.

Alongside this, the meta-analytic process was supported by references to other meta analyses of prevalence and risk factor estimates to guide the methodological and analytical processes. A key strength of the meta-analysis presented was the use of a quality assessment framework to consider the risk of bias for the papers included in the review. This is not often reported in published meta-analyses but is considered a vital part of the reviewing process (Cuijpers, 2016). This allowed us to explore differences in the results when removing studies which were deemed to be high risk of bias through subgroups sensitivity analyses and meta-regressions. These demonstrated that although the overall prevalence estimates for PTSD in parents following their child's acute trauma were relatively robust, the risk factor estimates for some variables were sensitive to bias. Whilst his may reflect a fragility in the risk factor estimates themselves, it may also reflect the variability of the results, and the limited number of estimated pooled from each paper. Additionally, as mentioned in the main body of the text, the risk of bias tool assigned equal weighting to all items despite some being associated with prevalence and other associated with risk factors. This may have impacted on the risk factor estimates, as

the tool may have been more weighted towards prevalence studies. This reflects a methodological difficulty with assessing risk of bias for both risk factor and prevalence estimates in one meta-analysis; traditionally these would be separated into two discrete reviews.

A further strength in the meta-analysis was the differences found in the method of assessment for PTSD in parents; prevalence estimates were significantly higher when assessed by self-report questionnaire than by clinical interview. Whilst this may be due to the much larger number of studies using questionnaire assessment methods, it also poses clinical implications. It is likely that using questionnaire screening tools is preferable for clinical services, due to time constraints and resources available, and these results suggest this is an adequate method of assessment. Secondly, this may be because questionnaire assessments are likely to capture a broader range of PTSD symptomology, particularly those who present with moderate to severe symptoms, compared to just identifying the more acute symptoms through clinical interview.

Unfortunately, the meta-analysis was limited by the lack of inclusion of studies exploring post-traumatic depression in parents following their child's trauma. The papers which focused purely on depression were excluded during the screening process due to the large volume of papers, which were considered too much to include in a single review, within the constraints of a doctoral training programme. Research suggests post-traumatic depression is a common comorbid condition with PTSD (Flory & Yehuda, 2015), and was found to be highly correlated with PTSD in our sample of parents. As such, we hope this post-traumatic response experienced by parents following their child's trauma may be explored in its own right by future researchers.

In addition, we acknowledged that the high level of heterogeneity across the studies included in the review is another limitation. Although this is often the case in psychological research (Cuijpers, 2006) due to the variability of measures used and the varied time between trauma and assessment, we recognise this limits the generalizability of the findings to some extent. Despite this, it is also a true reflection of how PTSD in parents is likely to present and be assessed clinically.

Sample: Across both our systemic review and empirical paper, there were limitations associated with the included sample. The review, despite providing a significant addition to the current understanding of parental PTSD, was limited by the relatively small number of studies which routinely assessed the same risk factors. Most risk factor meta-analyses had below 10 papers included, with some only having two. Within the main text, limitations to having such small numbers were discussed, in particular with how this impacted the sensitivity analyses as some variables could no longer be meta-analysed. Whilst this limits the conclusions that can be drawn from such results, this is often a common occurrence in meta-analytic research and therefore does not suggest these results are invaluable, but instead should be interpreted with caution.

Alongside this, the empirical study was also limited by the sample size. Whilst the sample was adequately powered, we recognize the relatively small sample, taken from a limited location in the UK which is likely to impact the generalizability of the results. As such, we aim to tentatively present our conclusions from the data, so as not to make any broad assumptions or inferences about the theoretical or clinical implications. We highlighted in the main text that the findings would need to be replicated and explored in more depth to provide more concrete evidence for a multi-factorial model of child PTSD.

Parent Reporting: Across both the systematic review and empirical paper, most of the measures relating to the child's mental health (e.g. PTSD, depression) were reported by the parent. Whilst this is somewhat expected in research with children, particularly with young children as in the empirical paper, this poses obvious difficulties with the interpretation of the results. Research suggests that parent and child agreement on the child's functioning is poor (Meiser-Stedman, Smith, Yule, Glucksman & Dalgleish, 2017b), and thus may be considered somewhat unreliable. Within the context of psychological functioning, parents who display more symptomology may over-estimate their child's presenting difficulties or may under estimate them due to not being as attuned. Ideally, for the appropriate variables in the meta-analysis we would have explored this as a possible moderating factor. Within the empirical paper, it may have been beneficial to explore both parent and child reports, however this would have limited our sample size further effecting the results in a different way. As the sample were young children, we felt that using parent-report measures was the most reflective of clinical practice given that much information about child functioning is assessed through parent report.

Diversity: Another weakness in both the meta-analytic and empirical papers is the limited cultural diversity of the included samples. Our meta-analysis excluded any studies which were not written (or translated into) the English Language which is likely to impact the diversity of the included samples. Similarly, the empirical paper only included participants who spoke proficient English. Whilst this criterion was included in order to safeguard the potential participants and ensure all those who participated were able to make informed consent, we again recognize the impact this ultimately has on the cultural diversity of the included sample. As such, these

restrictions present limitations for the wider generalizability of the results from both studies.

Empirical Study Data: A significant strength of the empirical study was the opportunity to use pre-existing data set from longitudinal study, the likes of which would not have been feasible within the context of a ClinPsyD project. This meant that the data included in the empirical paper was longitudinal in nature, capturing reactions in the acute (2-4week) aftermath of trauma, and six months following. Given the relatively limited time frame of conducting research within the limits of a doctoral program, a sample of this size collected over such a period would not have been possible. The meta-analysis highlighted a need to consider the mechanisms through which the relationship between parent and child PTSD operates and this would not have been possible without access to such a valuable data set. In addition, having access to this large study design allowed us to consider a variety of research questions, and ensured the analyses were moderately powered. These strengths in the empirical study were attributable to the initial methodological design and implementation of the study protocol by the study team.

Whilst using a pre-existing data-set is a strength of the study in its own right, it also allowed time to complete the comprehensive and thorough literature review. Most meta-analyses report either prevalence or risk factor estimates, however, having the added time allowed a comprehensive collation of both factors into one paper. Also, working with a colleague as part of a research team for the meta-analysis facilitated ongoing development of each researcher through peer supervision.

Reflections on the process of completing the thesis portfolio

This section offers some reflections on the process of completing the thesis as a whole.

The empirical study utilizing a pre-existing data set was undertaken following an initial project falling through. This original study aimed to explore the psychological responses and quality of life of parents of children who had been admitted to a Paediatric Intensive Care Unit. This project was approved by an NHS research ethics committee (REC) and was set up alongside a team of research nurses and a consultant in a major trauma centre in a local hospital. However, due to delays in the ethics review process, alongside temporary closure of the PICU which was the sole recruitment site, it was apparent that the project would not be completed within the specified time frames. As a result, the project is now being undertaken by a fellow trainee clinical psychologist along with support from the aforementioned research team. Whilst there was initial disappointment that the original project could not be undertaken, the process of making an application to the REC and undergoing the full ethical review procedure was a useful learning experience which will be helpful in any future research within the NHS. Also, reassurance was felt in the knowledge that the original project is being continued, meaning the families who had already offer their time to participate will still be included.

Theoretical Implications

Taken together, the empirical paper and the meta-analysis complemented one another greatly, as they both serve to develop an understanding of the impact of child acute trauma on the family as a whole, rather than just considering the impact to the child. They both build on existing knowledge about systemic influences on child functioning and continue to build on the theoretical understandings of post-traumatic

stress symptomology, supporting the validity of cognitive models. These imply peri and post-traumatic cognitive processes relating to threat appraisals, memory processing and negative appraisals of the effect of the trauma are key to the development of PTSD (Ehlers & Clark, 2000). They also imply the role of coping strategies in the maintenance of symptoms, such as avoidance, rumination, through suppression and control. The results whilst advocating importance of cognitive factors in the development of PTSD in parents and young children did not find parent maladaptive appraisals to play a mediating the relationship between parent and child PTSD symptomology. Instead, behavioural factors were identified as mediators, thus drawing on behavioural theory to explain the development of PTSD is necessary. Cognitive and behavioural theorists would argue the inherent link between the two processes, where behaviour is the external representation of an individual's cognitive processing, for example, a parent who appraises their child as vulnerable or under threat is more likely to be overprotective in their parenting. Research around cognitive processes in parents following their child's trauma (other than perceived severity of the trauma) was notably limited in the systematic review, thus indicating an important area for consideration in future studies. Exploring these post-trauma cognitive processes within the context of the parent-child relationship would provide a significant contribution to current theoretical understandings.

Furthermore, the results from the meta-analysis and empirical studies suggest that cognitive and behavioural models of PTSD are not sufficient in explaining its development and aetiology within the context of the parent-child relationship. Instead, there is a need to draw on relational models of attachment and wider systemic theories which capture the complexities of trauma within families. The findings from both studies provide support for Kazak et al (2006) and Scheeringa

and Zeanah's (2001) models of relational and systemic PTSD highlighting the profound importance of considering the nature of the parent child relationship. However, what is apparent from reviews of the literature is that this area of research is relatively small. As such, recommendations are made for continuing to build on current understandings of PTSD in young children, whilst exploring, through longitudinal studies, the direction of effects. This may involve research exploring the secondary nature of PTSD in parents alongside the complexity of parent role. Perhaps this may involve comparisons with the general adult population, or further exploration of the impact of attachment relationships on responses to single incident trauma.

Clinical Implications

The results from the meta-analytic study present clear clinical implications in relation to the service provision required to meet the needs of children and their parents. If the prevalence estimates reported in Chapter 2 are reflective of the reality of parents presenting in clinical services, offering treatment to all families would place a significant extra demand on the resources. Whilst evidence for trauma focused interventions such as trauma focused Cognitive Behavioural Therapy (CBT), as recommended by NICE (2018), for children and young people appear highly efficacious (Morina et al., 2016, Guterman et al., 2016, Silverman et al., 2008; Dalgleish, Meiser-Stedman & Smith, 2005), these may not account for the wider systemic element of PTSD.

