



# A meta-analysis of risk factors for post-traumatic stress disorder in children and adolescents

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## ABSTRACT

Post-traumatic stress disorder (PTSD) is a complex and chronic disorder that causes substantial distress and interferes with social and educational functioning. Consequently, identifying the risk factors that make a child more likely to experience traumatic distress is of academic, clinical and social importance. This meta-analysis estimated the population effect sizes of 25 potential risk factors for PTSD in children and adolescents aged 6–18 years across 64 studies ( $N = 32,238$ ). Medium to large effect sizes were shown for many factors relating to subjective experience of the event and post-trauma variables (low social support, peri-trauma fear, perceived life threat, social withdrawal, comorbid psychological problem, poor family functioning, distraction, PTSD at time 1, and thought suppression); whereas pre-trauma variables and more objective measures of the assumed severity of the event generated small to medium effect sizes. This indicates that subjective peri-trauma factors and post-event factors are likely to have a major role in determining whether a child develops PTSD following exposure to a traumatic event. Such factors could potentially be assessed following a potentially traumatic event in order to screen for those most vulnerable to developing PTSD and target treatment efforts accordingly. The findings support the cognitive model of PTSD as a way of understanding its development and guiding interventions to reduce symptoms.

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Psychological reactions of children and adolescents to potentially traumatic events have been studied for more than 20 years. Although other reactions such as depression, anxiety and behaviour problems do occur, the most commonly studied reaction is post-traumatic stress disorder (PTSD). PTSD can be a complex and chronic disorder that commonly co-occurs with other disorders including other anxiety disorders, mood disorders and substance use disorders (Brewin, Dalgleish, & Joseph, 1996). Symptoms of PTSD can cause substantial distress and interfere with social and educational functioning (National Institute for Health & Clinical Excellence, 2005). A meta-analysis of rates of PTSD in children and adolescents exposed to trauma, which combined the results of 34 studies, including a total of 2697 individuals found that overall, 36% were diagnosed with PTSD (Fletcher, 1996). However rates vary widely across studies from 0% to 100% (Dalgleish, Meiser-Stedman, & Smith, 2005), indicating that exposure to a potentially traumatic event is necessary, but not sufficient for a young person to develop PTSD. It is therefore increasingly accepted that factors other than the potentially traumatic event play a role in explaining PTSD in both adults and children (e.g. Brewin, Andrews, & Valentine, 2000; Foy, Madvig, Pynoos, & Camilleri, 1996).

## 1. Rationale for the present study

Knowing reliably which factors make a child more likely to develop traumatic distress (whether that is measured by a diagnosis of PTSD, or by severity of PTSD symptoms) is of both academic and clinical interest. Firstly if clinicians know which children and adolescents are most likely to be adversely affected following exposure to events, then those children and adolescents can be most closely monitored with a view to providing treatment as necessary before difficulties become chronic (Pine & Cohen, 2002). Secondly, robust knowledge of risk factors may help our understanding of PTSD and its causes, by confirming or disconfirming current models. In turn, a better understanding of PTSD may assist in assessment, prevention and intervention leading to better outcomes for children and young people exposed to potentially traumatic events.

Thirdly, such knowledge will also highlight areas for further research.

The extent to which knowledge can be robust relates not just to obtaining precise estimates of population effect sizes for risk factors, but also estimating the bias in these estimates. One likely source of bias is publication bias (the 'file drawer problem'): studies that yield non-significant risk factors may be less likely to be submitted for publication; where multiple risk factors are investigated authors may choose to report only the statistically significant one; and editors

and reviewers may be unwilling to publish non-significant findings or ask for non-significant effects to be trimmed to save space. Therefore, it is important to estimate the likely effects of publication bias on the conclusions we draw about risk factors.

### 1.1. Existing research

In trying to examine how different factors may be associated with the development of post-traumatic distress, we have categorised the wide range of different factors into the following categories: demographic factors, pre-trauma factors, objective trauma characteristics, subjective trauma characteristics, post-trauma individual factors, post-trauma psychological environment. The research relating to each of these categories is outlined in more detail subsequently.

### 1.2. Demographic factors

Demographic characteristics have been examined in many studies. Whilst data concerning these factors may in themselves not lend support to any particular theoretical account of PTSD, they are easy to assess and thus may aid efforts to identify youth at high risk of developing PTSD following exposure to a potentially traumatic event. Age has received particular attention and although results are mixed (Foy et al., 1996), a number of mechanisms have been proposed for how age may alter a young person's vulnerability to developing PTSD. For example, younger children have less prior knowledge and less language which affects their understanding and appraisal of the event as well as the amount of detail that is encoded; similarly younger children are less able to regulate their emotions which will also affect the way in which they process the event (Salmon & Bryant, 2002). Gender has also been considered to play a role in the development of symptomatic distress. Mechanisms that have been proposed to account for this include that female survivors exhibit more extreme acute reactions which may lead to increased risk of later PTSD (Pine & Cohen, 2002), and the fact that females are more likely to use rumination (Hampel & Petermann, 2005) which may influence the development of PTSD (Ehlers & Clark, 2000).

### 1.3. Pre-trauma factors

The question of how pre-trauma factors, such as previous traumas, may increase a young person's vulnerability or resilience following a potentially traumatic event has been explored in a number of studies. Viewing a child's response to a traumatic stressor within the context of their pre-trauma life experiences and mental health is consistent

with a developmental psychopathological perspective, and may identify important risk factors for the development of chronic PTSD. Foy and colleagues have suggested several ways in which various pre-trauma factors may play a role in the development of PTSD. Some factors may interact with the effects of the traumatic experience to heighten reactivity and thereby increase an individual's vulnerability, whilst others may increase distress independent of the effect of the traumatic experience. They go on to suggest that other factors may act both by interacting with the impact of the event and causing independent distress (Foy et al., 1996).

#### 1.4. Objective trauma characteristics

Several commentators have noted that objective characteristics such as severity of event, or level of exposure, consistently predict subsequent PTSD symptoms (Foy et al., 1996; Pine & Cohen, 2002). Quantifying the strength of association between objective trauma characteristics and PTSD allows for an examination of the relative importance of such trauma characteristics compared to other factors, as well as the identification of further ways of identifying youth at high risk.

#### 1.5. Subjective trauma characteristics

Within the current DSM-IV criteria for PTSD, subjective characteristics of an event (the experience of intense fear, helplessness or horror) – are an essential requirement for conferring this diagnosis. Some commentators have questioned whether this criterion is appropriate for young children given the difficulties inherent in assessing peri-trauma reactions in this age group (Scheeringa et al., 1993). However, subjective factors, such as the perception of threat and peri-traumatic affect, are highly likely to be linked to the onset of PTSD (Perrin, Smith, & Yule, 2000). Indeed, perceived life threat and fear have already been included in screening measures for trauma-exposed youth (Winston, Kassam-Adams, Garcia-España, Ittenbach, & Cnaan, 2003).

#### 1.6. Post-trauma individual factors

Comorbid psychological difficulties, acute post-traumatic stress symptoms, and coping styles are among the factors intrinsic to the child that have been considered as risk factors for PTSD. Other cognitive (Dalglish et al., 2005; Meiser-Stedman, 2002; Salmon & Bryant, 2002) and biological mechanisms (De Bellis et al., 1999) have also been suggested as playing an important role in the aetiology of PTSD. However, it remains to be seen whether there is any consistent pattern in the literature concerning such factors.

#### 1.7. Post-trauma psychological environment

Pine and Cohen's review found that in addition to trauma exposure, levels of social support were consistently associated with mental health outcomes for children exposed to a potentially traumatic event (Pine & Cohen, 2002). Furthermore, Pynoos and colleagues suggested that child-extrinsic factors such as parental and family functioning may be associated with a child's vulnerability by moderating the impact of the event, the impact of proximal reminders and the impact of secondary stresses (Pynoos, Steinberg, & Piacentini, 1999).

## 2. Existing reviews of research

There are a number of reviews of the literature that have attempted to increase our understanding of the development of child PTSD (Foy et al., 1996; Pine & Cohen, 2002). Pine and Cohen's review identified two factors consistently related to adverse outcome: trauma exposure and disrupted social support. Foy also argued

that parental distress might act as a powerful mediating factor in the development of the child's symptoms. Whilst such reviews are helpful, a more systematic review and meta-analysis of factors considered by research would add significantly to our understanding by enabling a closer examination of the consistency of the relationship between a particular factor and outcome across different studies. It would also enable results from different studies to be combined to produce a more accurate estimate of the population effect size for different risk factors.

Individual studies may report very different strengths of associations between a given risk factor and PTSD. Meta-analyses are able to explore this variation between studies, by examining how sample and study characteristics act as moderators to the association.

## 3. Other meta-analyses of risk factors for PTSD

There are two meta-analyses of studies examining risk factors for PTSD in adults (Brewin et al., 2000 and Ozer, Best, Lipsey, & Weis, 2003). Brewin and colleagues conducted meta-analyses of 14 risk factors and analysed moderating effects of various sample and study characteristics. The effect size of all the risk factors was modest; but factors operating during or after the trauma, such as trauma severity, lack of social support, and additional life stress, had larger effect sizes ( $r=0.23$  to  $0.40$ ) than pre-trauma factors ( $r=0.05$  to  $0.19$ ). Their analysis of moderators revealed that some risk factors (such as gender, age at trauma and race) predicted PTSD only in some populations whilst some predicted PTSD more consistently (such as education, previous trauma, and general childhood adversity). Results varied depending on the population studied (e.g. civilian or military) and the methods used; and some factors (such as psychiatric history, reported childhood abuse, and family psychiatric history) predicted PTSD more consistently. Ozer and colleagues conducted a meta-analysis of data concerning seven separate risk factors, all of which produced significant but modest effect sizes. Peri-traumatic psychological processes rather than prior characteristics were found to be the strongest predictors of PTSD symptoms or diagnostic status.

Cox and colleagues reviewed the literature concerning risk factors following accidental trauma in children and adolescents and found that eight factors had been measured in studies that met their inclusion criteria for their meta-analysis (Cox, Kenardy, & Hendrikz, 2008). Whilst all risk factors were statistically significant, only threat to life ( $r=0.38$ ) and pre-trauma psychopathology ( $r=0.29$ ) were considered to be strong predictors of PTSD. Female gender ( $r=0.18$ ) and pre-trauma psychopathology ( $r=0.22$ ) were weak predictors, whilst younger age ( $r=-0.04$ ), exposure to prior trauma ( $r=0.08$ ), injury severity ( $r=0.09$ ), and involvement of family or a friend in the accident ( $r=0.09$ ) were even weaker predictors. Most risk factors were significantly varied across studies with only pre-trauma psychopathology and threat to life showing consistent effect sizes across studies. Restricting their analysis to studies of accidental trauma may have limited the generalisability of results. The present study therefore included research that investigated a broader range of events, including natural events, and intentional violence.

Brewin et al. (2000) and Cox et al. (2008) both employed Rosenthal's fixed-effects model of meta-analysis (Rosenthal, 1991). However, random-effect meta-analyses are generally more appropriate for several reasons (see Field, 2001; 2003; 2005; Hunter & Schmidt, 2000). First, real-world data are likely to have variable population parameters (Field, 2003; Hunter & Schmidt, 1990, 2000; National Research Council, 1992; Osburn & Callender, 1992). Second, Hedges and Vevea (1998) have suggested that fixed-effect models are appropriate only when making inferences about the studies included in the meta-analysis and generally researchers want to generalise their conclusions beyond the studies within the analysis. Finally, applying fixed effects meta-analytic models to random-effect data can have undesirable effects on the outcomes of analyses but the

**Table 1**

Risk factors extracted from included studies and descriptive statistics of the overall effect sizes from each study (different psychological problems were combined for analysis).

| Risk factor                    | Article name                                           | Assessment of risk factor                                         | K                                                               | Mean <i>r</i> | SD   | Min.  | Max. |
|--------------------------------|--------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|---------------|------|-------|------|
| Bereavement                    | Goenjian et al., 1995                                  | Death of family members                                           | 3                                                               | 0.19          | 0.04 | 0.14  | 0.22 |
|                                | Lengua, Long, Smith, & Meltzoff, 2005                  | Knowing someone that died                                         | 1                                                               | 0.16          |      |       |      |
|                                | Pfefferbaum et al., 1999                               | Knowing someone killed                                            | 3                                                               | 0.16          | 0.03 | 0.12  | 0.19 |
| Blame others                   | Wickrama & Kaspar, 2007                                | Death of someone close                                            | 2                                                               | 0.35          | 0.01 | 0.34  | 0.35 |
|                                | Stallard, Velleman, Langsford, & Baldwin, 2001         | Kidcope                                                           | 1                                                               | 0.29          |      |       |      |
|                                | Vernberg, LaGreca, Silverman, & Prinstein, 1996        | Kidcope                                                           | 1                                                               | 0.56          |      |       |      |
| Comorbid anxiety               | Goenjian et al., 1995                                  | Diagnostic Interview Schedule for Children and Adolescents        | 1                                                               | 0.19          |      |       |      |
|                                | Kilic, Ozguven, & Sayil, 2003                          | State-Trait Anxiety Inventory for Children                        | 2                                                               | 0.22          | 0.03 | 0.20  | 0.24 |
|                                | Lack & Sullivan, 2008                                  | Tornado Exposure Questionnaire                                    | 1                                                               | 0.24          |      |       |      |
|                                | Lengua et al., 2005                                    | Revised Children's Manifest Anxiety Scale                         | 1                                                               | 0.69          |      |       |      |
|                                | Linning & Kearney, 2004                                | Anxiety Disorders Interview Schedule for Children – Child Version | 3                                                               | 0.24          | 0.01 | 0.24  | 0.25 |
|                                | Lonigan, Shannon, Finch, Daugherty, & Taylor, 1991     | Revised Children's Manifest Anxiety Scale                         | 2                                                               | 0.41          | 0.20 | 0.27  | 0.55 |
|                                | Saxe et al., 2005                                      | Multidimensional Anxiety Scale for Children                       | 1                                                               | 0.68          |      |       |      |
|                                | Schafer, Barkmann, Riedesser, & Schulte-Markwort, 2006 | Anxiety Disorders Interview Schedule – Revised                    | 1                                                               | 0.21          |      |       |      |
|                                | Udwin, Boyle, Yule, Bolton, & O'Ryan, 2000             | Revised Children's Manifest Anxiety Scale                         | 3                                                               | 0.35          | 0.12 | 0.22  | 0.45 |
|                                | Comorbid conduct problem                               | Lengua et al., 2005                                               | Youth Self Report – Delinquent & Aggressive Behaviour Subscales | 1             | 0.35 |       |      |
| Comorbid depression            | Goenjian et al., 1995                                  | Depression Self Rating Scale                                      | 4                                                               | 0.42          | 0.11 | 0.28  | 0.55 |
|                                | Goenjian et al., 2001                                  | Depression Self Rating Scale                                      | 4                                                               | 0.68          | 0.11 | 0.56  | 0.81 |
|                                | Jaycox et al., 2002                                    | Children's Depression Inventory                                   | 1                                                               | 0.54          |      |       |      |
|                                | Kilic et al., 2003                                     | Children's Depression Inventory                                   | 1                                                               | 0.10          |      |       |      |
|                                | Lengua et al., 2005                                    | Children's Depression Inventory                                   | 1                                                               | 0.46          |      |       |      |
|                                | Linning & Kearney, 2004                                | Anxiety Disorders Interview Schedule for Children – Child Version | 2                                                               | 0.41          | 0.04 | 0.38  | 0.44 |
|                                | Overstreet, Dempsey, Graham, & Moely, 1999             | Children's Depression Inventory                                   | 1                                                               | 0.18          |      |       |      |
|                                | Roussos et al., 2005                                   | Depression Self Rating Scale                                      | 3                                                               | 0.54          | 0.03 | 0.51  | 0.56 |
|                                | Schafer et al., 2006                                   | Children's Depression Inventory                                   | 1                                                               | 0.22          |      |       |      |
|                                | Thabet, Abed, & Vostanis, 2004                         | Short Mood and Feelings Questionnaire                             | 2                                                               | 0.34          | 0.11 | 0.26  | 0.42 |
|                                | Udwin et al., 2000                                     | Depression Self Rating Scale                                      | 3                                                               | 0.37          | 0.10 | 0.29  | 0.48 |
|                                | Wickrama & Kaspar, 2007                                | Youth Self Report – depression items                              | 1                                                               | 0.54          |      |       |      |
|                                | Comorbid internalising                                 | Otto et al., 2007                                                 | Behavioural Inhibition                                          | 2             | 0.12 | 0.05  | 0.08 |
| Comorbid psychological problem | McDermott, Lee, Judd, & Gibbon, 2005                   | Strength and Difficulties Questionnaire                           | 1                                                               | 0.22          |      |       |      |
|                                | Udwin et al., 2000                                     | Child and Adolescent Psychopathology Interview                    | 2                                                               | 0.18          | 0.03 | 0.16  | 0.20 |
| Distraction                    | Stallard & Smith, 2007                                 | Two questions to assess cognitive coping strategies               | 1                                                               | 0.58          |      |       |      |
|                                | Stallard et al., 2001                                  | Kidcope                                                           | 2                                                               | 0.29          | 0.01 | 0.28  | 0.30 |
| Female gender                  | Delahanty, Nugent, Christopher, & Walsh, 2005          | Standard demographic information                                  | 1                                                               | 0.36          |      |       |      |
|                                | Goenjian et al., 1995                                  | Standard demographic information                                  | 4                                                               | 0.14          | 0.15 | –0.07 | 0.26 |
|                                | Goenjian et al., 2001                                  | Standard demographic information                                  | 4                                                               | 0.20          | 0.09 | 0.07  | 0.28 |
|                                | Goenjian et al., 2005                                  | Standard demographic information                                  | 2                                                               | 0.21          | 0.12 | 0.13  | 0.29 |
|                                | Heptinstall, Sethna, & Taylor, 2004                    | Standard demographic information                                  | 1                                                               | –0.18         |      |       |      |
|                                | Husain et al., 1998                                    | Standard demographic information                                  | 1                                                               | 0.15          |      |       |      |
|                                | Jaycox et al., 2002                                    | Standard demographic information                                  | 1                                                               | 0.09          |      |       |      |
|                                | Kilic et al., 2003                                     | Standard demographic information                                  | 1                                                               | 0.36          |      |       |      |
|                                | Korol, Green, & Gleser, 1999                           | Standard demographic information                                  | 1                                                               | 0.06          |      |       |      |
|                                | Landolt, Vollrath, Ribl, Gnehm, & Sennhauser, 2003     | Standard demographic information                                  | 1                                                               | 0.12          |      |       |      |
|                                | Landolt, Vollrath, Timm, Gnehm, & Sennhauser, 2005     | Standard demographic information                                  | 2                                                               | 0.05          | 0.06 | 0.01  | 0.09 |
|                                | Lengua et al., 2005                                    | Standard demographic information                                  | 1                                                               | 0.05          |      |       |      |
|                                | Linning & Kearney, 2004                                | Standard demographic information                                  | 1                                                               | 0.35          |      |       |      |
|                                | Lonigan et al., 1991                                   | Standard demographic information                                  | 1                                                               | 0.15          |      |       |      |
|                                | McDermott et al., 2005                                 | Standard demographic information                                  | 1                                                               | 0.07          |      |       |      |
|                                | Mirza, Bhadrinath, Goodyear, & Gilmour, 1998           | Standard demographic information                                  | 4                                                               | 0.27          | 0.03 | 0.22  | 0.29 |
|                                | Ostrowski, Christopher, & Delahanty, 2007a             | Standard demographic information                                  | 2                                                               | 0.24          | 0.07 | 0.18  | 0.29 |
|                                | Otto et al., 2007                                      | Standard demographic information                                  | 2                                                               | 0.11          | 0.03 | 0.09  | 0.14 |
|                                | Overstreet et al., 1999                                | Standard demographic information                                  | 1                                                               | 0.14          |      |       |      |
|                                | Pfefferbaum et al., 2000                               | Standard demographic information                                  | 1                                                               | 0.21          |      |       |      |
|                                | Roussos et al., 2005                                   | Standard demographic information                                  | 1                                                               | 0.16          |      |       |      |
|                                | Runyon & Kenny, 2002                                   | Standard demographic information                                  | 1                                                               | 0.19          |      |       |      |
|                                | Schafer, Barkmann, Riedesser, & Schulte-Markwort, 2004 | Standard demographic information                                  | 1                                                               | 0.25          |      |       |      |

(continued on next page)

Table 1 (continued)

| Risk factor                    | Article name                                              | Assessment of risk factor                                                                                          | K | Mean r | SD   | Min.  | Max.  |
|--------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---|--------|------|-------|-------|
| Low intelligence               | Shannon, Lonigan, Finch, & Taylor, 1994                   | Standard demographic information                                                                                   | 1 | 0.20   |      |       |       |
|                                | Stallard & Smith, 2007                                    | Standard demographic information                                                                                   | 1 | 0.29   |      |       |       |
|                                | Stallard, Salter, & Velleman, 2004                        | Standard demographic information                                                                                   | 1 | 0.30   |      |       |       |
|                                | Thabet et al., 2004                                       | Standard demographic information                                                                                   | 1 | 0.01   |      |       |       |
|                                | Udwin et al., 2000                                        | Standard demographic information                                                                                   | 1 | 0.18   |      |       |       |
|                                | Vernberg et al., 1996                                     | Standard demographic information                                                                                   | 1 | 0.10   |      |       |       |
| Low SES                        | Saltzman, Weems, & Carrion, 2006                          | Wechsler Abbreviated Scales of Intelligence                                                                        | 9 | 0.25   | 0.11 | 0.12  | 0.40  |
|                                | Udwin et al., 2000                                        | Presence of learning difficulties                                                                                  | 2 | 0.18   | 0.00 | 0.18  | 0.18  |
| Low social support             | Delahanty et al., 2005                                    | Parental income                                                                                                    | 1 | 0.26   |      |       |       |
|                                | Landolt et al., 2003                                      | Paternal occupation & maternal education                                                                           | 1 | 0.06   |      |       |       |
|                                | Landolt et al., 2005                                      | Paternal occupation & maternal education                                                                           | 2 | 0.03   | 0.01 | 0.02  | 0.03  |
|                                | Max et al., 1998                                          | Hollingshead Four Factor Index                                                                                     | 4 | 0.27   | 0.05 | 0.20  | 0.30  |
|                                | Nugent, Ostrowski, Christopher, & Delahanty, 2007         | Parental education                                                                                                 | 2 | 0.16   | 0.09 | 0.10  | 0.22  |
|                                | Ostrowski, Christopher, & Delahanty, 2007b                | Parental income                                                                                                    | 1 | 0.48   |      |       |       |
| Maternal anxiety               | Otto et al., 2007                                         | Hollingshead Four Factor Index                                                                                     | 2 | 0.05   | 0.04 | 0.02  | 0.08  |
|                                | Heptinstall et al., 2004                                  | Feeling isolated or excluded                                                                                       | 2 | -0.15  | 0.15 | -0.26 | -0.04 |
|                                | Stallard & Smith, 2007                                    | Perceived alienation                                                                                               | 1 | 0.59   |      |       |       |
|                                | Udwin et al., 2000                                        | Social Support Scale                                                                                               | 3 | 0.29   | 0.08 | 0.22  | 0.38  |
| Maternal depression            | Vernberg et al., 1996                                     | Social Support Scale for Children and Adolescents                                                                  | 5 | 0.35   | 0.22 | 0.20  | 0.73  |
|                                | Smith, Perrin, Yule, & Rabe-Hesketh, 2001                 | State – Trait Anxiety Inventory                                                                                    | 1 | 0.24   |      |       |       |
| Maternal psychological problem | Kilic et al., 2003                                        | Beck Depression Inventory                                                                                          | 1 | 0.19   |      |       |       |
|                                | Smith et al., 2001                                        | Beck Depression Inventory                                                                                          | 1 | 0.17   |      |       |       |
| Maternal PTSD                  | Wickrama & Kaspar, 2007                                   | Center for Epidemiological Studies Depression Scale                                                                | 1 | 0.23   |      |       |       |
|                                | Kilic et al., 2003                                        | General Health Questionnaire                                                                                       | 1 | 0.26   |      |       |       |
| Parental depression            | Smith et al., 2001                                        | General Health Questionnaire                                                                                       | 1 | 0.19   |      |       |       |
|                                | Landolt et al., 2003                                      | Post-traumatic Diagnostic Scale                                                                                    | 1 | -0.01  |      |       |       |
| Parental psychological problem | Landolt et al., 2005                                      | Post-traumatic Diagnostic Scale                                                                                    | 2 | 0.15   | 0.13 | 0.06  | 0.24  |
|                                | Ostrowski et al., 2007a                                   | Clinician Administered PTSD Scale                                                                                  | 3 | 0.37   | 0.16 | 0.23  | 0.55  |
|                                | Punamaki, Qouta, Sarraj, & Montgomery, 2006               | PTSD Reaction Index                                                                                                | 3 | 0.11   | 0.11 | 0.00  | 0.22  |
|                                | Smith et al., 2001                                        | Impact of Events Scale – Revised                                                                                   | 2 | 0.35   | 0.03 | 0.33  | 0.37  |
|                                | Wickrama & Kaspar, 2007                                   | DSM-IV diagnostic interview items                                                                                  | 1 | 0.40   |      |       |       |
|                                | Meiser-Stedman, Yule, Dalgleish, Smith, & Glucksman, 2005 | Beck Depression Inventory                                                                                          | 2 | 0.42   | 0.03 | 0.40  | 0.44  |
| Parental PTSD                  | Linning & Kearney, 2004                                   | Family Environment Scale                                                                                           | 1 | 0.28   |      |       |       |
|                                | Nugent et al., 2007                                       | Symptom Checklist – 90 revised                                                                                     | 1 | 0.50   |      |       |       |
| Paternal depression            | Koplewicz et al., 2002                                    | Adult Post-traumatic Stress Reaction Index                                                                         | 4 | 0.48   | 0.30 | 0.08  | 0.81  |
|                                | Landolt et al., 2005                                      | Post-traumatic Diagnostic Scale                                                                                    | 1 | 0.52   |      |       |       |
|                                | Magal-Vardi et al., 2004                                  | Davidson Trauma Scale                                                                                              | 2 | 0.55   | 0.11 | 0.47  | 0.63  |
|                                | Nugent et al., 2007                                       | Impact of Events Scale – Revised                                                                                   | 3 | 0.38   | 0.13 | 0.23  | 0.45  |
|                                | Shemesh et al., 2005                                      | Impact of Events Scale                                                                                             | 2 | 0.33   | 0.01 | 0.32  | 0.34  |
|                                | Kilic et al., 2003                                        | Beck Depression Inventory                                                                                          | 1 | 0.58   |      |       |       |
| Paternal psychological problem | Kilic et al., 2003                                        | General Health Questionnaire                                                                                       | 1 | 0.52   |      |       |       |
|                                | Landolt et al., 2003                                      | Post-traumatic Diagnostic Scale                                                                                    | 1 | 0.02   |      |       |       |
| Perceived life threat          | Landolt et al., 2005                                      | Post-traumatic Diagnostic Scale                                                                                    | 2 | 0.16   | 0.21 | 0.01  | 0.31  |
|                                | Punamaki et al., 2006                                     | Adult Post-traumatic Stress Reaction Index                                                                         | 3 | 0.15   | 0.10 | 0.10  | 0.26  |
|                                | Lack & Sullivan, 2008                                     | Trauma Exposure Questionnaire – Children                                                                           | 1 | 0.41   |      |       |       |
|                                | Landolt et al., 2005                                      | Threat appraisal question                                                                                          | 2 | 0.33   | 0.06 | 0.29  | 0.37  |
|                                | McDermott et al., 2005                                    | Threat appraisal question                                                                                          | 1 | 0.40   |      |       |       |
|                                | Solomon & Lavi, 2005                                      | Threat appraisal question                                                                                          | 3 | 0.31   | 0.12 | 0.17  | 0.39  |
| Peri-trauma fear               | Udwin et al., 2000                                        | Threat appraisal questions                                                                                         | 2 | 0.27   | 0.06 | 0.22  | 0.31  |
|                                | Vernberg et al., 1996                                     | Hurricane-Related Traumatic Experiences Questionnaire                                                              | 1 | 0.39   |      |       |       |
|                                | Aaron, Zaglul, & Emery, 1999                              | Likert scale question                                                                                              | 1 | 0.56   |      |       |       |
|                                | Lack & Sullivan, 2008                                     | Trauma Exposure Questionnaire                                                                                      | 2 | 0.36   | 0.17 | 0.24  | 0.48  |
|                                | Udwin et al., 2000                                        | Fear and panic questions                                                                                           | 3 | 0.18   | 0.06 | 0.12  | 0.24  |
|                                | Kilic et al., 2003                                        | McMaster Family Assessment Device                                                                                  | 7 | 0.07   | 0.09 | -0.03 | 0.21  |
| Poor family functioning        | Meiser-Stedman et al., 2005                               | Family Functioning Questionnaire                                                                                   | 1 | 0.43   |      |       |       |
|                                | Otto et al., 2007                                         | Parental expressed emotion (criticism or over-involvement)                                                         | 4 | 0.05   | 0.02 | 0.03  | 0.07  |
|                                | Pelcovitz, Kaplan, DeRosa, Mandel, & Salzinger, 2000      | Parental Bonding Instrument, Family Adaptability and Cohesion Evaluation Scale III, Family Disagreements Interview | 4 | 0.78   | 0.10 | 0.65  | 0.87  |
|                                | Roussos et al., 2005                                      | Difficulties at home                                                                                               | 1 | 0.31   |      |       |       |
|                                | Udwin et al., 2000                                        | Child & Adolescent Psychopathology Interview (violence at home)                                                    | 1 | 0.15   |      |       |       |
|                                | Wickrama & Kaspar, 2007                                   | Parent-child relationship quality                                                                                  | 1 | 0.79   |      |       |       |
| Post-trauma life events        | Heptinstall et al., 2004                                  | Uncertain asylum application                                                                                       | 7 | 0.17   | 0.18 | -0.03 | 0.49  |
|                                | Landolt et al., 2005                                      | Occurrence of 12 major life events                                                                                 | 2 | -0.15  | 0.08 | -0.20 | -0.09 |