The theory behind most trauma focused therapies is largely based on Ehlers and Clark's (2000) model of PTSD, suggesting that modifying maladaptive appraisals of the trauma, and trauma memories leads to a reduction in PTSD symptomology. Our findings about the role of parent and child cognition and

behaviour in the development of PTSD in parents, and in young children, suggests a need to consider the context of the parent-child relationship in any trauma focused treatment. There is significant scope to suggest the need to treat parent's mental health problems, prior to offering support to children, in order for interventions to be effective and long-lasting (Scheeringa & Zeanah, 2001). Especially, given evidence of the association between parent child PTSD (Meiser-Stedman et al., 2017a) and the impact that a child environment has on their PTSD symptomology (Trickey et al., 2012). New approaches to treatment delivery for children with PTSD have implicated the valuable role of parents (Salloum et al., 2016); this study evaluated a stepped-care parent-led treatment for young children which was found to be highly effective. In order for these sorts of treatments to be used, assessment and treatment of the needs of parents would be essential to address first.

Alongside this, the meta-analysis revealed significant co-morbidity of other adverse psychological presentations, in particular, anxiety, stress, and depression, which may present in a clinically context. As such, if these presentations are identified in parents, it would be appropriate, and necessary for clinicians to consider screening parents for possible post-traumatic stress, for which the treatment would be different. In order for more conclusions to be drawn about the role of other mental health presentations in parents following their child's experience of trauma, further research would be needed; details of which are discussed below.

Future research directions

The results of both the meta-analytic review and the empirical paper, whilst providing an interesting addition to the field, also present several implications for future research, some of which have already been highlighted above. The present studies have provided an understanding of post-traumatic stress reactions in parents

and children following a child's trauma, however significant comorbidities were found with other mental health presentations such as depression and anxiety. As such, future studies may consider a meta-analytic approach to broader psychological reactions in parents following their child's trauma, to provide understanding of prevalence and or risk factors for these. In particular, as the systematic review initially intended to also explore parental depression, and this was found to have a large association with PTSD across studies, post-traumatic depression in parents would be a priority to explore.

Secondly, the present study has intended to consider the mechanisms of how the association between parent and child post-traumatic stress reactions occur over time, through exploring the role of parent cognitive and behavioural factors. Despite recent review of the role of parental behaviour in child PTSD (Williamson et al., 2017), our understanding of this is clearly in its infancy. An approach for future research may be to continue exploring possible mediating factors in the co-occurring PTSD between parent and child, such as the attachment relationship or modelling of maladaptive behaviour by parents. Expanding on the previous suggestion around exploring parental post-traumatic depression reactions, research has implicated parental attitudes towards worry as mediators between parent depression and child PTSS (Meiser-Stedman, Yule, Dalgleish, Smith & Glucksman, 2006). As such, future research may also wish to explore possible transdiagnostic mediators in the association between parent and mental health conditions.

Furthermore, an apparent difficulty with our assessment of cognitive processing in young children was a noted limitation of the empirical study. However, these assessments were limited by a lack of validated measures for use with this population. As such, future research to develop and validate such a measure would

be welcomed. This would ensure more robust and generalisable findings which would provide more robust conclusions about the role of cognition in the development of PTSD in young children. Clinically, such a tool may also be suitable for use in services offering support to children in the aftermath of trauma.

Lastly, further comparison of the results between this meta-analysis and that completed separately by the third author (AB) exploring parental PTSD within the context of a child's long-term health condition would be welcomed. This would be of particular interest given the impact the mixed samples had on our data when removed from the analysis and would allow for comparison between those families who experience a discrete single incident trauma, and those who are exposed to repeated traumatic experiences. Clinically, understanding these differences would support the targeting of resources to treat those who are at greater risk of adverse psychological outcomes following their child's trauma.

Overall Conclusion

The meta-analysis and empirical study presented clinically and theoretically interesting findings which add to our current understanding of post-traumatic stress reactions in families, following a child's single-event trauma. In particular, the findings have indicated the importance of considering the impact of a child's traumatic experience on the parents psychological functioning, both in the duty of care towards parents, but also due to the impact parental functioning has on child mental health. The papers suggested PTSD can be understood within multifaceted models, validating the important role of cognitive models, but also within the context of wider systemic, behavioural and attachment factors. As noted throughout, the results must be interpreted with caution, due to limitations in both studies, with further validation necessary to draw any firm conclusions. Despite this, the review

pointed to areas for future development, such as the need for validated measures of post-traumatic cognition in young children, and further exploration of the mediating factors in the association between child and parent PTSD. Additionally, the review calls for further exploration of other related psychological reactions to trauma within families, such as depression and anxiety, which may support the development of understanding transdiagnostic processes across parent-child dyads.

Chapter 7. References

Banyard, V. L., Rozelle, D., & Englund, D. W. (2001). Parenting the traumatized child: Attending to the needs of nonoffending caregivers of traumatized children. *Psychotherapy: Theory, Research, Practice, Training, 38*(1), 74-87. http://dx.doi.org/10.1037/0033-3204.38.1.74

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. J*ournal of Consulting and Clinical Psychology, 68*, 748–766.

Brewin, C, R., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of post-traumatic stress disorder. *Psychological Review, 103*(4), 670-686.

Cuijpers, P. (2016). *Meta-analyses in mental health research: A practical guide*. Amsterdam, Netherlands: VU University

Dalgleish, T. (2004). Cognitive approaches to posttraumatic stress disorder: the evolution of multi-representational theorizing. *Psychological Bulletin, 130*(2), 228–260.

Dalgleish, T., Meiser-Stedman, R., & Smith, P. (2005). Cognitive aspects of posttraumatic stress reactions and their treatment in children and adolescents: an empirical review and some recommendations. *Behavioural and Cognitive Psychotherapy, 33*, 459-486.

Ehlers, A., & Clark, D. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy, 38*(4), 319–345.

Flory, J, D., & Yehuda, R. (2015) Comorbidity between post-traumatic stress disorder and major depressive disorder: alternative explanations and treatment considerations. *Dialogues in Clinical Neuroscience, 17*(2), 141-150.

Frissa, S., Hatch, S, L., Gazard, B., Fear, N, T., & Hotopf, M. (2012). Trauma and the current symptoms of PTSD in a south east London community. *Social Psychiatry and Psychiatric Epidemiology, 48*, 1199-1209. DOI: 10.1007/s00127-013-0689-8

Guterman, J., Schreiber, F., Matulis, S., Schwartzkopff, L., Deppe, J., & Steil, R. (2016). Psychological Treatments for Symptoms of Posttraumatic Stress Disorder in Children, Adolescents, and Young Adults: A Meta- Analysis. *Clin Child Fam Psychol Rev, 19*(2), 77-93. doi: 10.1007/s10567- 016-0202-5

Kazak, A, E., Kassam-Adams, N., Schneider, S., Zelikovsky, N., Alderfer, M, A., & Rouke, M. (2006). An integrative model of pediatric medical traumatic stress. *Journal of Pediatric Psychology, 31*(4), 343-355. doi:10.1093/jpepsy/jsj054

Lewis, S, J., Arseneault, L., Caspi, A., Fisher, H., Matthews, T., Moffitt, T., … Danese, A. (2019). The epidemiology of trauma and posttraumatic stress disorder in a representative cohort of young people in England and Wales. *Lancet Psychiatry, 6,* 247-256.

Liu, H., Petukhova, M. V., Sampson, N. A., Aguilar-Gaxiola, S., Alonso, J., Andrade, L. H., . . . Kessler, R.C. (2017). Friendship of DSM-IV posttraumatic stress disorder with traumatic experience type and history in the World Health Organization World Mental Health Surveys. *JAMA Psychiatry, 74*(3), 270–281. doi:10.1001/jamapsychiatry.2016.3783

Meiser-Stedman, R., Smith, P., McKinnon, A., Dixon, C., Trickey, D., Ehlers, A., . . . Dalgleish, T. (2017a). Cognitive therapy as an early treatment for post-traumatic stress disorder in children and adolescents: a randomized controlled

trial addressing preliminary efficacy and mechanisms of action. *Journal of Child Psychology and Psychiatry, 58*(5), 623-633.

Meiser-Stedman, R., Smith, P., Yule, W., Glucksman, E., & Dalgleish, T. (2017b). Posttraumatic stress disorder in young children 3 years post trauma: Prevalence and longitudinal predictors. *Journal of Clinical Psychiatry, 78*, 334-339

Meiser-Stedman, R, A., 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*(4), 397-402. DOI: 10.1093/jpepsy/jsj005

National Institute for Health and Care Excellence. (2018). *Post-traumatic Stress Disorder.* (Guideline NG116), Retrieved from: https://www.nice.org.uk/guidance/ng116

Morina, N., Koerssen, R., & Pollet, T. (2016). Interventions for children and adolescents with posttraumatic stress disorder: A meta-analysis of comparative outcome studies. *Clinical Psychology Review, 47*, 41– 54.

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weis, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Bulletin, 129,* 52–73.

Salloum, A., Wang, W., Robst, J., Murphy, T. K., Scheeringa, M. S., Cohen, J. A. & Storch, E. A. (2016). Stepped care versus standard trauma-focused cognitive behavioral therapy for young children. *Journal of Child Psychology and Psychiatry, 57*, 614-622.

Scheeringa, M, S., & Zeanah, C, H. (2001). A relational perspective on PTSD in early childhood. *Journal of Trauma Stress, 14,* 799–815.

Silverman, W., Ortiz, C., Viswesvaran, C., Burns, B., Kolko, D., Putnam, F., & Amaya-Jackson, L. (2008). Evidence-based psychosocial treatments for children and adolescents exposed to traumatic events. Journal of Clinical Child and Adolescent Psychology, 37, 1, 156-183

Trickey, D., Siddaway, A. P., Meiser-Stedman, R., Serpell, L., & Field, A. P. (2012). A meta-analysis of risk factors for post-traumatic stress disorder in children and adolescents. *Clinical Psychology Review*, *32*(2), 122–138. https://doi.org/10.1016/j.cpr.2011.12.001

Williamson, V., Creswell, C., Fearon, P., Hiller, R, M., Walker, J. & Halligan, S, L. (2017). The role of parenting behaviours in childhood post-traumatic stress disorder: a meta-analytic review. *Clinical Psychology Review, 54* 1-13. http://dx.doi.org/10.1016/j.cpr.2017.01.005

Appendices

Appendix A. Clinical Psychology Review Author Guidelines

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Appendix B. Quality Checklist Tool

Quality Checklist for Prevalence and Risk Factor Meta-Analysis
Well addressed = 2
Partially addressed = 1
Poorly addressed/not addressed/not reported = 0

Assessed by:	
Section 1: Population	
1.1 Were participants and setting well described?	
Information regarding the characteristics (age, gender, ethnicity) of the sample and trauma variables (type, severity, duration) are well described with the setting well reported (health setting, country, geography)	2
Some information regarding participants characteristics and trauma variables are reported, with limited information on the setting	1
Sample characteristics, trauma variables and setting information are not reported in any detail	0
1.2 Was participation rate of those eligible at least 50%?	
More than 50% of those eligible to participate took part	2
Less than 50% of those eligible to participate took part	1
The number of eligible potential participants was not reported	0
1.3 Were reasons for non-response described?	
Reasons for non-response were described with the number of those participants not responding reported	2
Reasons were described for non-responders but no numbers provided OR Numbers of non-responders are reported but with no reasons	1
Non-response rates were not reported in the study	0
1.4 Was the sample representative – were there differences between those participants taking part and those not?	

There were no significant differences in demographics or trauma variables between those participating and those not	2
Reported significant differences between those participating and those not	1
Differences between participants and those not taking part were not reported	0
1.5 Were participants recruited in an appropriate way?	
Consecutive or random sampling was used to recruit potential participants in person by the research team	2
Consecutive or random sampling was used to recruit potential participants via letter or phone call	1
Recruitment procedures were not reported in the study	0
1.6 Were inclusion and exclusion criteria explicit and appropriate?	
Inclusion and exclusion criteria were reported in detail with a clear rationale	2
Some information on inclusion and exclusion criteria were reported but lacked a rationale	1
Inclusion and exclusion criteria were not reported	0
Section 2: Outcomes	
2.1 Was objective, standardised criteria used for the assessment of PTSD?	
A diagnostic interview was used which demonstrated good levels of reliability and validity in assessment of PTSD in parents, adhering to DSM-III, DSM-IV or DSM-5 criteria for PTSD	2
A self-report questionnaire used which demonstrated good levels of reliability and validity in the assessment of PTSD in parents, adhering to DSM-III, DSM-IV or DSM-5 criteria for PTSD	1

An observer-rated questionnaire/interview, self-report questionnaire without using DSM criteria, generic clinical interview was used, or measures used demonstrated poor reliability and/or validity	0
2.2 Were risk factors assessed using reliable and valid measures	
Risk factors for developing PTSD were assessed using a structured clinical interview or extracted from medical records (e.g. demographics, trauma related variables) or based on the physician/doctor/other professional	2
Risk factors for developing PTSD were assessed using reliable and validated self/parent-report outcome measures (including parent report of medical severity)	1
Risk factors were not based on reliable or valid measures	0
2.3 Was PTSD (and risk factors) assessed appropriately (professional and setting)?	
Assessment was carried out in person by an appropriately trained professional (e.g. clinical psychologist, psychiatrist, research nurse, trainee psychologist, psychological therapist, research assistant) at the most convenient location (e.g. participant's home if discharged from hospital). Or if self-report measures were used, they were administered by a trained professional to participants or participants had the opportunity to ask questions or speak with a trained professional.	2
Assessment was carried out by a trained professional over the phone **AND/OR** child factors were assessed by proxy (e.g. parent). Or if self-report measures were used participants had the opportunity to speak with a trained/clinical professional over the phone.	1
Assessment was indirect (through other health care professionals) or participants had no opportunity to discuss self-report measures with a trained/clinical professional. OR information regarding location and person assessing PTSD and risk factors were not reported.	0

2.4 Was follow-up time for PTSD assessment appropriate and meaningful?	
An appropriate time frame (>4 weeks post trauma) was used when assessing for PTSD	2
PTSD assessment was undertaken >6 months post trauma	1
No information regarding time frame used when assessing PTSD was reported	0
Section 3: Analyses	
3.1 Was the sample size adequate?	
Sample size was adequate to detect prevalence and risk factors which was based on a sample size or power calculation (or based on consideration of previous studies)	2
Sample size was adequate without reference to sample size calculations or consideration of previous studies	1
Same size justification was not reported, or sample size was too small	0
3.2 Was there appropriate statistical analysis used	
Statistical methods used for analysis were appropriate, with confidence intervals at 95% reported for estimate	2
Statistical methods used for analysis were appropriate, but no confidence intervals were reported	1
Statistical methods used were inappropriate or the study lacked information on statistical methodology when reporting data	0
Overall Risk of Bias	/24

Low risk of bias	**17 -24**
Moderate risk of bias	**9 - 16**
High risk of bias	**0 - 8**

This tool was developed by Mr Aaron Burgess and Miss Lucy Wilcoxon for a meta-analysis undertaken in partial fulfilment of a doctorate in clinical psychology. The development of this tool was based on previous quality checks and research (National Heart Lung and Blood Institute, 2014; NICE, 2012; Hoy et al., 2012; Munn, Moola, Riitana & Lisy, 2014).

Appendix C. Description of effect sizes extracted from each study.

Risk Factor	Article Name	Assessment of risk factor	*k*	Mean *r*	N	Min.	Max.
Objective Trauma Factors							
Trauma Severity							
	Balluffi et al. (2004)	Paediatric Risk of Mortality Scale-III	1	0.00	161		
	Binder et al. (2011)	Merge mother and father PTSD for Score for Neonatal Acute Physiology and Perinatal Risk Inventory	4	0.15	40	-0.001	0.32
	Bronner et al. (2008)	Merge mother and father PTSD for Paediatric Index of Mortality Scale - 2	2	0.00	247	0	0
	Coakley et al. (2010)	Medical Records - Injury Severity Score (Anatomical Scoring)	1	-0.09	51		
	De Vries et al. (1999)	Injury Severity Score (Medical Notes)	1	0.0	102		
	De Young et al. (2014)	Burn Size - Total Body Surface Area	1	0.30	120		
	Egberts et al. (2016/2016)/ Pan et al. (2015)	Merge mother and father PTSD for Burn Size - Total Body Surface Area	2	-0.04	162	-0.19	0.09
	Hall et al. (2006)	Burn Size - Total Body Surface Area	1	0.42	62		
	Kassam-Adams et al. (2009)	Injury Severity Score (Medial Records)	1	0.20	251		
	Kassam-Adams et al. (2015)	Injury Severity Score (Medical Notes)	1	0.00	178		

LeDoux et al. (1998)	Burn Size - Total Body Surface Area	1	0.00	35		
Lefkowitz et al. (2010)	NICU Medical Severity Rating	1	-0.11	85		
Martin-Herz et al. (2012)	AIS/Injury Severity Score (Medical Notes)	1	0.02	92		
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Triage Rating of Trauma Severity	1	0.06	56		
Rees et al. (2004)	Medical Records - Injury Severity Score	1	0.49	60		
Rizzone et al. (1994)	Burn Size - Total Body Surface Area	1	0.42	25		
Rodriguez-Rey & Alsonso-Tapia (2017)	Paediatric Index of Mortality Scale - 2	1	-0.05	143		
Willebrand & Sveen (2016/2016)	Merge Burn Size - Total Burn Surface Area and Total Burn Surface Area - Full thickness burn	2	0.24	106	0.22	0.26
Hospital Admission						
De Vries et al. (1999)	Medical Records	1	0.03	102		
Kassam-Adams et al. (2015)	Medical Records	1	0.00	178		
Sturms et al. (2005)	Medical Records	1	0.31	79		
Length of Hospital Admission						
Balluffi et al. (2004)	Medical Records	1	0.00	161		

Bronner et al. (2008)	Merge mother and father PTSD for Medical Records	2	0.00	247	0	0
Chang et al. (2016)	Medical Records	1	0.04	102		
Franck et al. (2015)	Medical Records	1	0.25	107		
Landolt et al. (1998)	Medical Records	1	0.34	29		
Landolt et al. (2003)	Merge mother and father PTSD for Medical Records	2	0.30	355	0.26	0.34
Lefkowitz et al. (2010)	Medical Records	1	-0.13	85		
Rees et al. (2004)	Medical Records	1	0.49	60		
Willebrand & Sveen (2016/2016)	Medical Records	1	0.23	106		
Parent direct exposure to trauma						
Allenou et al. (2010)	Parent was co-victim or witnessed the trauma	1	0.49	72		
Bryant et al. (2004)	Parent involved in or witnessed the trauma	1	0.00	80		
De Viries et al. (1999)	Standard Demographic Information	1	0.51	102		
Kassam-Adams et al. (2009)	Standard Demographic Information	1	0.04	251		
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Standard Demographic Information	1	0.18	56		

Rizzone et al. (1994)	Proximity between child and parent at time of burn	1	-0.28	25
Winston et al. (2003)	Parent witness the trauma	1	0.07	162
Parent Factors				
Parent pre-trauma characteristics				
Older Parent Age				
Chang et al. (2016)	Standard Demographic Information	1	0.08	102
Lefkowitz et al. (2010)	Standard Demographic Information	1	0.07	85
Martin-Herz et al. (2012)	Standard Demographic Information	1	0.01	92
Female Gender				
Balluffi et al. (2004)	Standard Demographic Information	1	0.47	161
Binder et al. (2011)	Standard Demographic Information	1	0.30	40
Bronner et al. (2008)	Standard Demographic Information	1	0.15	247
Franck et al. (2015)	Standard Demographic Information	1	0.00	107
Kassam-Adams et al. (2009)	Standard Demographic Information	1	0.06	251
Kassam-Adams et al. (2015)	Standard Demographic Information	1	0.21	178