Table 1 (continued)

| Risk factor                               | Article name                                     | Assessment of risk factor                                                                                 | K | Mean r | SD   | Min.  | Max.  |
|-------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---|--------|------|-------|-------|
| Post-trauma media exposure                | McDermott et al., 2005                           | Having to live elsewhere                                                                                  | 1 | 0.06   |      |       |       |
|                                           | Udwin et al., 2000                               | Life Events Scale                                                                                         | 3 | 0.34   | 0.08 | 0.28  | 0.44  |
|                                           | Wickrama & Kaspar, 2007                          | Number of days displaced from home                                                                        | 1 | 0.29   |      |       |       |
|                                           | Lengua, Long, & Meltzoff, 2006                   | Parental responses to questions about child media exposure                                                | 1 | −0.16  |      |       |       |
|                                           | Otto et al., 2007                                | Parental responses to questions about child media exposure                                                | 4 | 0.11   | 0.05 | 0.05  | 0.17  |
| Pre-trauma anxiety                        | Pfefferbaum et al., 2000                         | Child responses to questions about media exposure                                                         | 3 | 0.37   | 0.04 | 0.34  | 0.41  |
|                                           | Asarnow et al., 1999                             | Revised Children's Manifest Anxiety Scale                                                                 | 2 | 0.19   | 0.01 | 0.19  | 0.20  |
|                                           | Lengua et al., 2005                              | Child Behaviour Checklist, Revised Children's Manifest Anxiety Scale                                      | 3 | 0.08   | 0.03 | 0.05  | 0.11  |
|                                           | Mirza et al., 1998                               | Revised Children's Manifest Anxiety Scale                                                                 | 2 | 0.20   | 0.02 | 0.18  | 0.21  |
|                                           | Otto et al., 2007                                | Reported history of child anxiety disorder                                                                | 2 | 0.07   | 0.02 | 0.06  | 0.08  |
| Pre-trauma conduct problem                | Udwin et al., 2000                               | Retrospective Experiences and Child and Adolescent Psychopathology Interview                              | 1 | .17    |      |       |       |
|                                           | Lengua et al., 2005                              | Child Behaviour Checklist and Achenbach Youth Self Report – Delinquent and Aggressive Behaviour Subscales | 3 | 0.14   | 0.09 | 0.05  | 0.22  |
| Pre-trauma depression                     | Mirza et al., 1998                               | Young Person's Questionnaire (Parent Version) – Behaviour Indicator Scale Subscale                        | 2 | 0.16   | 0.19 | 0.02  | 0.29  |
|                                           | Lengua et al., 2005                              | Child Behaviour Checklist, Child Depression Inventory                                                     | 3 | 0.14   | 0.12 | 0.00  | 0.22  |
|                                           | Mirza et al., 1998                               | Mood and Feelings Questionnaire (Parent report)                                                           | 2 | 0.21   | 0.00 | 0.21  | 0.21  |
| Pre-trauma family psychological problem   | Otto et al., 2007                                | Kiddie Schedule for Affective Disorders and Schizophrenia, Epidemiologic Version (KSADS-E)                | 2 | .07    | .01  | .07   | .08   |
|                                           | Max et al., 1998                                 | Family History Research Diagnostic Criteria                                                               | 2 | 0.14   | 0.18 | 0.01  | 0.27  |
| Pre-trauma internalising life events      | Aaron et al., 1999                               | Child Behaviour Checklist                                                                                 | 1 | 0.39   |      |       |       |
|                                           | Heptinstall et al., 2004                         | Number of pre-migration traumas                                                                           | 2 | 0.48   | 0.09 | 0.41  | 0.54  |
|                                           | Landolt et al., 2003                             | Recent significant life events                                                                            | 1 | 0.05   |      |       |       |
|                                           | Landolt et al., 2005                             | Occurrence of major life events                                                                           | 2 | 0.20   | 0.08 | 0.14  | 0.25  |
|                                           | Lengua et al., 2006                              | General Life Events Schedule for Children                                                                 | 1 | 0.38   |      |       |       |
|                                           | Overstreet et al., 1999                          | Life Events Checklist                                                                                     | 1 | 0.16   |      |       |       |
|                                           | Stallard & Smith, 2007                           | Previous RTA, previous accident                                                                           | 2 | 0.16   | 0.04 | 0.13  | 0.19  |
|                                           | Stallard et al., 2004                            | Previous RTA                                                                                              | 1 | 0.10   |      |       |       |
|                                           | Udwin et al., 2000                               | Medical problems                                                                                          | 1 | 0.23   |      |       |       |
|                                           | Lengua et al., 2005                              | Perceived Competence Scale for Children-Self-worth Subscale                                               | 2 | 0.18   | 0.04 | 0.15  | 0.21  |
| Pre-trauma parental anxiety               | Mirza et al., 1998                               | Parent's version of Young Persons' Questionnaire.                                                         | 2 | 0.14   | 0.10 | 0.08  | 0.21  |
|                                           | Otto et al., 2007                                | Structured Clinical Interview for DSM-III-R (SCID)                                                        | 2 | 0.06   | 0.03 | 0.04  | 0.09  |
| Pre-trauma parental depression            | Otto et al., 2007                                | Structured Clinical Interview for DSM-III-R (SCID)                                                        | 2 | 0.15   | 0.09 | 0.08  | 0.21  |
|                                           | Max et al., 1998                                 | Family History Research Diagnostic Criteria                                                               | 2 | 0.22   | 0.03 | 0.20  | 0.24  |
| Pre-trauma parental psychological problem | Max et al., 1998                                 | Pre-injury internalising disorder                                                                         | 4 | 0.34   | 0.04 | 0.30  | 0.38  |
|                                           | Mirza et al., 1998                               | Rutter's Questionnaire (parent)                                                                           | 1 | 0.11   |      |       |       |
|                                           | Udwin et al., 2000                               | Retrospective Experiences and Child and Adolescent Psychopathology Interview                              | 1 | 0.16   |      |       |       |
| PTSD (T1)                                 | Koplewicz et al., 2002                           | Child PTSD Reaction Index                                                                                 | 2 | 0.79   | 0.01 | 0.78  | 0.79  |
|                                           | Landolt et al., 2005                             | Child PTSD Reaction Index                                                                                 | 2 | 0.31   | 0.47 | −0.02 | 0.64  |
|                                           | Nugent et al., 2007                              | Clinician Administered PTSD Scale – Child and Adolescent                                                  | 1 | 0.75   |      |       |       |
| Race (BME)                                | Udwin et al., 2000                               | Impact of Events Scale                                                                                    | 1 | 0.22   |      |       |       |
|                                           | La Greca, Silverman, Vernberg, & Prinstein, 1996 | Standard demographic information                                                                          | 6 | 0.20   | 0.04 | 0.15  | 0.25  |
|                                           | Lengua et al., 2005                              | Standard demographic information                                                                          | 2 | 0.10   | 0.12 | 0.02  | 0.18  |
|                                           | Lonigan et al., 1991                             | Standard demographic information                                                                          | 1 | 0.05   |      |       |       |
|                                           | Nugent et al., 2007                              | Standard demographic information                                                                          | 2 | 0.13   | 0.08 | 0.08  | 0.19  |
| Social withdrawal                         | Shannon et al., 1994                             | Standard demographic information                                                                          | 1 | 0.06   |      |       |       |
|                                           | Stallard et al., 2001                            | Kidcope                                                                                                   | 2 | 0.35   | 0.01 | 0.35  | 0.36  |
|                                           | Vernberg et al., 1996                            | Kidcope                                                                                                   | 1 | 0.37   |      |       |       |
| Thought suppression                       | Aaron et al., 1999                               | White Bear Suppression Inventory                                                                          | 3 | 0.62   | 0.07 | 0.55  | 0.69  |
|                                           | Stallard & Smith, 2007                           | Child rating of use of two strategies of suppression                                                      | 1 | 0.59   |      |       |       |
| Time post-trauma                          | Goenjian et al., 2005                            | Time between event and assessment                                                                         | 3 | −0.29  | 0.02 | −0.32 | −0.27 |
|                                           | Koplewicz et al., 2002                           | Time between event and assessment                                                                         | 1 | −0.13  |      |       |       |
|                                           | La Greca et al., 1996                            | Time between event and assessment                                                                         | 3 | −0.18  | 0.08 | −0.27 | −0.12 |
|                                           | Lengua et al., 2005                              | Time between event and assessment                                                                         | 1 | −0.06  |      |       |       |
|                                           | Lengua et al., 2006                              | Time between event and assessment                                                                         | 1 | −0.03  |      |       |       |
|                                           | Nugent, Christopher, & Delahanty, 2006           | Time between event and assessment                                                                         | 1 | −0.15  |      |       |       |
|                                           | Otto et al., 2007                                | Time between event and assessment                                                                         | 3 | 0.15   | 0.00 | 0.15  | 0.15  |
|                                           | Schafer et al., 2006                             | Time between event and assessment                                                                         | 1 | −0.33  |      |       |       |
| Trauma severity                           | Thabet & Vostanis, 1999                          | Time between event and assessment                                                                         | 2 | −0.53  | 0.06 | −0.57 | −0.49 |
|                                           | Aaron et al., 1999                               | Number of days in hospital                                                                                | 1 | 0.32   |      |       |       |
|                                           | Bal et al., 2003                                 | Type of trauma                                                                                            | 1 | 0.30   |      |       |       |
|                                           | Bradburn, 1991                                   | Distance from epicentre                                                                                   | 1 | 0.57   |      |       |       |
|                                           |                                                  | Injury severity                                                                                           | 1 | 0.10   |      |       |       |

(continued on next page)

Table 1 (continued)

| Risk factor | Article name                                | Assessment of risk factor                                                                                               | K | Mean r | SD   | Min.  | Max.  |
|-------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---|--------|------|-------|-------|
|             | Bryant, Salmon, Sinclair, & Davidson, 2007b | Injury severity                                                                                                         | 1 | 0.91   |      |       |       |
|             | Bryant, Salmon, Sinclair, & Davidson, 2007a |                                                                                                                         |   |        |      |       |       |
|             | Giannopoulou et al., 2006                   | Proximity to earthquake                                                                                                 | 1 | 0.15   |      |       |       |
|             | Goenjian et al., 1995                       | Proximity to epicentre                                                                                                  | 1 | 0.50   |      |       |       |
|             | Goenjian et al., 2001                       | Level of impact                                                                                                         | 3 | 0.58   | 0.16 | 0.45  | 0.76  |
|             | Goenjian et al., 2005                       | Proximity to epicentre                                                                                                  | 6 | 0.51   | 0.16 | 0.34  | 0.71  |
|             | Goenjian et al., 2009                       | Loss of parent                                                                                                          | 3 | 0.09   | 0.02 | 0.07  | 0.11  |
|             | Heptinstall et al., 2004                    | Violent death of family member, Experienced threats to life separated from parents                                      | 3 | 0.24   | 0.28 | −0.05 | 0.50  |
|             | Koplewicz et al., 2002                      | Directly witnessed event or not                                                                                         | 4 | 0.43   | 0.16 | 0.28  | 0.64  |
|             | La Greca et al., 1996                       | Number of life-threatening experiences                                                                                  | 1 | 0.39   |      |       |       |
|             | Lack & Sullivan, 2008                       | Tornado Exposure Questionnaire                                                                                          | 1 | 0.11   |      |       |       |
|             | Landolt et al., 2003                        | Days in hospital, functional status of child, type of trauma                                                            | 3 | 0.09   | 0.15 | −0.08 | 0.18  |
|             | Landolt et al., 2005                        | Injury severity, days in hospital, parent involved in accident, type of accident                                        | 7 | 0.02   | 0.09 | −0.05 | 0.21  |
|             | Laor et al., 2002                           | Proximity to epicentre                                                                                                  | 1 | 0.05   |      |       |       |
|             | Linning & Kearney, 2004                     | Duration of maltreatment                                                                                                | 1 | 0.30   |      |       |       |
|             | Lonigan et al., 1991                        | Hurricane exposure                                                                                                      | 1 | 0.23   |      |       |       |
|             | Max et al., 1998                            | Glasgow Coma Scale                                                                                                      | 4 | 0.24   | 0.21 | 0.05  | 0.46  |
|             | McDermott et al., 2005                      | Child endorsement of various trauma variables                                                                           | 6 | 0.26   | 0.16 | 0.11  | 0.53  |
|             | Mirza et al., 1998                          | Type of accident                                                                                                        | 1 | 0.20   |      |       |       |
|             | Nugent et al., 2007                         | Injury severity                                                                                                         | 4 | 0.07   | 0.04 | 0.03  | 0.11  |
|             | Otto et al., 2007                           | Dose of exposure                                                                                                        | 2 | 0.07   | 0.05 | 0.04  | 0.11  |
|             | Pfefferbaum et al., 1999                    | Relationship with deceased                                                                                              | 2 | 0.09   | 0.01 | 0.08  | 0.10  |
|             | Pfefferbaum et al., 2000                    | Indirect Interpersonal Exposure                                                                                         | 1 | .48    |      |       |       |
|             | Pfefferbaum, 2001                           | Physical exposure                                                                                                       | 2 | 0.18   | 0.02 | 0.17  | 0.19  |
|             | Rees et al., 2004                           | Severity of illness                                                                                                     | 1 | 0.10   |      |       |       |
|             | Roussos et al., 2005                        | Proximity to epicentre                                                                                                  | 1 | 0.04   |      |       |       |
|             | Runyon & Kenny, 2002                        | Trauma type                                                                                                             | 1 | 0.40   |      |       |       |
|             | Saxe et al., 2005                           | Surface of body area burned                                                                                             | 2 | 0.47   | 0.03 | 0.45  | 0.49  |
|             | Smith et al., 2001                          | Analogue Pain Scale                                                                                                     | 1 | 0.28   |      |       |       |
|             | Solomon & Lavi, 2005                        | Number of experienced traumatic events                                                                                  | 3 | 0.23   | 0.02 | 0.22  | 0.25  |
|             | Stallard & Smith, 2007                      | Type or RTA, arent involved in RTA, Triage rating, A&E Outcome                                                          | 4 | 0.07   | 0.06 | 0.03  | 0.13  |
|             | Stallard et al., 2004                       | Type of accident, others involved, triage rating, priority rating, X-ray, blow to head, fractures, admitted to hospital | 8 | 0.07   | 0.04 | 0.01  | 0.13  |
|             | Thabet & Vostanis, 1999                     | Number of experienced traumatic events                                                                                  | 1 | 0.64   |      |       |       |
|             | Thabet, Abed, & Vostanis, 2002              | Exposure to bombardment                                                                                                 | 3 | 0.24   | 0.00 | 0.24  | 0.24  |
|             | Thabet et al., 2004                         | Gaza Traumatic Event Checklist                                                                                          | 2 | 0.15   | 0.03 | 0.13  | 0.17  |
|             | Udwin et al., 2000                          | Saw blood, non-swimmer in the water, injury severity, trapped in wreckage                                               | 5 | 0.21   | 0.02 | 0.20  | 0.24  |
|             | Vernberg et al., 1996                       | Hurricane related traumatic experiences                                                                                 | 3 | 0.51   | 0.08 | 0.43  | 0.59  |
|             | Wickrama & Kaspar, 2007                     | Property destruction index, social losses, displacement duration                                                        | 3 | 0.25   | 0.07 | 0.18  | 0.31  |
| Younger Age | Bryant et al., 2007a                        | Standard demographic information                                                                                        | 1 | 0.40   |      |       |       |
|             | Heptinstall et al., 2004                    | Standard demographic information                                                                                        | 1 | −0.07  |      |       |       |
|             | Jaycox et al., 2002                         | Standard demographic information                                                                                        | 1 | −0.04  |      |       |       |
|             | Korol et al., 1999                          | Standard demographic information                                                                                        | 3 | −0.01  | 0.18 | −0.18 | 0.17  |
|             | Landolt et al., 2003                        | Standard demographic information                                                                                        | 1 | 0.06   |      |       |       |
|             | Landolt et al., 2005                        | Standard demographic information                                                                                        | 2 | −0.08  | 0.01 | −0.09 | −0.07 |
|             | Lengua et al., 2006                         | Standard demographic information                                                                                        | 1 | 0.22   |      |       |       |
|             | Lonigan et al., 1991                        | Standard demographic information                                                                                        | 2 | 0.10   | 0.11 | 0.02  | 0.17  |
|             | McDermott et al., 2005                      | Standard demographic information                                                                                        | 1 | 0.32   |      |       |       |
|             | Nugent et al., 2007                         | Standard demographic information                                                                                        | 2 | 0.10   | 0.06 | 0.06  | 0.15  |
|             | Otto et al., 2007                           | Standard demographic information                                                                                        | 2 | −0.08  | 0.09 | −0.14 | −0.02 |
|             | Overstreet et al., 1999                     | Standard demographic information                                                                                        | 1 | −0.18  |      |       |       |
|             | Runyon & Kenny, 2002                        | Standard demographic information                                                                                        | 1 | −0.34  |      |       |       |
|             | Saxe et al., 2005                           | Standard demographic information                                                                                        | 1 | 0.17   |      |       |       |
|             | Schafer et al., 2004                        | Standard demographic information                                                                                        | 1 | 0.03   |      |       |       |
|             | Stallard & Smith, 2007                      | Standard demographic information                                                                                        | 1 | −0.08  |      |       |       |
|             | Stallard et al., 2004                       | Standard demographic information                                                                                        | 1 | 0.05   |      |       |       |
|             | Thabet et al., 2004                         | Standard demographic information                                                                                        | 1 | −0.12  |      |       |       |