Landolt et al. (2012)	Standard Demographic Information	1	0.22	460		
Martin-Herz et al. (2012)	Standard Demographic Information	1	-0.26	92		
Race (BME)						
Balluffi et al. (2004)	Standard Demographic Information	1	0.28	161		
Coakley et al. (2010)	Standard Demographic Information	1	0.27	51		
Franck et al. (2015)	Standard Demographic Information	1	0.00	107		
Kassam-Adams et al. (2009)	Standard Demographic Information	1	0.23	251		
Lefkowitz et al. (2010)	Standard Demographic Information	1	-0.17	85		
Martin-Herz et al. (2012)	Standard Demographic Information	1	0.48	92		
Low SES						
Chang et al. (2016)	Standard Demographic Information - merge Unemployment, education level and low income	3	0.05	102	0	0.13
Coakley et al. (2010)	Standard Demographic Information	1	-0.21	51		
Franck et al. (2015)	Standard Demographic Information – merge unemployment, education level and low SES	3	0.00	107	0	0
Kassam-Adams et al. (2009)	Standard Demographic Information	1	-0.20	251		

Landolt et al. (2003)	Standard Demographic Information - merge mother and father PTSD for low SES	2	0.09	180	0.03	0.15
Previous trauma or Mental Health Difficulty						
Coakley et al. (2010)	Question about exposure to previous trauma/psychopathology	1	0.52	51		
De Young et al. (2014)	Demographic Questionnaire	1	0.25	120		
Franck et al. (2015)	Question about parent's prior hospitalisation	1	0.00	107		
Kassam-Adams et al. (2009)	Traumatic Events Screening Inventory	1	0.30	251		
Landolt et al. (2003)	Merge mother and father PTSD for number of preceding Life events - self developed Scale	2	0.06	355	-0.04	0.15
Lefkowitz et al. (2010)	Merge self-report history of depression, anxiety or mental illness	3	0.44	85	0.38	0.50
Martin-Herz et al. (2012)	World Health Organisation Traumatic Event Inventory	1	0.07	92		
Parent peri-trauma variables						
Perceived Severity of trauma						
Balluffi et al. (2004)	Parent reported worry that child might die.	1	0.28	161		
Coakley et al. (2010)	Rating of trauma severity	1	0.61	51		
Kassam-Adams et al. (2009)	Parent reported worry that child might die.	1	0.30	251		
Lefkowitz et al. (2010)	Parent perceived Injury Severity Score	1	0.13	85		

Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Parent report subjective threat	1	0.07	56		
Rees et al. (2004)	Parent perceived injury Severity Score	1	0.47	60		
Rodriguez-Rey & Alsonso-Tapia (2017)	Parent perceived illness severity	1	0.15	143		
Peritraumatic Dissociation						
Allenou et al. (2010)	Merge mother and father PTSD with mother and father Peritraumatic Dissociative Experiences Questionnaire	4	0.20	100	0.28	0.37
Hall et al. (2006)	Stanford Acute Stress Reaction Questionnaire	1	0.41	62		
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Demographic Questionnaire	1	0.05	56		
Parent post-trauma variables						
Acute Stress Disorder						
Balluffi et al. (2004)	Acute Stress Disorder Scale	1	0.62	161		
Egberts et al. (2016/2016)/ Pan et al. (2015)	Merge Mother and father PTSD with mother and father ASD scores on the Impact of Events Scale	4	0.53	202	0.40	0.70
Kassam-Adams et al. (2009)	Stanford Acute Stress Reaction Questionnaire	1	0.54	251		
Lefkowitz et al. (2010)	Acute Stress Disorder Scale	1	0.62	85		
Martin-Herz et al. (2012)	PTSD Checklist	1	0.03	92		

Depression				
Chang et al. (2016)	Centre for Epidemiological Studies Depression Scale	1	0.52	102
Franck et al. (2015)	Hospital Anxiety and Depression Scale	1	0.27	107
Kassam-Adams et al. (2015)	Centre for Epidemiological Studies Depression Scale	1	0.66	178
Lefkowitz et al. (2010)	Postpartum Depression Screening Scale	1	0.82	85
Martin-Herz et al. (2012)	Centre for Epidemiological Studies Depression Scale	1	0.04	92
Rodriguez-Rey & Alsonso-Tapia (2017)	Hospital Anxiety and Depression Scale	1	0.68	143
Scheeringa et al. (2015)	Beck Depression Inventory	1	0.80	62
Anxiety				
Franck et al. (2015)	Hospital Anxiety and Depression Scale	1	0.49	107
Hall et al. (2006)	Brief Symptom Inventory	1	0.48	62
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Anxiety Sensitivity Index	1	0.01	56
Rodriguez-Rey & Alsonso-Tapia (2017)	Hospital Anxiety and Depression Scale	1	0.67	143

Stress						
Binder et al. (2011)	Postnatal Complications Rating - Parent Stress	1	0.26	40		
Lefkowitz et al. (2010)	Total number of concurrent stressors	1	0.34	85		
Ribi et al. (2007)	Self-report Stress Appraisal Questions'	1	0.56	139		
Rizzone et al. (1994)	Parent Rating of stress at time of trauma	1	0.02	25		
Psychological Distress						
Allenou et al. (2010)	Merge mother and father PTSD and mother and father Peritraumatic Distress Inventory	4	0.23	100	-0.01	0.34
Binder et al. (2011)	Merge mother and father PTSD for Brief Symptom Inventory	2	0.00	40	0	0
De Young et al. (2014)	Parent Distress - Depression, Anxiety Stress Scale	1	0.28	120		
Martin-Herz et al. (2012)	Parent report 'general Mental Health'	1	-0.02	92		
Nugent et al. (2007)	Symptom Checklist - General distress Subscale	1	0.76	61		
Negative Coping Style						
Franck et al. (2015)	COPE - Negative Coping Subscale	1	0.35	107		
Ribi et al. (2007)	COPE - Dysfunctional Coping Subscale	1	0.50	139		

Avoidance				
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Questions asked about thought suppression	1	0.14	56
Willebrand & Sveen (2016/2016)	Four questions about fear-avoidance beliefs	1	0.34	106
Alcohol Use				
Franck et al. (2015)	COPE - disengagement/substance use coping subscale	1	0.14	107
Martin-Herz et al. (2012)	Alcohol Use Disorders Identification Test	1	0.04	92
Sense of Blame/Guilt				
De Young et al. (2014)	COPE – Guilt Subscale	1	0.28	120
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Modified version of the Posttraumatic Cognition Inventory	1	0.01	56
Neuroticism				
Chang et al. (2016)	Maudsley Personality Inventory	1	0.54	102
Ribi et al. (2007)	Neo Five Factor Inventory	1	0.23	139
Child Factors				
Child pre-trauma characteristics				
Younger Age				
Balluffi et al. (2004)	Standard Demographic Information	1	0.00	161

Bronner et al. (2008)	Standard Demographic Information – merge mother and father PTSD	2	-0.01	247	0.01	0.02
Coakley et al. (2010)	Standard Demographic Information	1	-0.27	51		
De Vries et al. (1999)	Standard Demographic Information	1	-0.20	102		
De Young et al. (2014)	Standard Demographic Information	1	-0.12	120		
Egberts et al. (2016/2016)/ Pan et al. (2015)	Standard Demographic Information - merge mother and father PTSD	2	-0.19	162	-0.15	-0.23
Franck et al. (2015)	Standard Demographic Information	1	0.00	107		
Landolt et al. (1998)	Standard Demographic Information	1	-0.07	29		
Landolt et al. (2003)	Standard Demographic Information - merge mother and father PTSD	2	0.01	355	-0.02	0.05
Martin-Herz et al. (2012)	Standard Demographic Information	1	0.03	92		
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Standard Demographic Information	1	0.05	56		
Willebrand & Sveen (2016/2016)	Standard Demographic Information	1	-0.06	106		
Winston et al. (2003)	Standard Demographic Information	1	-0.23	162		
Male Gender						
Balluffi et al. (2004)	Standard Demographic Information	1	0.00	161		
Bronner et al. (2008)	Standard Demographic Information - merge mother and father PTSD	2	-0.07	247	0.02	0.12

Chang et al. (2016)	Standard Demographic Information	1	0.02	102		
Coakley et al. (2010)	Standard Demographic Information	1	0.14	51		
De Vries et al. (1999)	Standard Demographic Information	1	0.09	102		
De Young et al. (2014)	Standard Demographic Information	1	0.04	120		
Franck et al. (2015)	Standard Demographic Information	1	0.00	107		
Landolt et al. (1998)	Standard Demographic Information	1	0.03	29		
Landolt et al. (2003)	Standard Demographic Information - merge mother and father PTSD	2	-0.08	355	-0.11	-0.07
Martin-Herz et al. (2012)	Standard Demographic Information	1	0.31	92		
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Standard Demographic Information	1	0.01	56		
Ostrowski et al. (2007)	Standard Demographic Information	1	0.43	61		
Willebrand & Sveen (2016/2016)	Standard Demographic Information	1	0.05	106		
Previous Trauma/Hospital Admission						
Balluffi et al. (2004)	Prior Hospital Admissions	1	0.00	161		
Coakley et al. (2010)*	Structured Parent Interview	1	0.26	51		

De Vries et al. (1999)	Screening Question	1	0.18	102		
Franck et al. (2015)	Demographic Questionnaire – merge child prior hospitalisation and child readmission to hospital	2	0.22	107	0.19	0.24
Kassam-Adams et al. (2009)	Traumatic Events Screening Inventory	1	0.21	251		
Kubota (2016)	No. of previous hospital admissions	1	0.32	72		
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Demographic Questionnaire	1	0.03	56		
Child trauma related variables						
Medical complications						
Binder et al. (2011)	Merge mother and father PTSD with for gestational age, and birth weight	4	0.10	40	-0.17	-0.04
Bronner et al. (2008)	Merge mother and father PTSD with Artificial Ventilation, Circulatory Support & Neuro Blocking	6	0.13	247	0.02	0.37
Chang et al. (2016)	Low birth weight	1	0.16	102		
De Young et al. (2014)	Number of invasive procedures	1	0.32	120		
Sturms et al. (2005)	Presence of a Head Injury	1	0.38	79		
Winston et al. (2003)	Presence of an Extremity Fracture	1	0.28	162		
Child post-trauma variables						
Acute Stress Disorder						
Bryant et al. (2004)	Impact of Events Scale - Child Version	1	0.00	80		

Kassam-Adams et al. (2009)	Child Acute Stress Disorder Questionnaire	1	0.28	251		
Martin-Herz et al. (2012)	Reaction Index - Adolescent Version	1	0.16	92		
Post-traumatic Stress Disorder						
Bryant et al. (2004)	Impact of Events Scale - Child Version	1	0.00	80		
De Vries et al. (1999)	PTSD Checklist for Children - Parent Report	1	0.65	102		
De Young et al. (2014)	PTSD Subscale of the Diagnostic Infant Preschool Assessment	1	0.6	120		
Hall et al. (2006)	Child Posttraumatic Stress Disorder Reaction Index	1	0.44	62		
Kassam-Adams et al. (2009)	Posttraumatic Symptom Inventory (age5-7), Clinician Administered TPSD Scale for 8-17 year olds	1	0.08	251		
Kassam-Adams et al. (2015)	Child PTSD Symptom Scale	1	0.17	178		
Landolt et al. (2003)	Merge mother and father PTSD for DSM-IV Diagnostic Interview for Children and PTSD Symptom Scale	2	0.00	355	-0.01	0.02
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	PTSD Semi-Structure Interview and Observational Record for Infants and Young Children (IORYC)/CAPS	1	0.29	108		
Mirzamani & Bolton (2002)	Clinician Administered PTSD Scale	1	0.45	37		
Nugent et al. (2007)	Clinician Administered PTSD Scale	1	0.45	82		
Ostrowski et al. (2007)	Clinician Administered PTSD Scale	1	0.33	61		

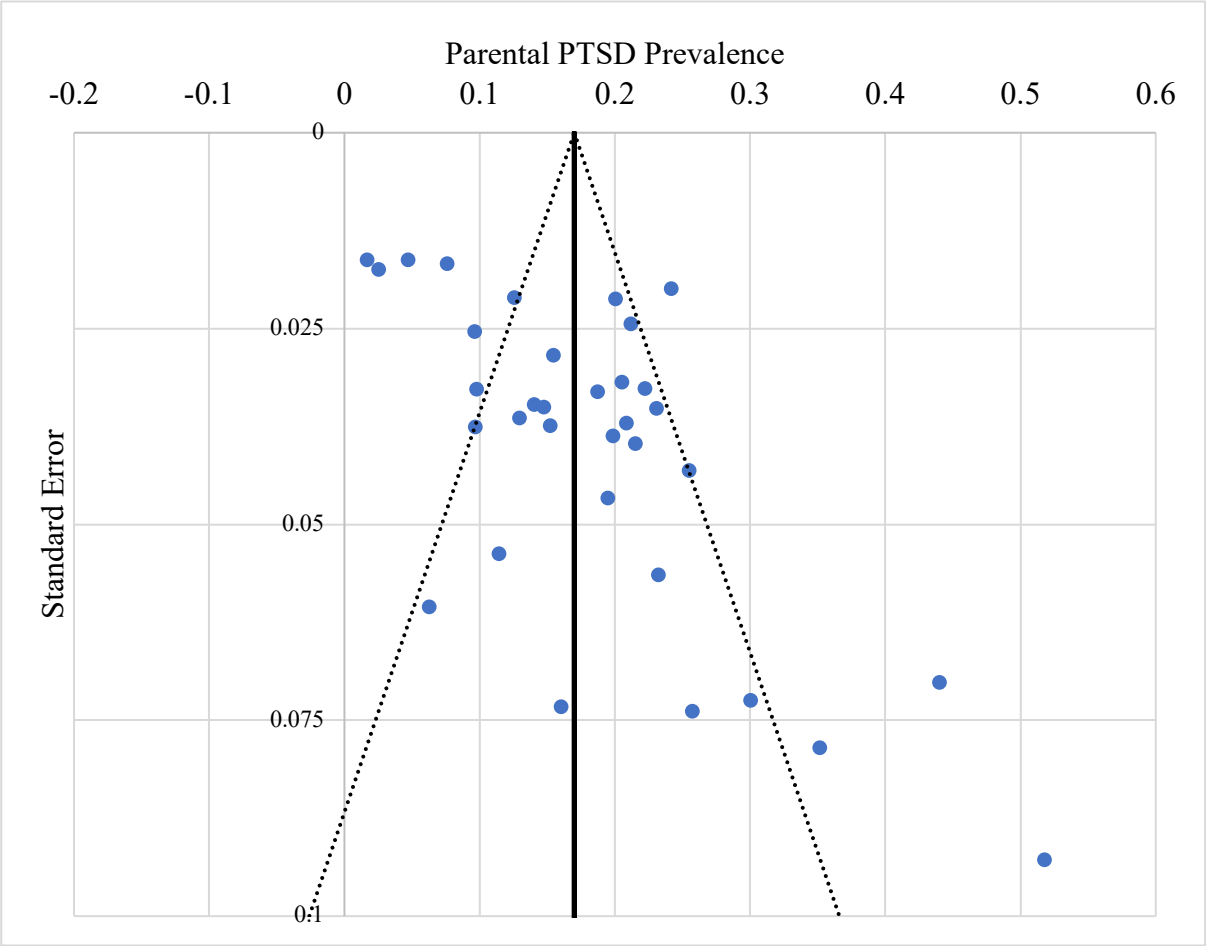
Ostrowski et al. (2011)	Clinician Administered PTSD Scale	1	0.26	99		
Rees et al. (2004)	Impact of Events Scale - Child Version	1	0.40	60		
Scheeringa et al. (2015)	Posttraumatic Stress Disorder Semi-Structured Interview and Observational Record for Infants and Young Children (PTSD-SSI)	1	0.29	62		
Sturms et al. (2005)	Impact of Events Scale - Child Version	1	0.65	50		
Externalising problems						
De Young et al. (2014)	Child Behaviour Checklist	1	0.24	120		
Egberts et al. (2016/2016)/ Pan et al. (2015)	Merge mother and father PTSD with mother and father reports on CBC-L	4	0.11	162	0.09	0.13
Kubota (2016)	Child Behaviour Checklist	1	0.37	72		
LeDoux et al. (1998)	Child Behaviour Checklist	1	0.00	35		
Winston et al. (2003)	Posttraumatic Stress Risk Factor Form	1	0.22	162		
Poorer Recovery						
Balluffi et al. (2004)	Child having another hospital Admission	1	-0.24	161		
Franck et al. (2015)	Hospital Records - Health Status post hospitalization	1	-0.37	107		
Kassam-Adams et al. (2015)	Single Item - Parent Rated	1	-0.27	178		

Kubota (2016)	Kid-KIND Questionnaire - QOL	1	-0.28	72		
Landolt et al. (2003)	Merge mother and father PTSD for Functional Status - Single Item Question	2	-0.24	355	-0.18	-0.30
Ribi et al. (2007)	Physician rated 2-point scale	1	-0.31	139		
Co-morbid Psychological Problem						
Egberts et al. (2016/2016)/ Pan et al. (2015)	Merge mother and father PTSD for Low Emotional Health - Burn Outcomes Questionnaire	2	0.49	162	0.48	0.49
Kassam-Adams et al. (2015)	Centre for Epidemiological Studies Depression Scale	1	0.11	178		
Martin-Herz et al. (2012)	Centre for Epidemiological Studies Depression Scale	1	0.02	92		
Willebrand & Sveen (2016/2016)	Burn Outcomes Questionnaire	1	0.19	106		
Family Factors						
Poor Family Functioning						
Coakley et al. (2010)	Family Assessment Device	1	0.41	51		
Egberts et al. (2016/2016)/ Pan et al. (2015)	Merge mother and father PTSD for Burn Outcomes Questionnaire – family disruption subscale	2	0.32	162	0	0.62
Franck et al. (2015)	Family Cohesion - Family Environment Scale	1	0.00	107		
Hall et al. (2006)	Merge family strains and part-child conflict subscales of the Family Strains Index	2	0.60	62	0.47	0.71
Meiser-Stedman et al. (2017)/Hiller et al. (2016)	Family Functioning Index - Irritable Distress Subscale	1	0.07	56		

Kubota (2016)	Mother's rating of satisfaction with fathers help	1	0.35	72		
Landolt et al. (2003)	Merge mother and father PTSD with 'family situation'	2	0.02	180	-0.11	0.15
Ribi et al. (2007)	Family Relationships Inventory	1	0.02	139		
Lack of Social Support						
Franck et al. (2015)	Merge COPE – Social Support Subscale and Duke-UNC functional social support questionnaire	2	0.00	107	0	0.01
Rizzone et al. (1994)	Parent rating of how helpful are friends and family?	1	-0.20	25		
Willebrand & Sveen (2016/2016)	Parent reported perceived lack of social support	1	-0.13	106		

Appendix D. Publication Bias Funnel Plot

Funnel Plot to assess for Publication Bias



Appendix E. Journal of Abnormal Child Psychology Author Guidelines

Manuscript Submission

Submission of a manuscript implies: that the work described has not been published before; that it is not under consideration for publication anywhere else; that its publication has been approved by all co-authors, if any, as well as by the responsible authorities – tacitly or explicitly – at the institute where the work has been carried out. The publisher will not be held legally responsible should there be any claims for compensation.