k = the number of effect sizes.

reverse is not true (Field, 2003; Hunter & Schmidt, 2000). Using Monte Carlo analysis Field (2003) demonstrated that fixed-effects model are unreliable (they inflate estimates of population effect-sizes and yield corresponding confidence intervals that are too narrow) when there is substantial or moderate heterogeneity: the chance of a Type I error rose from 5% to between 43 and 80%. For these reasons, we considered it important to employ a random-effect model.

### 3.1. The present study

The present study adds to the meta-analyses described earlier because it brings together all of the existing child and adolescent research of sufficient quality that investigates risk factors for PTSD following a variety of potentially traumatic events using random-effect meta-analytic techniques.

## 4. Method

### 4.1. Selection of studies for the meta-analysis

English-language articles published in peer-reviewed journals between 1980 (the first *DSM* definition of PTSD) and May 2009 were considered for inclusion. Various psychological and medical literature databases were searched, including the PILOTS database managed by the National Center for PTSD, Medline, PsychInfo, Embase and Web of Science. In addition, each issue of the *Journal of Traumatic Stress* was examined for relevant research. Secondary sources such as review articles, book chapters and the reference sections of selected articles were examined. Search terms for the literature databases included combinations of the following: PTSD, post-traumatic stress disorder or post-traumatic stress disorder; child or children or adolescent(s); and, risk, predictor, prediction or predisposition. A predictor or risk factor was operationally defined as any variable examined as a potential contributor to variability in PTSD symptom level or diagnostic status. This literature search yielded a preliminary database of 1210 published articles, which were then reviewed for inclusion in the meta-analysis using various inclusion and exclusion criteria.

### 4.2. Inclusion and exclusion criteria

There is some debate in the child PTSD literature as to whether PTSD manifests differently in children of different ages and developmental levels, and therefore how best to assess PTSD in children of different ages (e.g. Dehon & Scheeringa, 2006; Fletcher, 1996; Meiser-Stedman, Smith, Glucksmann, Yule, & Dalgleish, 2008; Scheeringa, Zeanah, Myers & Putnam, 2003). With the exception of assessments specifically for pre-school children (e.g. Scheeringa et al., 2003) most standardised assessments of PTSD in children have been validated on groups of children of school age and above. Thus, the age range for samples to be included in the present meta-analysis was set at 6–18 years as long as the measure of PTSD was appropriate for the age group of the sample. A more conservative approach would have been to set the lower age range at 8 years, however a random effect moderator analysis of effect-sizes across all risk factors demonstrates that there was no significant difference in overall effect-size between studies that breached the 8–18 years age range, and those that did not, ( $\chi^2(1) = 0.079, p = 0.778$ )

Bal, Oost, Bourdeaudhuij, and Crombez (2003) breached the upper age limit by just one year with their age range of 11–19. We decided to include this study because the vast majority of the sample was within the age range, and those that were not, were only just above it.

To be included in the analysis, studies had to have used measures of child PTSD that considered all three PTSD symptom clusters (intrusion, avoidance/numbing and hyperarousal), and demonstrated adequate reliability and validity as shown by publication of their psychometric properties in a peer-reviewed journal or by having a strong pedigree (e.g. minimal but necessary changes to a measure with proven reliability and validity such as the UCLA PTSD Reaction Index which has been modified in order to take into account changes in diagnostic criteria, Steinberg, Brymer, Decker, & Pynoos, 2004).

Articles were excluded on any of the following grounds:

- (a) The study measured only acute trauma response (e.g. Acute Stress Disorder or PTSD measured before 1 month post-trauma) rather than PTSD, which according to DSM-IV-TR, can be diagnosed only after 1 month (American Psychiatric Association, 2000)
- (b) The study used a categorical measure of PTSD and included in the same comparison group individuals meeting full diagnostic criteria for PTSD together with individuals with less severe post-traumatic symptoms or partial PTSD (e.g. 'subsyndromal PTSD'), and contrasted them with a group exposed to the same event but without PTSD;

- (c) The study sample consisted entirely of individuals who fulfilled the full diagnostic criteria for PTSD and therefore were unsuitable for ascertaining the frequencies of these phenomena
- (d) The study sample was selected on the basis that participants were experiencing a specific comorbid psychiatric disorder (e.g. depression, ADHD, substance abuse, learning difficulties, offenders), which would limit the generalisability of results
- (e) The study did not specifically assess *DSM*-defined PTSD symptoms (e.g. studies that reported only general symptoms)
- (f) Studies with insufficient data to calculate univariate effect sizes, and where such data could not be obtained from the study author
- (g) The article was a review that did not present new data or only presented qualitative analyses
- (h) The primary aim of the study was to investigate the efficacy of treatment; and
- (i) Single case studies.

Finally any study that examined a risk factor that was not also examined by at least one other study was excluded from further examination. All eligible studies were carefully reviewed by two authors (LS & AS) to ensure decision-rule consistency, with 100% agreement.

### 4.3. Coding of studies

Following this procedure, 62 studies with a total sample size of 32,238 participants yielded 453 effect sizes that were included in the meta-analysis. These studies are identified with an asterisk in the reference section. Table 1 provides a full list of the data extracted from each study for each risk factor and Table 2 provides a detailed list of characteristics of the studies used in the meta-analysis. Effect-sizes for both current and past PTSD symptoms, as well as longitudinal studies that presented multiple assessments of symptoms over time, were included. The simple mean was computed for studies contributing multiple effect-sizes for the same risk factor. We did not include multiple effect-sizes from the same study because the results could be biased by the studies contributing numerous effect sizes. Only single-*df* comparisons were appropriate for selection in the meta-analysis (Rosenthal, 1991). Different articles reporting analyses from the same data set were included if the studies provided effect-size estimates for different risk factors. On nine occasions, the same data were reported in more than one publication. When this occurred, estimates from the largest sample or from the most comprehensive article were used.

For obvious reasons, meta-analysis was not conducted on any risk factor for which only a single effect size was available (e.g. cortisol levels, handedness, dissociation and grief reactions risk factors). Where continuous (symptom severity) and categorical (diagnosis) measures of a given risk factor were both available within a study, we used the effect-size for PTSD symptom severity because of the statistical advantages of continuously measured variables in predictive research. Whenever the same risk factors had been assessed within a study using more than one measure (e.g., several separate aspects of previous psychiatric history might have been assessed), effect sizes were averaged across these measures. An effect size of zero was assigned for the few studies ( $k = 2, 0.4\%$  of all effect sizes) that reported non-significant findings and did not provide an effect-size. Although this conservative strategy generally underestimates the true magnitude of effect sizes (Durlak & Lipsey, 1991; Rosenthal, 1995), this approach is preferable to excluding non-significant results from the meta-analysis, which would result in an overestimation of combined effect sizes (Rosenthal, 1995).

### 4.4. Computation and analysis of effect sizes

Meta-analyses were conducted using SPSS 18 and R 2.10 (R Development Core Team, 2010) using Field and Gillett's (2010) syntax. A separate meta-analysis was carried out for each risk factor. In the present study, Pearson's correlation coefficient,  $r$ , was chosen as the effect