Permissions

Authors wishing to include figures, tables, or text passages that have already been published elsewhere are required to obtain permission from the copyright owner(s) for both the print and online format and to include evidence that such permission has been granted when submitting their papers. Any material received without such evidence will be assumed to originate from the authors.

Online Submission

Please follow the hyperlink "Submit online" on the right and upload all of your manuscript files following the instructions given on the screen.

Cover Letter

Per APA guidelines, all submissions must include a cover letter that provides information about:

- Any previous presentation of the data.
- The existence of any closely related manuscripts that have been submitted for simultaneous consideration to the same or to another journal.

Of particular note, the cover letter must describe any previous publications or manuscripts being submitted for simultaneous consideration in which the main variables of interest overlap with the variables being examined in the current JACP submission. If the publication is using a publicly available data set, authors must provide a link to a list of other publications using the data set and list previous publications using the same variables. Finally, the cover letter needs to include a statement describing how the current results add significantly to previous publications with the same sample to warrant publication as a separate paper.

Title page

The title page should include:

- The name(s) of the author(s)
- A concise and informative title
- The affiliation(s) and address(es) of the author(s)
- The e-mail address, and telephone number(s) of the corresponding author
- If available, the 16-digit ORCID of the author(s)

Abstract

Please provide an abstract of 150 to 250 words. The abstract should not contain any undefined abbreviations or unspecified references.

Keywords

Please provide 4 to 6 keywords which can be used for indexing purposes.

Text

Text Formatting

Manuscripts should be submitted in Word.

- Use a normal, plain font (e.g., 10-point Times Roman) for text.
- Use italics for emphasis.
- Use the automatic page numbering function to number the pages.
- Do not use field functions.
- Use tab stops or other commands for indents, not the space bar.
- Use the table function, not spreadsheets, to make tables.
- Use the equation editor or MathType for equations.
- Save your file in docx format (Word 2007 or higher) or doc format (older Word versions).
- Manuscripts with mathematical content can also be submitted in LaTeX.

Headings

Please use no more than three levels of displayed headings.

Abbreviations

Abbreviations should be defined at first mention and used consistently thereafter.

Footnotes

Footnotes can be used to give additional information, which may include the citation of a reference included in the reference list. They should not consist solely of a reference citation, and they should never include the bibliographic details of a reference. They should also not contain any figures or tables.

Footnotes to the text are numbered consecutively; those to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data). Footnotes to the title or the authors of the article are not given reference symbols.

Always use footnotes instead of endnotes.

Acknowledgments

Acknowledgments of people, grants, funds, etc. should be placed in a separate section on the title page. The names of funding organizations should be written in full.

MANUSCRIPT FORMAT

All JACP manuscripts should be submitted to Editorial Manager in 12-point Times New Roman with standard 1-inch borders around the margins.

APA Style

Page length: 35 pages; Text must be double-spaced; APA Publication Manual standards must be followed.

Terminology

- Please use the standard mathematical notation for formulae, symbols etc.:

- Italic for single letters that denote mathematical constants, variables, and unknown quantities
- Roman/upright for numerals, operators, and punctuation, and commonly defined functions or abbreviations, e.g., cos, det, e or exp, lim, log, max, min, sin, tan, d (for derivative)
- Bold for vectors, tensors, and matrices.

Scientific style

- Please always use internationally accepted signs and symbols for units (SI units).
- Generic names of drugs and pesticides are preferred; if trade names are used, the generic name should be given at first mention.
-

References

Citation

Cite references in the text by name and year in parentheses. Some examples:

- Negotiation research spans many disciplines (Thompson 1990).
- This result was later contradicted by Becker and Seligman (1996).
- This effect has been widely studied (Abbott 1991; Barakat et al. 1995; Kelso and Smith 1998; Medvec et al. 1999).

Reference list

The list of references should only include works that are cited in the text and that have been published or accepted for publication. Personal communications and unpublished works should only be mentioned in the text. Do not use footnotes or endnotes as a substitute for a reference list.

Reference list entries should be alphabetized by the last names of the first author of each work.

Tables

- All tables are to be numbered using Arabic numerals.
- Tables should always be cited in text in consecutive numerical order.
- For each table, please supply a table caption (title) explaining the components of the table.
- Identify any previously published material by giving the original source in the form of a reference at the end of the table caption.
- Footnotes to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data) and included beneath the table body.

Artwork and Illustrations Guidelines

Electronic Figure Submission

- Supply all figures electronically.
- Indicate what graphics program was used to create the artwork.

- For vector graphics, the preferred format is EPS; for halftones, please use TIFF format. MSOffice files are also acceptable.
- Vector graphics containing fonts must have the fonts embedded in the files.
- Name your figure files with "Fig" and the figure number, e.g., Fig1.eps.

Line Art

- Definition: Black and white graphic with no shading.
- Do not use faint lines and/or lettering and check that all lines and lettering within the figures are legible at final size.
- All lines should be at least 0.1 mm (0.3 pt) wide.
- Scanned line drawings and line drawings in bitmap format should have a minimum resolution of 1200 dpi.
- Vector graphics containing fonts must have the fonts embedded in the files.

Halftone Art

- Definition: Photographs, drawings, or paintings with fine shading, etc.
- If any magnification is used in the photographs, indicate this by using scale bars within the figures themselves.
- Halftones should have a minimum resolution of 300 dpi.

Combination Art

- Definition: a combination of halftone and line art, e.g., halftones containing line drawing, extensive lettering, color diagrams, etc.
- Combination artwork should have a minimum resolution of 600 dpi.

Color Art

- Color art is free of charge for online publication.
- If black and white will be shown in the print version, make sure that the main information will still be visible. Many colors are not distinguishable from one another when converted to black and white. A simple way to check this is to make a xerographic copy to see if the necessary distinctions between the different colors are still apparent.
- If the figures will be printed in black and white, do not refer to color in the captions.
- Color illustrations should be submitted as RGB (8 bits per channel).

Figure Lettering

- To add lettering, it is best to use Helvetica or Arial (sans serif fonts).
- Keep lettering consistently sized throughout your final-sized artwork, usually about 2–3 mm (8–12 pt).
- Variance of type size within an illustration should be minimal, e.g., do not use 8-pt type on an axis and 20-pt type for the axis label.
- Avoid effects such as shading, outline letters, etc.
- Do not include titles or captions within your illustrations.

Figure Numbering

- All figures are to be numbered using Arabic numerals.
- Figures should always be cited in text in consecutive numerical order.
- Figure parts should be denoted by lowercase letters (a, b, c, etc.).
- If an appendix appears in your article and it contains one or more figures, continue the consecutive numbering of the main text. Do not number the appendix figures, "A1, A2, A3, etc." Figures in online appendices (Electronic Supplementary Material) should, however, be numbered separately.

Figure Captions

- Each figure should have a concise caption describing accurately what the figure depicts. Include the captions in the text file of the manuscript, not in the figure file.
- Figure captions begin with the term Fig. in bold type, followed by the figure number, also in bold type.
- No punctuation is to be included after the number, nor is any punctuation to be placed at the end of the caption.
- Identify all elements found in the figure in the figure caption; and use boxes, circles, etc., as coordinate points in graphs.
- Identify previously published material by giving the original source in the form of a reference citation at the end of the figure caption.

Figure Placement and Size

- Figures should be submitted separately from the text, if possible.
- When preparing your figures, size figures to fit in the column width.
- For most journals the figures should be 39 mm, 84 mm, 129 mm, or 174 mm wide and not higher than 234 mm.
- For books and book-sized journals, the figures should be 80 mm or 122 mm wide and not higher than 198 mm.

Permissions

If you include figures that have already been published elsewhere, you must obtain permission from the copyright owner(s) for both the print and online format. Please be aware that some publishers do not grant electronic rights for free and that Springer will not be able to refund any costs that may have occurred to receive these permissions. In such cases, material from other sources should be used.

Accessibility

In order to give people of all abilities and disabilities access to the content of your figures, please make sure that

- All figures have descriptive captions (blind users could then use a text-to-speech software or a text-to-Braille hardware)
- Patterns are used instead of or in addition to colors for conveying information (colorblind users would then be able to distinguish the visual elements)
- Any figure lettering has a contrast ratio of at least 4.5:1

Electronic Supplementary Material

Springer accepts electronic multimedia files (animations, movies, audio, etc.) and other supplementary files to be published online along with an article or a book chapter. This feature can add dimension to the author's article, as certain information cannot be printed or is more convenient in electronic form.

Before submitting research datasets as electronic supplementary material, authors should read the journal’s Research data policy. We encourage research data to be archived in data repositories wherever possible.

Appendix F. Information Sheet and Consent Form

Information Sheet and Consent Form for participants.

How children feel after being in a traffic accident

Information Sheet for Parents

Ethics Reference number: 04-802

We are a team of psychologists based at King's College London, working with Dr Ed Glucksman and his staff at King's College Hospital A&E department. We would like to invite you and your child to participate in our study. Please read this information sheet carefully if you wish for you and your child to participate. Your participation is entirely voluntary.

Purpose of the study

We are conducting a study looking at what causes children to develop long-term reactions to traffic accidents. Your child's participation in the study will help us to better identify which children are at risk of developing severe reactions to frightening events, and how we can help these children to get over what has happened to them.

What will the study involve

We would like to meet you and your child on two occasions; within a month after the accident, and about six months after the accident. At about three months after the accident we would also like to send some questionnaires to you for your child and yourself to complete. On the two occasions when we would meet, we would like to talk to you and your child about the accident, and any problems your child might have had since it happened. We would also like you and your child (if they are able to read) to complete questionnaires about how you've been feeling about the accident, and some psychological tasks that will help us to understand why some children experience difficulties following very frightening events. Each meeting will take about 2 hours with you and your child.