**Table 2**  
Characteristics of studies included in the meta-analysis.

| Article                     | Trauma type                                                                           | Sample size | PTSD measure               | Interview or questionnaire | Age range    | Mean age (SD) | Percentage of sample that were female | Location             |
|-----------------------------|---------------------------------------------------------------------------------------|-------------|----------------------------|----------------------------|--------------|---------------|---------------------------------------|----------------------|
| Aaron et al., 1999          | Mixed: RTA; other                                                                     | 40          | CPTSD-RI                   | Interview                  | 8–17         | 13.60 (2.95)  | 52                                    | US                   |
| Asarnow et al., 1999        | Natural disaster: earthquake                                                          | 49          | CPTSD-RI                   | Interview                  | 8.59–18.60   | 13.66 (2.60)  | 40                                    | US                   |
| Bal et al., 2003            | Mixed: sexual abuse; accident; interpersonal violence; neglect; illness/injury; other | 970         | CAPS-CA                    | Interview                  | 11–19        | 14.43 (1.49)  | 52                                    | Belgium              |
| Bradburn, 1991              | Natural disaster: earthquake                                                          | 22          | CPTSD-RI                   | Interview                  | 10–12        | Not reported  | 45                                    | US                   |
| Bryant et al., 2007b        | Mixed: traumatic falls; RTA; other                                                    | 62          | UCLA PTSD Index for DSM-IV | Interview                  | 7–13         | 9.64 (2.4)    | 34                                    | Australia            |
| Bryant et al., 2007a        | Mixed: RTA; injury; other                                                             | 76          | UCLA PTSD Index for DSM-IV | Interview                  | 7–12         | Not reported  | 34                                    | Australia            |
| Delahanty et al., 2005      | Mixed: RTA; sports injury; interpersonal violence; other                              | 58          | CAPS-CA                    | Interview                  | 8–18         | 13.04 (3.05)  | 31                                    | US                   |
| Giannopoulou et al., 2006   | Natural disaster: earthquake                                                          | 2037        | RIES-C                     | Questionnaire              | 9–17         | 12.85 (2.45)  | 49                                    | Greece               |
| Goenjian et al., 2009       | Natural disaster: earthquake                                                          | 92          | CPTSD-RI                   | Questionnaire              | Not reported | 14.0 (1.8)    | 40                                    | Armenia              |
| Goenjian et al., 1995       | Natural disaster: earthquake                                                          | 218         | CPTSD-RI                   | Questionnaire              | Not reported | 13.7          | 57–65                                 | Armenia              |
| Goenjian et al., 2001       | Natural disaster: hurricane                                                           | 158         | CPTSD-RI                   | Questionnaire              | 13           | 13.00 (0.35)  | 48                                    | Nicaragua            |
| Goenjian et al., 2005       | Natural disaster: earthquake                                                          | 125         | CPTSD-RI                   | Questionnaire              | 15–17        | 16.4 (0.475)  | 59–63                                 | Armenia              |
| Heptinstall et al., 2004    | Refugee                                                                               | 40          | IES-R – 13 Item            | Questionnaire              | 8–16         | 11.3          | 43                                    | UK                   |
| Husain et al., 1998         | War: siege                                                                            | 791         | IES/CPTSD-RI               | Questionnaire              | 7–15         | 11.0 (2.3)    | 51                                    | Bosnia & Herzegovina |
| Jaycox et al., 2002         | Violence                                                                              | 1004        | CPSS                       | Questionnaire              | 8–15         | 11.4 (1.8)    | 49                                    | US                   |
| Kilic et al., 2003          | Natural disaster: earthquake                                                          | 49          | CPTSD-RI                   | Questionnaire              | 7–14         | 10.25         | 47                                    | Turkey               |
| Koplewicz et al., 2002      | Terrorism                                                                             | 49          | CPTSD-RI                   | Questionnaire              | 6–12         | Not reported  | 69                                    | US                   |
| Korol et al., 1999          | Industrial accident                                                                   | 120         | CPTSD-RI                   | Interview                  | 7–15         | 11.44 (2.65)  | 50                                    | US                   |
| La Greca et al., 1996       | Natural disaster: hurricane                                                           | 442         | CPTSD-RI                   | Questionnaire              | 6–13         | Not reported  | 58                                    | US                   |
| Lack & Sullivan, 2008       | Natural disaster: tornado                                                             | 102         | CPTSD-RI                   | Interview                  | 8–12         | 10.40 (1.23)  | 53                                    | US                   |
| Landolt et al., 2003        | Injury/illness                                                                        | 209         | CPTSD-RI                   | Interview                  | 6.5–14.5     | 10.0 (2.3)    | 40                                    | Switzerland          |
| Landolt et al., 2005        | RTA                                                                                   | 68          | CPTSD-RI                   | Interview                  | 6.5–14.5     | 9.82 (2.55)   | 46                                    | Switzerland          |
| Laor et al., 2002           | Natural disaster: earthquake                                                          | 404         | CPTSD-RI                   | Questionnaire              | Not reported | 8.52 (1.22)   | 55                                    | Turkey               |
| Lengua et al., 2005         | Terrorism                                                                             | 145         | CPSS                       | Questionnaire              | 9.13–13.65   | 10.93 (1.01)  | 53                                    | US                   |
| Lengua et al., 2006         | Terrorism                                                                             | 143         | CPSS                       | Questionnaire              | 9.13–13.65   | 10.93 (1.01)  | 53                                    | US                   |
| Linning & Kearney, 2004     | Physical & sexual abuse                                                               | 55          | CPTSD-I                    | Interview                  | 8–17         | 12.65 (2.58)  | 58                                    | US                   |
| Lonigan et al., 1991        | Natural disaster: hurricane                                                           | 5687        | CPTSD-RI                   | Questionnaire              | 9–19         | 14.02 (2.41)  | 51                                    | US                   |
| Magal-Vardi et al., 2004    | Injury/illness                                                                        | 20          | CPTSD-RI                   | Interview                  | 7–18         | 13.6 (3.6)    | 50                                    | Israel               |
| Max et al., 1998            | Injury/illness                                                                        | 44          | K-SADS-E                   | Questionnaire              | 6–14         | 10.30 (2.43)  | 36                                    | US                   |
| McDermott et al., 2005      | Natural disaster: fire                                                                | 222         | CPTSD-RI                   | Questionnaire              | 8–18         | 12.50 (2.48)  | 55                                    | Australia            |
| Meiser-Stedman et al., 2005 | Mixed: interpersonal violence & RTA                                                   | 66          | RIES-C                     | Questionnaire              | 10–16        | 13.8 (1.9)    | 39–40                                 | UK                   |
| Mirza et al., 1998          | RTA                                                                                   | 156         | K-SADS-L                   | Questionnaire              | 8–16         | 13.61 (2.44)  | 31                                    | UK                   |
| Nugent et al., 2006         | Mixed: RTA; sports injury; interpersonal violence; other                              | 82          | CAPS-CA                    | Interview                  | 8–18         | 13.19 (2.94)  | 31                                    | US                   |
| Nugent et al., 2007         | Mixed: RTA; sports injury; interpersonal violence; other                              | 82          | CAPS-CA                    | Interview                  | 8–18         | 13.19 (2.94)  | 31                                    | US                   |
| Ostrowski et al., 2007a     | Mixed: RTA; other                                                                     | 61          | CAPS-CA                    | Interview                  | 8–18         | 13.32 (3.08)  | 46                                    | US                   |
| Ostrowski et al., 2007b     | Mixed: RTA; other                                                                     | 54          | CAPS-CA                    | Interview                  | 8–18         | Not Reported  | 45                                    | US                   |
| Otto et al., 2007           | Terrorism                                                                             | 166         | IES-R                      | Interview                  | 7–15         | 11.0 (3.1)    | 53                                    | US                   |
| Overstreet et al., 1999     | Interpersonal violence                                                                | 75          | CCDS                       | Questionnaire              | 10–15        | 12.50 (1.0)   | 52                                    | US                   |
| Pelcovitz et al., 2000      | Mixed: interpersonal violence & physical abuse                                        | 185         | K-SADS-E                   | Interview                  | 12–18        | 15.35 (1.8)   | 54                                    | US                   |
| Pfefferbaum et al., 1999    | Terrorism                                                                             | 3218        | PTSS                       | Questionnaire              | 11–18        | Not reported  | 57                                    | US                   |
| Pfefferbaum et al., 2000    | Terrorism                                                                             | 119         | PTSS                       | Questionnaire              | 12–13        | Not reported  | 51                                    | US                   |
| Pfefferbaum, 2001           | Terrorism                                                                             | 2381        | PTSS                       | Questionnaire              | 11–14        | Not reported  | Not reported                          | US                   |
| Punamaki et al., 2006       | War                                                                                   | 216         | CPTSD-RI                   | Questionnaire              | 15–17        | 16.38 (1.14)  | 52                                    | Palestine            |
| Rees et al., 2004           | Paediatric Intensive Care Admission                                                   | 68          | CAPS-CA                    | Questionnaire              | 5–18         | Not reported  | 38                                    | UK                   |
| Roussos et al., 2005        | Natural disaster: earthquake                                                          | 1937        | UCLA PTSD Index for DSM-IV | Questionnaire              | 9–18         | Not reported  | 56                                    | Greece               |
| Runyon & Kenny, 2002        | Physical & sexual abuse                                                               | 98          | CPTSD-RI                   | Questionnaire              | 8–17         | 12.09 (2.84)  | 60                                    | US                   |
| Saltzman et al., 2006       | Mixed: physical & sexual abuse; witnessing violence                                   | 59          | CAPS-CA                    | Interview                  | 7.1–14.1     | 10.7 (1.9)    | 42                                    | US                   |
| Saxe et al., 2005           | Injury/illness                                                                        | 72          | CPTSD-RI                   | Interview                  | 7–17         | 11.2 (3.51)   | 33                                    | US                   |
| Schafer et al., 2004        | RTA                                                                                   | 45          | IES-R                      | Questionnaire              | 8–18         | 13 (3.20)     | 44                                    | Germany              |
| Schafer et al., 2006        | RTA                                                                                   | 72          | IES-R: Total Score         | Questionnaire              | 8–18         | 13.6 (3.3)    | 42                                    | Germany              |
| Shannon et al., 1994        | Natural disaster: hurricane                                                           | 5687        | CPTSD-RI                   | Questionnaire              | 9–19         | 14.02 (2.41)  | 51                                    | US                   |
| Shemesh et al., 2005        | Injury/illness                                                                        | 76          | UCLA PTSD Index for DSM-IV | Questionnaire              | 8–19         | 13.7 (3.2)    | 59                                    | US                   |
| Smith et al., 2001          | War                                                                                   | 339         | IES-R                      | Questionnaire              | 9–14         | Not reported  | Not REPORTED                          | Bosnia & Herzegovina |
| Solomon & Lavi, 2005        | War/Terrorism                                                                         | 740         | CPTSD-RI                   | Questionnaire              | 11.5–15      | Not reported  | 49–54                                 | Israel               |
| Stallard & Smith, 2007      | RTA                                                                                   | 75          | CAPS-CA                    | Interview                  | 7–18         | 14.01 (3.36)  | 51                                    | UK                   |
| Stallard et al., 2001       | RTA                                                                                   | 109         | CAPS-CA                    | Interview                  | 7–18         | 14.62 (3.16)  | 47–53                                 | UK                   |
| Stallard et al., 2004       | RTA                                                                                   | 158         | CAPS-CA                    | Interview                  | 7–18         | 14.85 (3.11)  | 53                                    | UK                   |
| Thabet & Vostanis, 1999     | War                                                                                   | 239         | CPTSD-RI                   | Questionnaire              | 6–11         | 8.9           | 46                                    | Palestine            |
| Thabet et al., 2002         | War                                                                                   | 180         | CPTSD-RI                   | Interview                  | 9–18         | 13.85         | 50                                    | Palestine            |

Table 2 (continued)

| Article                 | Trauma type                 | Sample size | PTSD measure                | Interview or questionnaire | Age range | Mean age (SD) | Percentage of sample that were female | Location  |
|-------------------------|-----------------------------|-------------|-----------------------------|----------------------------|-----------|---------------|---------------------------------------|-----------|
| Thabet et al., 2004     | War                         | 403         | CPTSD-RI                    | Questionnaire              | 9–15      | 12.0 (1.7)    | 53                                    | Palestine |
| Udwin et al., 2000      | Accident                    | 217         | CAPS                        | Interview                  | 11–18     | 14.70 (1.14)  | 74                                    | UK        |
| Vernberg et al., 1996   | Natural disaster: hurricane | 568         | CPTSD-RI                    | Questionnaire              | 6–13      | Not reported  | 55                                    | US        |
| Wickrama & Kaspar, 2007 | Natural disaster: tsunami   | 325         | DSM-IV diagnostic interview | Interview                  | 12–19     | Not reported  | Not reported                          | Sri Lanka |

Note. CAPS = Clinician Administered PTSD Scale, CAPS-CA = Clinician Administered PTSD Scale for Children and Adolescents, CCDS = Checklist for Children's Distress Symptoms, CPSS = Child PTSD Symptom Scale, CPTSD-RI = Children's PTSD Reaction Index, K-SADS-E = Schedule for Affective Disorders and Schizophrenia for School-Age Children, IES-R = Impact of Events Scale-Revised, RIES-C = Revised Impact of Events Scale for Children, RTA = Road Traffic Accident.

size for a number of reasons. First, *r* is a common metric for which the greatest number of effect sizes could be reported or converted; second, *r* is easily computed from chi-square, *t*, *F*, and *d* (see Hunter & Schmidt, 2004); and third, *r* is readily interpretable in terms of practical importance (Field, 2001; Rosenthal, 1991; Rosenthal & DiMatteo, 2001).

For categorical data, correlation coefficients were computed such that a positive coefficient reflected a higher mean in the PTSD group than the control group, and a negative coefficient represented a lower mean in the PTSD group than the control group. For continuous data, correlation coefficients were computed such that a positive coefficient reflected more severe PTSD symptoms, and a negative coefficient reflected less severe PTSD symptoms. Higher values of *r* indicate a stronger positive association with PTSD. Table 1 shows the effect sizes included in the meta-analysis for each risk factor.

4.5. Method of meta-analysis

For reasons discussed earlier, a random-effect meta-analysis was used. Hedges' (Hedges & Olkin, 1985; Hedges & Vevea, 1998) method was applied using Fisher-transformed correlation coefficients with results reported after the back transformation to the Pearson product-

moment correlation coefficient (see Field, 2005; Overton, 1998). Using this method, each effect size is weighted by a value reflecting both the within study variance ( $1/n - 3$  for correlation coefficients in which *n* is the sample size) and the between study variance ( $\tau^2$ ) (see Field & Gillett, 2010, for a guide to using Hedges and Vevea's method).

Moderator analyses were conducted using a random-effect general linear model in which each *z*-transformed effect size can be predicted from the transformed moderator effect (represented by regression coefficient,  $\beta$ ). The moderator effect,  $\beta$ , is estimated using generalised least squared (GLS). In both the main analysis and moderator analyses, between study variance was estimated non iteratively\*\* (e.g. Dersimonian & Laird, 1986). For a technical overview of the GLS moderator analysis that we employed see Overton (1998) or Field and Gillett (2010).

5. Results

5.1. Characteristics of studies

The method described earlier generated 25 risk factors that were explored by two or more studies, which could then be entered into the meta-analysis. Sample sizes from individual studies ranged from

Table 3 Individual meta-analyses of individual risk factors.

| Risk factor                           | <i>k</i> | $\tau^2$ | $\chi^2$ | $\hat{\rho}$ | 95% confidence interval of $\hat{\rho}$ |        | <i>Z</i> | $\rho_{pb}$ |
|---------------------------------------|----------|----------|----------|--------------|-----------------------------------------|--------|----------|-------------|
|                                       |          |          |          |              | Lower                                   | Upper  |          |             |
| Demographic factors                   |          |          |          |              |                                         |        |          |             |
| Female gender                         | 29       | 0.002    | 31.20    | 0.154        | 0.126                                   | 0.182  | 10.77*** | 0.142       |
| Low intelligence                      | 2        | 0.000    | 0.28     | 0.198        | 0.079                                   | 0.317  | 3.25**   | 0.181       |
| Low SES                               | 7        | 0.013    | 6.71     | 0.165        | 0.047                                   | 0.282  | 2.75**   | 0.134       |
| Race (BME)                            | 5        | 0.001    | 6.12     | 0.081        | 0.041                                   | 0.121  | 3.93***  | 0.062       |
| Younger age                           | 18       | 0.015    | 23.84    | 0.030        | -0.041                                  | 0.101  | 0.83     | 0.023       |
| Pre-trauma factors                    |          |          |          |              |                                         |        |          |             |
| Life events                           | 8        | 0.209    | 6.98     | 0.209        | 0.109                                   | 0.309  | 4.09***  | 0.179       |
| Psychological problem                 | 14       | 0.000    | 8.57     | 0.152        | 0.107                                   | 0.196  | 6.64***  | 0.130       |
| Parent psychological problem          | 4        | 0.000    | 1.11     | 0.121        | 0.024                                   | 0.218  | 2.45*    | 0.095       |
| Pre-trauma low self-esteem            | 2        | 0.000    | 0.10     | 0.163        | 0.049                                   | 0.278  | 2.80*    | 0.142       |
| Objective trauma characteristics      |          |          |          |              |                                         |        |          |             |
| Bereavement                           | 4        | 0.008    | 2.63     | 0.217        | 0.116                                   | 0.319  | 4.19***  | 0.204       |
| Time post-trauma                      | 9        | 0.048    | 6.63     | -0.183       | -0.338                                  | -0.028 | 2.32*    | -0.148      |
| Trauma severity                       | 41       | 0.025    | 85.25*** | 0.292        | 0.236                                   | 0.347  | 10.32*** | .0204       |
| Subjective trauma characteristics     |          |          |          |              |                                         |        |          |             |
| Peri-trauma fear                      | 3        | 0.029    | 2.24     | 0.361        | 0.132                                   | 0.590  | 3.09**   | 0.316       |
| Perceived life threat                 | 6        | 0.000    | 4.67     | 0.362        | 0.309                                   | 0.416  | 13.25*** | 0.346       |
| Post-trauma individual factors        |          |          |          |              |                                         |        |          |             |
| Blame others                          | 2        | 0.052    | 10.28**  | 0.474        | 0.143                                   | 0.806  | 2.80**   | 0.522       |
| Comorbid Psychological Problem        | 25       | 0.023    | 38.13*   | 0.404        | 0.336                                   | 0.472  | 11.60*** | 0.361       |
| Distraction                           | 2        | 0.055    | 1.00     | 0.473        | 0.115                                   | 0.832  | 2.59*    | 0.424       |
| PTSD (T1)                             | 4        | 0.182    | 2.87     | 0.636        | 0.203                                   | 1.069  | 2.88**   | 0.541       |
| Thought suppression                   | 2        | 0.000    | 0.07     | 0.696        | 0.508                                   | 0.883  | 7.26***  | 0.601       |
| Post-trauma psychological environment |          |          |          |              |                                         |        |          |             |
| Low social support                    | 4        | 0.032    | 6.69     | 0.327        | 0.127                                   | 0.526  | 3.21**   | 0.288       |
| Life Events                           | 5        | 0.027    | 4.45     | 0.212        | 0.145                                   | 0.279  | 6.20***  | 0.141       |
| Parental psychological problem        | 25       | 0.021    | 26.06    | 0.290        | 0.220                                   | 0.360  | 8.08***  | 0.254       |
| Poor family functioning               | 7        | 0.168    | 6.61     | 0.460        | 0.149                                   | 0.770  | 2.90**   | 0.405       |
| Social withdrawal                     | 2        | 0.000    | 0.04     | 0.385        | 0.310                                   | 0.461  | 9.98***  | 0.367       |
| Media exposure                        | 3        | 0.062    | 2.15     | 0.112        | -0.186                                  | 0.410  | 0.74     | 0.097       |

Note. \*\*\* = *p* < .001, \*\* = *p* < .01, \* = *p* < .05, *k* = number of studies.