We are inviting children aged between 2 and 10, who attend A&E departments in South London after traffic accidents, to take part in our study, and we hope to have 120 children take part.

If at the end of the study we think that your child might be suffering from any serious problems, we can discuss with you the possibility of getting help for your child. This professional help might come from the Maudsley hospital. The Maudsley hospital is one of the leading centres internationally for the assessment and treatment of children who have been exposed to very frightening events, such as traffic accidents.

Please turn over…

As so little is known about young children's responses to frightening events, we are only following up participants for 6 months. Depending on what we learn, we may contact you at a later date to conduct a further interview, but you would be free to not to participate any further.

Participation and withdrawal

All the information recorded will be strictly confidential, and used only by clinicians and researchers working within the Child Traumatic Stress Clinic at the Maudsley Hospital. Information about you and your child will be stored anonymously. The results we obtain from this study may be published in order to help other people working with children who have been in frightening events, *but you or your child would not be named*.

If you decide to take part, you can withdraw *at any time* and *without giving a reason*. If you decide not to take part or decide to withdraw from the study, this will not affect the care you receive at any hospitals.

You will receive a copy of this information sheet and the signed consent section if you decide to participate.

You will receive some money in acknowledgement of your time in contributing to this study.

If you would like to be informed about the findings of this study please let us know and we will ensure that you are informed.

Thank you for considering taking part in our study.

For more information

Please ask if there is anything you or your child does not understand or if you would like more information. You can contact Richard Meiser-Stedman on 020 7848 0580.

Richard Meiser-Stedman, Patrick Smith, & William Yule

Consent

I agree to my son/daughter participating in this study. I agree to take part.

Child's name ……

Parent's name ……..

Parent's signature ……..Date …….

Appendix G. Research Ethics Committee Approval Form

January 1996

THIS FORM SHOULD BE COMPLETED IN TYPESCRIPT AND RETURNED TO THE RESEARCH ETHICS CO-ORDINATOR, ROOM W109, INSTITUTE OF PSYCHIATRY. PLEASE REFER TO THE NOTES FOR GUIDANCE AS YOU COMPLETE THE FORM. PLEASE NOTE THAT IT IS THE APPLICANT'S RESPONSIBILITY TO ENSURE THAT SUBMITTED FORMS ARE OF SUFFICIENT QUALITY TO BE LEGIBLY REPRODUCED AND THAT SIGNATURES OF APPLICANT, PRINCIPAL INVESTIGATOR AND INVESTIGATOR(S) ARE APPENDED AT THE END

Applicants are reminded that ethical justification must be given for the inclusion of special groups of subjects eg mentally incapacitated in research projects

INSTITUTE OF PSYCHIATRY REF NO._____
THE SOUTH LONDON AND MAUDSLEY NHS TRUST

APPLICATION TO THE ETHICAL COMMITTEE RESEARCH FOR APPROVAL OF A RESEARCH PROJECT

Section 1 Details of Applicants* (NOTE 3A)

(a) Applicant Mr Richard Meiser-Stedman **Status** Research Fellow

Department Psychology

Address for Correspondence Department of Psychology (P78)
Institute of Psychiatry

Telephone Number 020 7848 0580

(b) Principal Investigator Professor William Yule **Status** Professor of Applied Child Psychology

Department Psychology

Address Department of Psychology (P77)
Institute of Psychiatry

Telephone No. 020 7848 0217

(the principal investigator should be of Consultant or Senior Lecturer Status and hold a contract with the South London and Maudsley Trust or Institute of Psychiatry. The Principal Investigator is responsible for the study to the Trust/IOP. Please refer to the Notes for Guidance)

(c) Investigator(s) Status

Mr Richard Meiser-Stedman	Research Fellow
Prof. William Yule	Professor of Applied Child Psychology
Dr Patrick Smith	Research Fellow

*Please note that a 1 page curriculum vitae is required for each applicant or investigator not under contract to, or a student of, the Trust or Institute of Psychiatry. Principal Investigators must hold a contract with either the Trust or Institute

(d) Research Strategy Group Child and adolescent

(e) Sponsoring Organisation RMS is supported by a Margaret Pollak Research Fellowship awarded by the Psychiatry Research Trust.

Dr Patrick Smith is supported by a Psychiatry Research Trust Kraupl Taylor Fellowship

Please give details of any organisation sponsoring the research proposal eg pharmaceutical or device manufacturer or charitable organisation

Section 2 TITLE OF PROJECT

Post-traumatic stress disorder in young children exposed to road traffic accidents: a prospective study

PROPOSED START DATE: 1st March 2004

Section 3 Purpose of Project (NOTE 3B)

(This section should state, **as far as possible in lay language,** the hypothesis to be addressed and the clinical relevance and benefit of the study)

A number of studies have examined the responses of older children (i.e. children over the age of 9) and adolescents to traumatic events, such as violence, war, natural disasters, and road traffic accidents. These studies have found that older children and adolescents can experience post-traumatic stress disorder (PTSD), a severe and debilitating anxiety disorder, following exposure to traumatic events.

Prospective studies (where participants are interviewed at more than one point in time following a traumatic event) have shown that in a significant minority PTSD can persist for several months, even several years. More recent prospective studies have also addressed the aetiology of PTSD in this age-group, identifying a significant role for cognitive (e.g. did the child think they were going to die), and psychosocial (e.g. how parents and family responded to the trauma) processes in maintaining this disorder.

Young children (i.e., aged less than 9 years) are often referred to the Child Traumatic Stress Clinic at the Maudsley Hospital for treatment for PTSD. Case studies have been published reporting that young children can develop PTSD following trauma. However, no prospective studies have been conducted regarding young children exposed to traumatic events. This means that there is no proper estimate of i) how common PTSD is in this age group; ii) how long PTSD lasts in this age group, or iii) what causes some young children to develop PTSD.

The proposed study will address these questions in young children exposed to road traffic accidents. The findings of the study will inform what services are needed to support young children exposed to trauma, and what kinds of psychological interventions will help young children with PTSD.

Section 4 Conduct of Project (NOTE 3C)

(a) **Location** Institute of Psychiatry

(b) **Nature of Subjects** Children aged 2-10 years attending Accident and Emergency departments in South London following road traffic accidents. Ethical permission will also be sought from local ethics committees. In addition, children aged 2-10 who have not attended A&E, and have not been referred to any clinics at the Maudsley hospital, will be recruited, together with a parent, so as to form a control group.

Number 120 for main body of study; 40 for control group.

Exclusion criteria Moderate to severe learning disabilities
Moderate to severe traumatic brain injury (i.e. post-traumatic amnesia greater than 24 hours)

Will any of the subjects involved in this study be detained patients under the Mental Health Act? If so, please justify in Section 6. No

(c) **Will patients/volunteers be recruited from within the Trust?** No

Please give details of any patients/volunteers who will be recruited from outside the Trust

The families of children attending Accident and Emergency departments in South London following road traffic accidents will be contacted and invited to participate in the study. Ethical permission will also be sought from local ethics committees.
The control group will be recruited by adverts in the local area (South London).

(d) **Is it proposed to use staff members of the Institute or the Joint Hospital as subjects in this study?** No

(e) **Does the researcher foresee any interference with their duties?** No

(f) **Expected duration of Project** 3 years

(g) **Proposed frequency and duration of procedures:**

i) for research subjects
First assessment: with child and parent at 2-4 weeks after accident – 2 hours
Second assessment: postal assessment with parents and children able to read, at 3 months after accident – 20 minutes
Third assessment: with child and parent at 6 month after accident – 2 hours

ii) for controls
A one-off assessment, lasting no more than one hour.

(h) **Proposed payment (if any) to subjects**
£20 to each family at the 2-4 week assessment, and at the 6 month assessment. Control families will be paid £10.

(i) **Funding (if any) sought for project** (NOTE 3C cont.)

Please state **i) Source** Steel Charitable Trust

ii) Amount £2000

ii) to whom payable (please complete whichever is applicable):

£0 **(as a personal emolument)**

£2000 **(Institute/Hospital funds)**

(j) **Grant Reference Number (if known)** Not known

(k) **Will data relating to subjects/controls resulting from the research be stored on computer**
Yes

If so, please state that the requirements of the Data Protection Act will be complied with

The Data Protection Act will be complied with.

(l) **Please state that you will observe the Code of Practice on the Use of Audio-Visual Material (if applicable)**
The Code of Practice on the Use of Audio-Visual Material will be observed.

(m) Description of design, methodology and techniques
(as far as possible in lay language)

The study will use a prospective design, i.e. children and their families will be assessed at multiple time points.

The families of children attending A&E departments following road traffic accidents will be contacted and invited to participate in the study. Children and one of their parents (or caregivers, if applicable) will be assessed by interview at two to four weeks, three months, and six months after the accident.

At the initial assessment the nature of the study and why it is being conducted will be explained to both parents and children. The child's psychological responses to the road traffic accident will be assessed at this time point in a variety of ways:

1) Detailed semi-structured interviews with parents, with regards to their child. These interviews will primarily assess child PTSD, as well as other psychopathology (e.g. depression, separation anxiety disorder) and what strategies the child and family have used to cope with the accident.
2) Detailed age-appropriate semi-structured interviews with children. As with adults, these interviews will primarily assess PTSD, as well as other psychopathology and what strategies the child has used to cope with the accident. In the case of children aged 3-5 years these questions will be grossly simplified.
3) Children will report visual analogue measures relating to their accident-related fears, general anxiety, and sadness.
4) A standardised play assessment protocol will be used to examine the prevalence of accident-related play and behavioural re-enactment of the accident, each symptoms of PTSD.
5) Self-report questionnaires to be completed by parents, relating to their own PTSD, depression, anxiety, and ways of coping, including cognitive style, as well as their child's psychopathology.
6) Self-report questionnaires to be completed by 6-10 year old children (with the help of the investigator, if necessary). These questionnaires will address PTSD, depression, anxiety, and ways of coping, including cognitive style.
7) Children's spoken accounts of what happened during the accident. Children's descriptions of what happened will be recorded, and later analysed to see if the quality of their memories of what happened are related to PTSD.
8) Intelligence testing. This will allow us to examine whether intelligence is related to the quality of their memories of what happened and the onset of PTSD.

At the three month assessment parents will complete questionnaires relating to their own and their child's PTSD, anxiety and depression. Children aged 6-10 years who are able to complete questionnaires will do so regarding their own PTSD, depression, and anxiety. Children's teachers will also asked to complete a questionnaire regarding the child's psychopathology.

At the six month assessment families will complete the same procedures as at the two to four week assessment, and each child's teacher will also be asked to complete a questionnaire regarding the child's psychopathology. Children found to have developed PTSD will be given the offer of treatment by staff at the Maudsley Hospital Child Traumatic Stress Clinic.

Control families will be recruited from South London, who will complete some of the key and novel measures devised for use in this study, so as to provide an idea of whether the behaviour demonstrated by the accident-exposed children might be considered normal or abnormal. Parents will complete the parent interview (to provide a comparison for item 1,

above), and children will be asked to describe a recent event that has occurred to them (to provide a comparison for item 7), and will complete the standardised play assessment protocol (to provide a comparison for item 4).

Section 5 Scientific Background (NOTE 3D)

(a) **Has this investigation been carried out previously with human subjects? If so, why is it being repeated?** No

(b) **Which research instruments will be used? (avoid using acronyms)**

Child and parent interviews:

Semi-structured interviews will be devised and piloted for use in this study, as no entirely satisfactory interview schedules are currently available for children aged under eight years. The interview schedule devised will assess PTSD, depression, and anxiety. The schedule will be submitted for scrutiny by the committee once it has been satisfactorily piloted.

Parent questionnaire measures:

PTSD Diagnostic Scale (Foa et al., 1997, Psychological Assessment)
Beck Depression Inventory (Beck et al., 1961, Archives of General Psychiatry)
Beck Anxiety Inventory (Beck et al., 1988, Journal of Consulting and Clinical Psychology)

Measures for assessing aspects of the parent's coping with their child's accident will be devised and piloted. These will be submitted to the committee once they have been satisfactorily piloted.

Child questionnaire measures:

Child PTSD Symptom Scale (Foa et al., 2001, Journal of Clinical Child Psychology)

Revised Impact of Event Scale, child version (Smith et al., 2002, Personality & Individual Differences)

The Birleson Depression Inventory (Birleson, 1981, Journal of Child Psychology and Psychiatry)

Revised Children's Manifest Anxiety Scale (Reynolds et al., 1978, Journal of Abnormal Child Psychology)

Simplified analogue measures of mood and fear, suitable for use by the younger children participating in the study, will be devised and piloted. As with the interview schedule, these will be submitted to the committee once they have been satisfactorily piloted.

Furthermore, measures for assessing aspects of children's coping with the trauma, including their appraisals of what occurred, and the degree of social support available to them, will be devised and piloted for use with 6-10 year olds participating in the study who are able to read. These will be submitted to the committee once they have been satisfactorily piloted.

Intelligence testing:

British Picture Vocabulary Scale, Second Edition (BPVS-II)

Parent and teacher reports of children:

Strengths and Difficulties Questionnaire (Goodman, 1997, Journal of Child Psychology and Psychiatry)

Standardised play assessment protocol:

This measure will be devised and piloted by the applicants, so that the DSM-IV symptoms specifically for young children (repetitive play and behavioural re-enactment) might be systematically investigated in the course of this study. An account of the protocol will be submitted to the committee once it has been satisfactorily piloted.

(c) **How has the number of recruits been decided upon?** (please justify the statistical viability - see Notes for Guidance Note 3D)

Multiple linear regression statistics will be used to investigate the role of different factors in causing PTSD in young children. For 12 predictor variables, detecting a medium effect size (a conservative estimate as large effect sizes have been observed in previous studies of older children exposed to trauma), with 90% power, and at 5% significance level, 120 participants will be required.

Section 6 Ethical Considerations (NOTE 3E)

(a) Please provide a brief account **IN LAY LANGUAGE** of the ethical considerations raised by this project

i) Confidentiality: All data will be kept in strict confidence. Access will only be granted to other researchers and clinicians working within the Child Traumatic Stress Clinic at the Institute of Psychiatry and Maudsley Hospital who may be involved in treating participants or data analysis.

ii) Informed consent: Parental informed consent will be required for families participating in the study. Given the age of children who will be participating in the study, it will not usually be possible to obtained informed consent from children invited to participate in the study, i.e. younger children (aged 2-6 years) may struggle to understand the study is being conducted. In such cases the child's assent to participation in the study will be sought, i.e. based on what they do comprehend about the study, are they happy to take part.

iii) Impact on child: The impact of participating in the study on each child will be carefully monitored, so as to ensure that no child is adversely affected. At the end of each assessment children will be asked if they have been upset by taking part in the study, and parents will later be telephoned so as to they were aware of any distress in their child.

iv) Distress: The interviews will be conducted by Richard Meiser-Stedman, a post-doctoral research fellow who is experienced in working with children and adolescents exposed to traumatic events. Further training will be provided to him regarding assisting young children who are distressed by participating in the study. It will be stressed to children and parents that they can withdraw from the study at any time without any consequences for their care.

Previous studies conducted by the investigators have found there to be no significant distress caused by participating in prospective studies of this kind.

v) Children with PTSD: Children who are identified as developing PTSD will be referred to the Child Traumatic Stress Clinic at the Maudsley hospital. Principal caregivers who are thought to have PTSD will also be offered the choice of receiving treatment within the Institute of Psychiatry or the Maudsley hospital.

vi) Long-term follow-up: As so little is known about young children's responses to trauma, in particular with regards to the time course of any psychiatric disorder following trauma, it is possible that at a later date ethical permission will be sought to conduct a much longer follow up study of the cohort recruited for the present study. Whether this long-term follow-up study occurs depends on whether the findings from the present study suggest that the young children's responses to trauma last for any significant duration, and whether the funding is available to conduct such study. In order to alert potential participants to the possibility that they may be contacted at a later date, a clause has been entered on the

information sheet for parents. It is stressed that participants would be free not to participate in this follow-up study, if it occurred.

(b) **What are the benefits of the study to the NHS?**
The study will be provide a far greater understanding of how common psychological distress, and in particular PTSD, is in young children following traumatic events, and also aid our understanding of what causes PTSD in young children. This knowledge will have benefits for both the identification and treatment of young children with PTSD following single event traumas.

Will the benefits be	short term	No
	medium term	Yes
	long term	Yes
	potential for prevention	Yes

Section 7 Safety and Other Controls (NOTE 3F)

(a) **Does this study involve ionising radiation eg X Rays, Nuclear Medicine?**
No

If so, please complete and submit the Application Form for Procedures which involve the use of ionising radiation (available from Committee Administrator)

(b) **Have you obtained a certificate from the Administration of Radioactive Substances Act Committee (ARSAC?)**
N/A

Section 8 Drug Studies (NOTE 3G)

(a) If drugs are to be used, then does the drug that is the subject of the investigation have:

i)	a full Clinical Trial Certificate	N/A
ii)	a Clinical Trial Exemption Certificate	N/A
iii)	If neither (i) or (ii), apply, is the substance being used without a Product Licence for the stated indication	N/A

b) Please state all other drugs involved in the study
N/A

Are these being supplied by a Drug Company? N/A

If yes, by whom

(c) Pharmacy Support (NOTE 3G contd.)
N/A

Has the Principal Pharmacist been informed of this research proposal?
N/A

Section 9 Insurance and Indemnity (NOTE 3H)

(a) **Is this study being sponsored by an Industrial or drug company?** No

If yes, have you obtained indemnity from the sponsoring industrial or drug company?
N/A

(Please attach a copy where applicable to your application)

(b) **If the study is not sponsored and involves healthy volunteers, please indicate what insurance arrangements have been made for these participants (See Note 3Hb) of the Notes for Guidance)**
Normal IoP Indemnity

Section 10 Consents (NOTE 3I)

(a) **Please state how you propose to obtain informed consent, how such consent will be recorded, and why you consider the proposed method to be appropriate to this particular project. A copy of the information and the consent form (both duly headed) should be supplied.**

The parents of children who have attended Accident and Emergency departments in South London will be contacted and told about the nature of the study. If they agree to their children participating in the study, their children also will be told about what the study involves, and asked for their consent to participate in the study. In the case of children aged 3-6 who are not likely to be able to understand fully what the study is about and why it is being conducted, assent to participation will be necessary for their participation.

Written consent will be obtained when the child and parent are met for the first interview. The full nature of study will be explained, with an age-appropriate explanation for younger children. Copies of the consent forms and information sheets to be used are attached.

It will be stressed to both parent and child before they participate that their involvement in the study is entirely voluntary, and that they can withdraw at any time. It will also be stressed that if they decide not to participate, or if they decide to withdraw from the study, this will not have consequences for how they are treated.

(b) **Please indicate how you are gaining permission from consultants in charge of patients (if applicable)**

All children will have been in the care of consultants in A&E departments. Their permission will be sought for recruiting participants for this study. Participating consultants will make the initial contacts.

DECLARATION
The above information is correct to the best of our knowledge. We have read and approved all the relevant supporting documents.

We have read and understood the responsibilities of researchers and principal investigators undertaking research in the NHS as set out in the Department of Health's Research Governance Framework for Health and Social Care.
(http://www.doh.gov.uk/research/rd3/nhsrandd/researchgovernance.htm)
Signed_____(Principal Investigator)
Signed_____(Applicant)
(if different from above)

Signed _____ Dr Patrick Smith (Investigator(s))
_____
(if different from above)
Date of Submission _____

Form to be returned to: Research Ethics Coordinator, W109, Institute of Psychiatry, De Crespigny Park, LONDON SE5 8AF