20 to 5687. Characteristics of the studies included in the meta-analysis (trauma type, sample size, measure of PTSD, whether the measure was an interview or questionnaire, age range, mean age, percentage of sample that were female, and location of study) are contained in Table 2.

### 5.2. Risk factor estimates

The main results of the meta-analysis for each risk factor are contained in Table 3. For each risk factor this table shows the number of studies ( $k$ ), the estimate of between-study variability ( $\tau^2$ ), test of significance of between study variability ( $\chi^2$ ), estimate of the population effect size ( $\hat{\rho}$ ), 95% confidence intervals, test of the population effect size ( $z$ ) and estimate of the population effect size under severe two-tailed publication bias ( $\rho_{pb}$ ).

The estimate of the population effect size, the confidence intervals and the range of effect sizes from individual studies are shown diagrammatically in Fig. 1.

Two risk factors yielded population effect size estimates close to zero: race (Black and minority ethnic; BME) and younger age. However, the effect of race, whilst small, was nevertheless statistically significant unlike that of younger age, which was not.

Thirteen risk factors yielded small to medium population effect size estimates (i.e. with an absolute value between 0.1 and 0.3, explaining 1–9% of the variance in PTSD symptoms). It is worth noting that the effect of media exposure was not statistically significant, but this is likely to reflect the small number of studies on which the effect size estimate were based ( $k=3$ ). The remaining 10 risk factors yielded medium to large effect sizes (i.e. greater than 0.3, explaining more than 9% of the variance in PTSD symptoms).

There are some noteworthy caveats to these results. First, most of these effects are based on very small numbers of studies. For example, the two largest effect size estimates (thought suppression and PTSD at time 1) are based on only 2 and 4 studies respectively. As such, these effect sizes could reflect idiosyncrasies in the studies, or may simply not be generalisable. The only risk factor to yield a relatively large effect size estimate that was based on a large number of studies

was post-trauma psychological problem ( $k=25$ ). Second, three risk factors showed significant heterogeneity across effect sizes from individual studies (trauma severity, blame others and post-trauma psychological problem). However this is in contrast to other meta-analysis of risk factors for PTSD (e.g. Brewin et al., 2000 and Cox et al., 2008) in which a majority of factors had varied results from different studies. The heterogeneity of the effect sizes for trauma severity and post-trauma psychological problem can in part be explained by the relatively large number of studies, ( $k=41$  and 25 respectively), the estimate of variability,  $\tau^2$ , itself was not large in either of these cases and so the significance could reflect the relatively large power of the test.

### 5.3. Moderator analysis

Four risk factors (trauma severity, comorbid psychological problems, younger age, and female gender) had sufficient numbers ( $k \geq 18$  in the smallest category) of studies to enable an analysis of variables that might moderate the effect sizes. Five potential moderator variables were identified:

- (1) Whether PTSD was measured by interview or questionnaire (which in Brewin et al., 2000, moderated results for female gender, younger age at trauma, trauma severity and previous trauma).
- (2) Whether the trauma was a group trauma (i.e., the same event affecting very many people, such as an earthquake) or an individual trauma (an event happening to one individual, such as an assault). It is possible that social support following a group trauma manifests in different ways to social support following individual events, and given the importance of social support in Brewin's meta-analysis of adult risk factors, this was considered to be of interest as a possible moderating factor.
- (3) Whether the trauma was intended (e.g., war, terrorism, abuse, shooting) or not. In Fletcher (1996) rates of PTSD were found to be different depending on whether the event was a natural event or "human-caused", which may indicate that different meaning is attributed to different types of events, which have

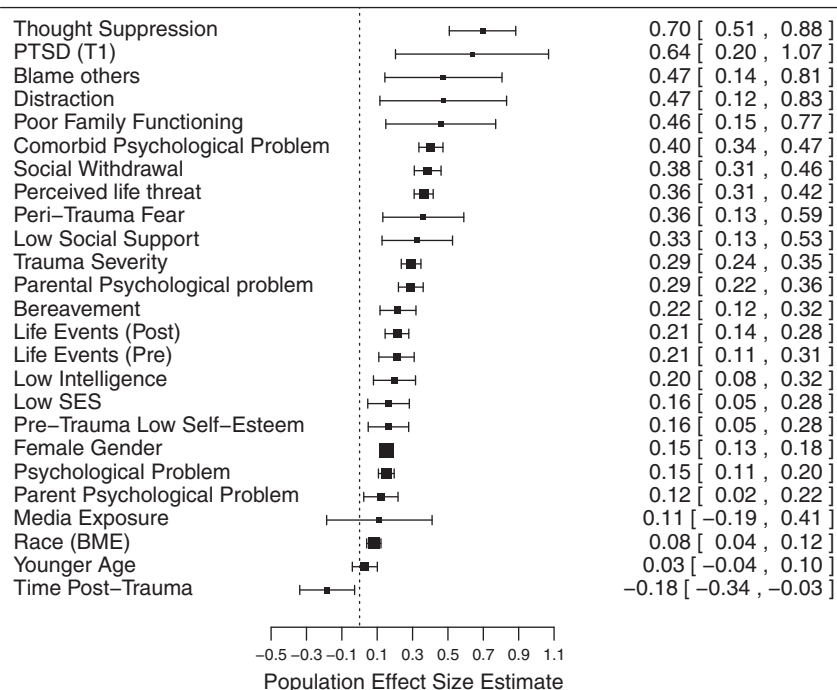


Fig. 1. Forest plot of all risk factors, showing their population effect size estimate, their confidence interval and the range of effect sizes from different studies.

**Table 4**  
Moderator analyses of individual risk factors.

| Risk factor                    | Moderator               | k  | b      | 95% confidence interval of b |       | Z     | p      |
|--------------------------------|-------------------------|----|--------|------------------------------|-------|-------|--------|
|                                |                         |    |        | Lower                        | Upper |       |        |
| Trauma severity                | Interview measure       | 41 | -0.051 | -0.165                       | 0.064 | -0.86 | 0.387  |
|                                | Intended vs. unintended | 34 | -0.042 | -0.171                       | 0.088 | -0.63 | 0.526  |
|                                | Intended vs. mixed      | 20 | 0.124  | -0.058                       | 0.306 | 1.34  | 0.180  |
|                                | Group trauma            | 41 | 0.091  | -0.022                       | 0.204 | 1.58  | 0.114  |
| Comorbid psychological problem | Mean age                | 28 | 0.009  | -0.023                       | 0.041 | 0.57  | 0.567  |
|                                | Anxiety vs. other       | 13 | 0.188  | -0.005                       | 0.380 | 1.91  | 0.056  |
|                                | Depression vs. other    | 16 | 0.248  | 0.066                        | 0.430 | 2.67  | 0.008  |
|                                | Interview measure       | 25 | -0.044 | -0.189                       | 0.100 | -0.60 | 0.548  |
|                                | Intended vs. unintended | 24 | 0.390  | 0.323                        | 0.459 | 11.16 | <0.001 |
|                                | Group Trauma            | 25 | 0.005  | -0.153                       | 0.164 | 0.07  | 0.947  |
|                                | Mean Age                | 23 | -0.018 | -0.074                       | 0.039 | -0.61 | 0.545  |
|                                | Younger age             | 18 | 0.050  | -0.099                       | 0.199 | 0.66  | 0.510  |
|                                | Interview measure       | 15 | 0.149  | 0.016                        | 0.283 | 2.19  | 0.029  |
|                                | Intended vs. mixed      | 10 | 0.310  | 0.111                        | 0.509 | 3.05  | 0.002  |
| Female gender                  | Group trauma            | 18 | 0.196  | 0.063                        | 0.004 | 2.90  | 0.004  |
|                                | Mean age                | 17 | 0.009  | -0.045                       | 0.062 | 0.32  | 0.751  |
|                                | Interview measure       | 29 | 0.009  | -0.045                       | 0.062 | 0.32  | 0.751  |
|                                | Intended vs. unintended | 27 | 0.061  | 0.006                        | 0.116 | 2.18  | 0.029  |
|                                | Intended vs. mixed      | 12 | 0.198  | 0.003                        | 0.393 | 1.99  | 0.047  |
|                                | Group trauma            | 29 | 0.004  | -0.056                       | 0.065 | 0.14  | 0.888  |
|                                | Mean Age                | 26 | 0.028  | 0.009                        | 0.046 | 2.90  | 0.004  |

k = number of studies, b = regression parameter for the moderator effect, z = test of the moderation effect.

subsequent effects on outcome. Categorising events as either intended or not was considered to be a more discriminating categorisation than natural or “human-caused”, as the fact that the harm was caused on purpose may be even more meaningful for the victims, than simply the fact that it was human caused.

- (4) Whether the measure of PTSD was categorical or continuous. This was a significant moderator of six factors in Brewin et al. (2000).
- (5) The mean age of the sample (which was considered worthy of further investigation given the discussion of age and PTSD in the introduction).

**Table 5**  
Moderators of the impact of trauma severity as a risk factor for PTSD.

| Moderator          | Group         | k  | $\hat{\rho}$ | 95% confidence interval for $\hat{\rho}$ |       | Z       |
|--------------------|---------------|----|--------------|------------------------------------------|-------|---------|
|                    |               |    |              | Lower                                    | Upper |         |
| Assessment         | Interview     | 18 | 0.268        | 0.147                                    | 0.389 | 4.33*** |
|                    | Questionnaire | 23 | 0.310        | 0.244                                    | 0.377 | 9.17*** |
| Intentional trauma | Intentional   | 13 | 0.293        | 0.203                                    | 0.384 | 6.36*** |
|                    | Unintentional | 21 | 0.254        | 0.180                                    | 0.328 | 6.75*** |
|                    | Mixed         | 7  | 0.421        | 0.100                                    | 0.742 | 2.57*   |
| Group trauma       | Group         | 22 | 0.331        | 0.257                                    | 0.405 | 8.74*** |
|                    | Individual    | 19 | 0.240        | 0.155                                    | 0.324 | 5.56*** |

Note. \*\*\* = p < .001, \* = p < .05, k = number of studies,  $\hat{\rho}$  = estimate of the population effect size, z = test of the population effect size estimate.

**Table 6**  
Moderators of the impact of comorbid psychological problems as a risk factor for PTSD.

| Moderator                       | Group         | k  | $\hat{\rho}$ | 95% confidence interval for $\hat{\rho}$ |       | z        |
|---------------------------------|---------------|----|--------------|------------------------------------------|-------|----------|
|                                 |               |    |              | Lower                                    | Upper |          |
| Type of disorder                | Anxiety       | 9  | 0.406        | 0.275                                    | 0.537 | 6.06***  |
|                                 | Depression    | 12 | 0.471        | 0.383                                    | 0.559 | 10.51*** |
|                                 | Other         | 4  | 0.217        | 0.123                                    | 0.312 | 4.52***  |
| Assessment                      | Interview     | 9  | 0.376        | 0.236                                    | 0.517 | 5.24***  |
|                                 | Questionnaire | 16 | 0.421        | 0.339                                    | 0.502 | 10.12*** |
| Intentional trauma <sup>a</sup> | Intentional   | 9  | 0.415        | 0.269                                    | 0.560 | 5.58***  |
|                                 | Unintentional | 15 | 0.374        | 0.289                                    | 0.458 | 8.67***  |
| Group Trauma                    | Group         | 17 | 0.405        | 0.322                                    | 0.488 | 9.60***  |
|                                 | Individual    | 8  | 0.396        | 0.244                                    | 0.548 | 5.10***  |

Note. \*\*\* = p < .001, k = number of studies,  $\hat{\rho}$  = estimate of the population effect size, z = test of the population effect size estimate.

<sup>a</sup> There was only one study that included mixed trauma, therefore, a comparison between intended and unintended trauma was the only one that could be made. The single effect size of ‘mixed’ was excluded from this particular analysis

For comorbid psychological problem we used an additional moderator variable that specified the type of psychological problem in three categories: anxiety, depression and ‘other’.

Table 4 shows the results of all moderator analyses, including betas for the moderator, 95% CIs, and their significance. These analyses will be discussed for each risk factor in turn. Tables 5–8 show the individual meta-analyses for these risk factors by moderating group (except for mean age, which was a continuous predictor and needed no sub-analysis). In all analyses, intended trauma had three groups (intended, unintended and mixed) and so was entered as two dummy variables (intended versus unintended, intended versus mixed), in this case the overall moderation effect is reported in the text (as Q), and the individual contributions of the dummy variables are in Table 4.

5.4. Trauma severity

For trauma severity, there were no significant moderators of the population effect size estimate i.e. the effect size for each group was not significantly different from their comparison group (Table 4). Although somewhat higher effect sizes were found for questionnaires (compared to interview), mixed trauma (compared to intended and unintended), and group trauma (compared to individual). The effect size for each group individually was significant (Table 5). The differences between groups may not have been statistically significant, however the fact that one is bigger than the other is still of interest.

5.4.1. Comorbid psychological problems

For the additional moderator of the type of psychological problem two dummy variables representing anxiety compared to ‘other’, and

**Table 7**  
Moderators of the impact of younger age as a risk factor for PTSD.

| Moderator          | Group         | k  | $\hat{\rho}$ | 95% confidence interval for $\hat{\rho}$ |       | z     |
|--------------------|---------------|----|--------------|------------------------------------------|-------|-------|
|                    |               |    |              | Lower                                    | Upper |       |
| Assessment         | Interview     | 9  | 0.054        | -0.039                                   | 0.147 | 1.14  |
|                    | Questionnaire | 9  | 0.005        | -0.101                                   | 0.111 | 0.09  |
| Intentional trauma | Intentional   | 7  | -0.079       | -0.185                                   | 0.027 | -1.47 |
|                    | Unintentional | 8  | 0.075        | -0.007                                   | 0.158 | 1.79  |
|                    | Mixed         | 3  | 0.232        | 0.038                                    | 0.427 | 2.34* |
| Group trauma       | Group         | 6  | 0.154        | 0.031                                    | 0.277 | 2.46* |
|                    | Individual    | 12 | -0.045       | -0.114                                   | 0.025 | -1.26 |

Note. \* = p < .05, k = number of studies,  $\hat{\rho}$  = estimate of the population effect size, z = test of the population effect size estimate.

**Table 8**  
Moderators of the impact of female gender as a risk factor for PTSD.

| Moderator          | Group         | k  | $\hat{\rho}$ | 95% confidence interval for $\hat{\rho}$ |       | z        |
|--------------------|---------------|----|--------------|------------------------------------------|-------|----------|
|                    |               |    |              | Lower                                    | Upper |          |
| Assessment         | Interview     | 10 | 0.191        | 0.124                                    | 0.259 | 5.55***  |
|                    | Questionnaire | 19 | 0.145        | 0.114                                    | 0.176 | 9.15***  |
| Intentional trauma | Intentional   | 10 | 0.110        | 0.057                                    | 0.164 | 4.02***  |
|                    | Unintentional | 17 | 0.170        | 0.141                                    | 0.198 | 11.78*** |
|                    | Mixed         | 2  | 0.306        | 0.122                                    | 0.491 | 3.26**   |
| Group trauma       | Group         | 15 | 0.160        | 0.135                                    | 0.186 | 12.37*** |
|                    | Individual    | 14 | 0.171        | 0.101                                    | 0.241 | 4.78***  |

Note: \*\*\* =  $p < .001$ , \*\* =  $p < .01$ , k = number of studies,  $\hat{\rho}$  = estimate of the population effect size, z = test of the population effect size estimate.

depression compared to 'other' were included. Overall, there was a significant moderation effect  $Q(2) = 7.15$ ,  $p = 0.028$ . Table 4 shows that effect sizes for depression differed significantly to other,  $p = 0.008$ . For anxiety, effects were higher than for other, although this did not quite reach statistical significance,  $p = 0.056$ . Table 6 shows that the population effect size estimate for 'other' was significantly lower than both anxiety and depression; however, population effect size estimates were significantly different from zero in all three groups (anxiety, depression and other).

The only other significant moderator was whether the trauma was intended or not. Intended trauma gave rise to significantly higher effect sizes than unintended trauma, although both population effect size estimates were significantly greater than zero (Table 6).

#### 5.4.2. Younger age

For the younger age risk factor, intentionality of trauma was a significant moderator overall,  $Q(2) = 10.70$ ,  $p < 0.005$ . The dummy variables (Table 4) and sub-group analyses (Table 7) showed that effect sizes for intended trauma were significantly lower (and in the opposite direction) than both unintended trauma and mixed trauma. Mixed trauma was the only subgroup for which the population effect size estimate differed significantly from zero, however small numbers of studies indicate caution when drawing conclusions from these results. The only other significant moderator was group versus individual trauma (Table 4). Effect sizes were significantly larger for group trauma compared to individual trauma (Table 7), and the population effect size differed significantly from zero for group trauma, but not for individual trauma.

#### 5.4.3. Female gender

For the female gender risk factor, intentionality of trauma was a significant moderator overall,  $Q(2) = 7.30$ ,  $p = 0.026$ . The dummy variables (Table 4) and sub-group analyses (Table 8) showed that effect sizes for intended trauma were significantly lower than both unintended trauma and mixed trauma. Population effect size estimates differed significantly from zero in all three groups (Table 8). The only other significant moderator was mean age: the positive beta (Table 4) indicates that effect sizes increased significantly as a function of mean age. (In other words, the degree to which being female significantly increases risk increases with age.)

#### 5.5. Publication bias

'Publication bias' (or the so-called 'file-drawer problem') describes the relationship between the decision to publish a paper and the results of the paper (Begg, 1994). Studies with non-significant findings are less likely to be published than studies with significant findings, which could result in a positive bias within the child PTSD literature. In addition, authors of studies that measure multiple risk factors may choose to report only those that were significant.

Although Rosenthal's fail-safe  $N$  is commonly used to quantify publication bias (Rosenthal, 1979), it is problematic because it emphasises significance testing the population effect size rather than estimating bias in the population effect size itself. We performed a sensitivity analysis, which 'corrects' the population effect size estimate for publication bias based on a weight function that reflects the nature of the bias. We applied Vevea and Woods (2005) methods because they can be applied to relatively small samples of studies. In Table 3 we report  $\rho_{pb}$ , which is an estimate of the population effect size under severe two-tailed publication bias. (We corrected for other models too, but the results were consistent with the reported model.) In Table 3, if  $\rho_{pb}$  and  $\hat{\rho}$ , are similar, then publication bias has had little effect. Table 3 shows that although the population effect size estimates are reduced when corrected for publication bias, our basic conclusions remain unchanged.

## 6. Discussion

This meta-analysis involved investigating 25 risk factors for PTSD in children and adolescents aged 6–18 years, across 64 studies published between 1980 and May 2009. The combined sample size for the studies considered was very large (32,238). A small effect size was observed for race and younger age as risk factors for PTSD; a small to medium-sized effect was observed for female gender, low intelligence, low SES, pre- and post-trauma life events, pre-trauma psychological problems in the individual and parent, pre-trauma low self-esteem, post-trauma parental psychological problems, bereavement, time post-trauma (an inverse relationship), trauma severity, and exposure to the event by media; whilst a large effect was observed for low social support, peri-trauma fear, perceived life threat, social withdrawal, comorbid psychological problem, poor family functioning, distraction, PTSD at time 1, and thought suppression. These findings are consistent with the earlier reviews of Foy et al. (1996) and Pine and Cohen (2002), but go further in quantifying the relative importance of these risk factors. It should be noted that in discussing and comparing the effect sizes of different factors, there is no implication that the difference is necessarily statistically significant.

However, only 6 out of the 25 variables examined were investigated in 10 or more studies. Despite the increase in the number of studies into child PTSD over the past 25 years, only a limited number of variables have been routinely investigated. In contrast, in Brewin and colleagues' meta-analysis examining factors related to PTSD in adult samples, 11 of the 14 variables under consideration had been examined in 10 or more studies (Brewin et al., 2000). The present meta-analysis therefore highlights the need for the further investigation of some very rudimentary potential risk factors (e.g. low intelligence, race, perceived life threat, low social support). Furthermore, it highlights some areas for future research about which we currently know relatively little but, based on preliminary evidence, may turn out to be very important. Examples of such factors are thought suppression, media exposure and social withdrawal.

In order to consider the impact on our results of publication bias, we estimated population effect sizes under severe two-tailed publication bias. This suggested that the aforementioned pattern of results was not substantially affected by publication bias. Whilst publication bias may not, therefore, have been a major factor in determining these findings, the results of this meta-analysis need to be interpreted in light of the wide variability in the number of effect sizes included for each risk factor, and the between-studies variability in effect sizes for some of the risk factors.

### 6.1. Demographic and pre-trauma factors

Clear theoretically-driven predictions as to the impact of younger age on the risk of developing PTSD have been difficult to make, given the often contradictory effects of age on different processes

underlying traumatic stress reactions (e.g. Meiser-Stedman, 2002; Pfefferbaum, 1997; Salmon & Bryant, 2002). A clear picture emerged from our meta-analysis concerning younger age as a risk factor for PTSD, with 18 studies included. The results of this meta-analysis strongly suggest that overall younger age is largely unrelated to whether a young person develops PTSD. Moderator analysis revealed that, unlike with female sex, there was a statistically significantly stronger relationship between being younger and PTSD when the index trauma was unintentional rather than intentional; however regardless of intentionality, the population effect size estimate remained non-significant. Similarly younger age was found to have a different association with PTSD depending on whether the potentially traumatic event was a group event or an individual one. Further analysis revealed that it was a significant risk factor albeit with a small effect size ( $\hat{\rho} = 0.15$ ), for group trauma whereas it remained non-significant for individual trauma. This is intriguing as it suggests that if the event is experienced as part of a group, younger children may find it slightly harder to process than older ones.

Only five of the 64 studies that were included in the analysis examined the relationship between ethnicity and the development of PTSD. This is a smaller percentage of studies than other reviews or meta-analyses such as the review by Foy et al. (1996) or the meta-analysis of Brewin et al. (2000). In the present meta-analysis, ethnicity was found to have a consistent but small effect on the likelihood of developing PTSD. As with the Brewin et al. (2000) adult meta-analysis, it should be stressed that this variable was coded in a dichotomous fashion (white versus black or minority ethnic), which may have masked important differences between minority ethnic groups.

Low intelligence and low socio-economic status were more important, but still only yielded small to medium effect sizes consistently reported across studies. Intelligence was only examined in two studies and clearly needs further investigation.

A notable finding was the identification of female sex as a consistent, but ultimately small ( $\hat{\rho} = 0.15$ ) risk factor for PTSD in children and adolescents. The direction of this effect tallies with the conclusions of previous reviews (Davis & Siegel, 2000; Foy et al., 1996; Pfefferbaum, 1997); however, this study helps to establish the limited extent of the relationship. Placing strong emphasis on female sex in PTSD screening programs would appear to be unwarranted. The observation of female sex as a significant if small risk factor also concurs with data for adult populations (Brewin et al., 2000).

Moderator analysis found that female sex became a stronger risk factor in older children and adolescents, and when the index trauma was unintentional. The age-related effect may reflect the emergence of more differential responses to stressful events, e.g. the tendency of female adolescents to use rumination (Broderick, 1998; Cutler & Nolen-Hoeksema, 1991; Hampel & Petermann, 2005; Nolen-Hoeksema & Girgus, 1994). That intentional traumatic stressors should be related to a larger risk of PTSD in female youth, than other types of trauma is an important observation. An increased sensitivity to interpersonal violence in female youth may be understood from a variety of developmental theories (e.g. neuroendocrinology, socialisation to particular sex roles), but presents an easily identifiable specific type of trauma where this risk factor may be more important.

Pre-trauma factors (i.e. pre-trauma psychological problems, life events and parental psychological problems) were also only small to medium risk factors. Objective trauma characteristics (i.e. bereavement, time post-trauma, and trauma severity) also yielded only small to medium effect sizes. Trauma severity (as indexed by objective criteria) was the trauma characteristic most strongly associated with risk of developing PTSD. It was also apparent, however, that this effect varied very widely. Clearly this is related strongly to the very wide range of measures of trauma severity used, all of which are assumed to be directly related to trauma severity.

Analysis revealed that none of the moderators that we investigated significantly moderated the effect sizes of trauma severity. This

might reflect the complexity of 'trauma severity', the objective measurement of which is complicated by a number of conceptual factors. For example, what is the essential property that makes a trauma traumatic; can trauma exposure be adequately differentiated from trauma severity; do measurable properties of a trauma correspond with the traumatic quality, so comparisons across trauma types are likely to be even more complex. For example, one interpretation of the tendency of group trauma to increase the link between trauma severity and risk of PTSD would be that in studies where large groups of young people are exposed to trauma, trauma severity may be indexing exposure (e.g. proximity to a natural disaster), rather than the severity of a trauma to which a young person was clearly exposed (e.g. degree of injury following a motor vehicle accident). Attempts to screen for children and adolescents at high risk of PTSD may therefore need to index severity in a trauma-specific way, possibly limiting the applicability of some screening tools.

## 6.2. Peri-traumatic factors and meaning-making

Peri-traumatic fear and the perception of threat to life during the trauma had large effect sizes as predictors of PTSD. Surprisingly, these variables had only been investigated in 3 and 6 studies respectively, underlining the need for further research examining peri-traumatic emotions and cognitions. Whilst these data are clearly preliminary, these variables are easily assessed using questionnaire measures and may prove to be of great utility in PTSD screening tools for trauma-exposed youth (e.g. Nixon, Ellis, Nehmy, & Ball, 2010; Winston et al., 2003).

## 6.3. Individual factors post-trauma

A number of features of participants' post-trauma coping and environment were significant risk factors for PTSD. Blame others was found to have a medium to large effect size, and all of the other individual post-trauma factors assessed (comorbid psychological problems, distraction, PTSD at time 1, and thought suppression) yielded large effect sizes.

The presence of comorbid psychological problems, as with trauma severity, was a significant risk factor for PTSD but with the degree of association varying considerably across different studies. Moderation analysis revealed that anxiety, depression and other psychological problems were all significant risk factors, depression was the most predictive of PTSD symptoms. Furthermore, the presence of a comorbid psychological problem was more of a risk factor for PTSD, in intentional trauma compared to unintentional trauma. The wide variation for comorbid psychological problems likely reflects again the broad range of traumas included within this meta-analysis, and the differing impacts that trauma can have on young people. The way in which the interpersonal dimension of intentional trauma may lead to wider psychiatric disturbance than unintentional trauma is an important issue. One possible mechanism for this is greater cognitive misappraisal (for preliminary evidence of this see Meiser-Stedman, Dalgleish, Glucksman, Yule, & Smith, 2009). An alternative explanation is that young people exposed to intentional trauma may be more likely to be living in toxic environments, thus implicating pre-traumatic factors. Regardless of how comorbidity precisely relates to PTSD, its importance as a risk factor for PTSD adds weight to two points concerning the way in which clinicians consider young people's responses to trauma. Firstly, psychiatric reactions other than PTSD should be considered in the aftermath of trauma, particularly certain types of trauma (e.g. intentional trauma). Secondly, understanding how other psychiatric reactions (particularly depression) are elicited by trauma exposure is vital. Work has begun to delineate the aetiology of different psychiatric responses in adults exposed to trauma (e.g., Ehrling, Ehlers, & Glucksman, 2008), but no such work has been conducted in youth.

Blame of others for the event was found to have a small to medium effect size, but with only two studies being considered, further research is required before drawing firm conclusions. However it is consistent with clinical experience where some clients are so wrapped up in blaming someone for *why* an event has happened, they appear to be unable to devote sufficient resources to processing *what* has happened. The emergence of distraction and thought suppression as major risk factors for PTSD, albeit in only two studies each at this stage, is significant, and these factors represent important targets for future investigation. This relationship may merely reflect the overlap with the core avoidance symptoms of PTSD, but, given the ease with which these psychological processes can be assessed, they may nevertheless have a very important function within screening batteries. Indeed, these variables compared favourably with the ability of an early index of PTSD to act as a risk factor for PTSD one month post-trauma. Additionally, the fact that distraction and thought suppression are amongst the largest effect sizes, supports the cognitive model's assertion that avoidance is central to the symptomatology.

The very large effect associated with T1 PTSD symptomatology as a risk factor for later PTSD is hardly surprising, but this finding does help to emphasise the utility of including early symptom levels within screening tools (e.g. the Trauma Screening Questionnaire for adults; [Brewin et al., 2002](#)). Theoretically, these suggest that early processes (i.e. either peri-trauma or in the immediate aftermath) play a major role in the development of more significant and persistent PTSD symptoms.

#### 6.4. Psychological environmental factors post-trauma

All the features of the post-trauma psychological environment considered within this meta-analysis showed small to medium or large effect sizes, indicating the strength of the relationship between what happens after the event, with the development of PTSD. Life events and parental psychological difficulties showed small to medium effect sizes whilst low social support, family poor functioning and social withdrawal showed medium to large effect sizes. Whilst social support has been identified as being a factor of potential great importance to the successful resolution of traumatic experience (e.g. [Davis & Siegel, 2000](#); [Pine & Cohen, 2002](#)), this meta-analysis only found 4 studies that have adequately addressed this construct. Poor family functioning was a stronger risk factor for PTSD than poor parental mental health, though parental mental health is the more established correlate of PTSD (being examined in 25 studies), and its effect size was on the borderline between a medium and a large effect size ( $p > 0.3$ ).

#### 6.5. Limitations

The present study is limited by the highly heterogeneous nature of studies in this area, with the inclusion of papers that are widely ranging in terms of trauma type, assessment tools, and the indices for several putative risk factors. A majority of the studies included in the analysis used child-report measures of PTSD, with more studies it would be able to determine whether this makes a difference to how the risk factors operate. This may be particularly pertinent for younger children who may be less able to report reliably on internal states. Future meta-analyses and reviews may consider focussing on particular trauma types, in particular, distinguishing between intended versus unintended and collective versus individual trauma exposure (which accounted for much of the between-study variability in the present study). Nevertheless, the PTSD diagnosis is not intended to be specific to any given form of traumatic experience (within certain conceptual bounds), and between-trauma differences are worth highlighting. The initial search was restricted to publications in English language, and it is not known to what extent this limitation may have influenced the findings.

As already noted, many variables included in this meta-analysis have only been examined in a handful of studies. Clearly this limits

the conclusions that can be drawn about these risk factors, but it does also help to highlight areas that warrant further investigation.

#### 6.6. Implications

Despite the limitations outlined earlier, the present analysis does have some implications for the theoretical understanding of PTSD in youth. First, the data concerning pre-trauma factors shed light on the ultimate aetiology of PTSD and the diagnostic distinctiveness of this construct. Whilst the relationship between pre-trauma life events or psychological problems and PTSD was significant across the studies that examined these variables, the strength of this association was only modest in comparison to most of the peri-trauma or post-trauma factors. This supports the suggestion that PTSD in youth is chiefly the result of a reaction to the specific event, and as such is not particularly closely related to the previous functioning of the young person, or to their previous experiences.

Second, the broadly consistent failure to observe a substantial relationship between young age and PTSD needs to be acknowledged by clinicians and theoreticians alike. Clinically, resources should not be devoted to younger children at the expense of adolescents. Whether younger children are as able to report their distress and access help outside of research studies is however a significant issue to be addressed in future studies. Theoretically, this finding may suggest that developmental considerations are not as important as is often thought. Developmental vulnerabilities for the onset and maintenance of PTSD may have already been passed by the age of 8 years. Alternatively, a more complex picture may emerge of young children being more vulnerable to developing PTSD because of some developmentally sensitive factors, but more resilient due to other age-related factors (see [Salmon & Bryant, 2002](#), for an extensive review of how development may differentially impact on the psychological processing of a potentially traumatic event). As the present meta-analytic study was restricted to 6–18 year olds, it is not possible to say whether an age-related vulnerability to developing PTSD is present or not in even younger children, though research within this younger population is clearly more problematic ([Scheeringa, Zeanah, Drell, & Larrieu, 1995](#)).

Third, the strong relationship between PTSD risk and aspects of young people's recovery environment underlines the importance – and feasibility – of developing efficacious post-trauma screening tools and interventions for children and adolescents. Demographic and pre-trauma factors, are only weakly related to PTSD risk and are therefore unlikely to have particular utility on their own as targets for screening tools (e.g. female gender, age, pre-trauma psychological problems). Post-trauma factors, however, appear to be more strongly implicated in the development of PTSD. Interventions based on these risk factors may include empirically based screening tools for diverting resources to the most vulnerable young people, and low intensity and cost effective interventions that do not rely on individual psychological therapy. Preliminary work has begun to this end (e.g. [Kenardy, Thompson, Le Brocq, & Olsson, 2008](#)), but further research is required to specify which features of the post-trauma recovery environment are actively toxic and which are epiphenomenal.

Some risk factors – namely, the perception of life threat, the use of distraction and thought suppression – offer tentative support for a cognitive approach to understanding PTSD in young people (e.g. [Brewin et al., 1996](#); [Dalgleish, 1999](#); [Ehlers & Clark, 2000](#); [Meiser-Stedman, 2002](#)). Such an account offers a framework for investigating the specific mechanisms by which robust risk factors (e.g. parental psychological problems, comorbidity, poor family functioning) may trigger or maintain post-traumatic stress in youth (see [Meiser-Stedman, 2002](#) for a fuller discussion), which would in turn inform the development of more targeted and efficacious interventions. Regardless of how such a cognitive research agenda turns out, a broadly psychosocial account of child and adolescent PTSD would appear to be a paradigm for directing future research in this area.

## References\*

- \*Aaron, J., Zaglul, H., & Emery, R. (1999). Posttraumatic stress in children following acute physical injury. *Journal of Pediatric Psychology*, 24, 335–343.
- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author (text rev.).
- \*Asarnow, J., Glynn, S., Pynoos, R. S., Nahum, J., Guthrie, D., Cantwell, D. P., et al. (1999). When the earth stops shaking: Earthquake sequelae among children diagnosed for pre-earthquake psychopathology. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 1016–1023.
- \*Bal, S., Oost, P. V., Bourdeaudhuij, I. D., & Crombez, G. (2003). Avoidant coping as a mediator between self-reported sexual abuse and stress-related symptoms in adolescents. *Child Abuse & Neglect*, 27, 883–897.
- Begg, C. B. (1994). Publication bias. In H. Cooper, & L. V. Hedges (Eds.), *The handbook of research synthesis* (pp. 399–409). New York: Russell Sage Foundation.
- \*Bradburn, I. S. (1991). After the earth shook: Children's stress symptoms 6–8 months after a disaster. *Advances in Behaviour Research and Therapy*, 13, 173–179.
- Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal 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, 670–686.
- Brewin, C. R., Rose, S., Andrews, B., Green, J., Tata, P., McEvedy, C., et al. (2002). Brief screening instrument for post-traumatic stress disorder. *The British Journal of Psychiatry*, 181, 158–162.
- Broderick, P. C. (1998). Early adolescent gender differences in the use of ruminative and distracting coping strategies. *The Journal of Early Adolescence*, 18, 173–191.
- \*Bryant, R. A., Salmon, K., Sinclair, E., & Davidson, P. (2007). Heart rate as a predictor of posttraumatic stress disorder in children. *General Hospital Psychiatry*, 29, 66–68.
- \*Bryant, R. A., Salmon, K., Sinclair, E., & Davidson, P. (2007). A prospective study of appraisals in childhood posttraumatic stress disorder. *Behaviour Research and Therapy*, 45, 2502–2507.
- 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.
- Cutler, S. E., & Nolen-Hoeksema, S. (1991). Accounting for sex differences in depression through female victimization: Childhood sexual abuse. *Sex Roles*, 24, 425–438.
- Dalgleish, T. (1999). Cognitive theories of post-traumatic stress disorder. In W. Yule (Ed.), *Post-traumatic stress disorders: Concepts and therapy* (pp. 193–220). New York: John Wiley & Sons Ltd.
- 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.
- Davis, L., & Siegel, L. J. (2000). Posttraumatic stress disorder in children and adolescents: A review and analysis. *Clinical Child and Family Psychology Review*, 3(3), 135–154.
- De Bellis, M. D., Baum, A. S., Birmaher, B., Keshavan, M. S., Eccard, C. H., Boring, A. M., et al. (1999). Developmental traumatology: I. Biological stress systems. *Biological Psychiatry*, 45, 1259–1270.
- Dehon, C., & Scheeringa, M. (2006). Screening for preschool posttraumatic stress disorder with the Child Behavior Checklist. *Journal of Pediatric Psychology*, 31, 431–435.
- \*Delahanty, D. L., Nugent, N. R., Christopher, N. C., & Walsh, M. (2005). Initial urinary epinephrine and cortisol levels predict acute PTSD symptoms in child trauma victims. *Psychoneuroendocrinology*, 30, 121–128.
- Dersimonian, R., & Laird, N. (1986). Meta-analysis in clinical-trials. *Controlled Clinical Trials*, 7(3), 177–188.
- 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.
- Ehring, T., Ehlers, A., & Glucksman, E. (2008). Do cognitive models help in predicting the severity of posttraumatic stress disorder, phobia, and depression after motor vehicle accidents? A prospective longitudinal study. *Journal of Consulting and Clinical Psychology*, 76(2), 219–230.
- Field, A. P. (2001). Meta-analysis of correlation coefficients: A Monte Carlo comparison of fixed and random-effects methods. *Psychological Methods*, 6, 161–180.
- Field, A. P. (2003). The problem in using fixed-effects models of meta-analysis on real-world data. *Understanding Statistics*, 2, 77–96.
- Field, A. P. (2005). Is the meta-analysis of correlation coefficients accurate when population effect sizes vary? *Psychological Methods*, 10(4), 444–467.
- Field, A. P., & Gillett, R. (2010). How to do a meta-analysis. *The British Journal of Mathematical and Statistical Psychology*, 63, 665–694.
- 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.
- Foy, D. W., Madvig, B. T., Pynoos, R. S., & Camilleri, A. J. (1996). Etiologic factors in the development of posttraumatic stress disorder in children and adolescents. *Journal of School Psychology*, 34(2), 133–145.
- \*Giannopoulos, I., Strouthos, M., Smith, P., Dikaiakou, A., Galanopoulou, V., & Yule, W. (2006). Post-traumatic stress reactions of children and adolescents exposed to the Athens 1999 earthquake. *European Psychiatry*, 21, 160–166.
- \*Goenjian, A. K., Molina, L., Steinberg, A. M., Fairbanks, L. A., Alvarez, M. L., Goenjian, H. A., et al. (2001). Posttraumatic stress and depressive reactions among Nicaraguan adolescents after Hurricane Mitch. *The American Journal of Psychiatry*, 158, 788–794.
- \*Goenjian, A. K., Pynoos, R., Steinberg, A. M., Najarian, L. M., Asarnow, J., Karayan, I., et al. (1995). Psychiatric comorbidity in children after the 1988 earthquake in Armenia. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34, 1174–1184.
- \*Goenjian, A. K., Walling, D., Steinberg, A. M., Karayan, I., Najarian, L. M., & Pynoos, R. (2005). A prospective study of posttraumatic stress and depressive reactions among treated and untreated adolescents 5 years after a catastrophic disaster. *The American Journal of Psychiatry*, 162, 2302–2308.
- \*Goenjian, A. K., Walling, D., Steinberg, A. M., Rousso, A., Goenjian, H. A., & Pynoos, R. (2009). Depression and PTSD symptoms among bereaved adolescents 6½ years after the 1988 Spitak earthquake. *Journal of Affective Disorders*, 112, 81–84.
- Hampel, P., & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence*, 34, 73–83.
- Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. Orlando, FL: Academic Press.
- Hedges, L. V., & Vevea, J. L. (1998). Fixed- and random-effects models in meta-analysis. *Psychological Methods*, 3, 486–504.
- \*Heptinstall, E., Sethna, V., & Taylor, E. (2004). PTSD and depression in refugee children: Associations with pre-migration trauma and post-migration stress. *European Child & Adolescent Psychiatry*, 13, 373–380.
- Hunter, J. E., & Schmidt, F. L. (1990). *Methods of meta-analysis: Correcting error and bias in research findings*. Newbury Park, CA: Sage.
- Hunter, J. E., & Schmidt, F. L. (2000). Fixed effects vs. random effects meta-analysis models: Implications for cumulative research knowledge. *International Journal of Selection and Assessment*, 8, 275–292.
- Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings* (2nd ed.). Newbury Park, CA: Sage.
- \*Husain, S. A., Nair, J., Holcomb, W., Reid, J. C., Vargas, V., & Nair, S. S. (1998). Stress reactions of children and adolescents in war and siege conditions. *The American Journal of Psychiatry*, 155, 1718–1719.
- \*Jaycox, L. H., Steyn, B. D., Kataoka, S. H., Wong, M., Fink, A., Escudero, P., et al. (2002). Violence exposure, posttraumatic stress disorder, and depressive symptoms among recent immigrant schoolchildren. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 1104–1110.
- Kenardy, J., Thompson, K., Le Brocq, R., & Olsson, K. (2008). Information-provision intervention for children and their parents following pediatric accidental injury. *European Child & Adolescent Psychiatry*, 17, 316–325.
- \*Kilic, Z. E., Ozguven, H. D., & Sayil, I. (2003). The psychological effects of parental mental health on children experiencing disaster: The experience of Bolu earthquake in Turkey. *Family Process*, 42, 485–495.
- \*Koplewicz, H. S., Vogel, J. M., Solanto, M. V., Morrissey, R. F., Alonso, C. M., Abikoff, H., et al. (2002). Child and parent response to the 1993 World Trade Centre bombing. *Journal of Traumatic Stress*, 15, 77–85.
- \*Korol, M., Green, B. L., & Gleser, G. L. (1999). Children's responses to a nuclear waste disaster: PTSD symptoms and outcome prediction. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 368–375.
- \*La Greca, A. M., Silverman, W. K., Vernberg, E. M., & Prinstein, M. J. (1996). Symptoms of posttraumatic stress in children after Hurricane Andrew: A prospective study. *Journal of Consulting and Clinical Psychology*, 64, 712–723.
- \*Lack, C. W., & Sullivan, M. A. (2008). Attributions, coping, and exposure as predictors of long-term posttraumatic distress in tornado-exposed children. *Journal of Loss and Trauma*, 13, 72–84.
- \*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., Timm, K., Gnehm, H. E., & Sennhauser, F. H. (2005). Predicting posttraumatic stress symptoms in children after road traffic accidents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 44, 1276–1283.
- \*Laor, N., Wolmer, L., Kora, M., Yucl, D., Spirman, S., & Yazgan, Y. (2002). Posttraumatic, dissociative and grief symptoms in Turkish children exposed to the 1999 earthquake. *The Journal of Nervous and Mental Disease*, 190, 824–832.
- \*Lengua, L. J., Long, A. C., & Meltzoff, A. N. (2006). Pre-attack stress-load, appraisals, and coping in children's responses to the 9/11 terrorist attacks. *Journal of Child Psychology and Psychiatry*, 47, 1219–1227.
- \*Lengua, L. J., Long, A. C., Smith, K. I., & Meltzoff, A. N. (2005). Pre-attack symptomatology and temperament as predictors of children's responses to the September 11 terrorist attacks. *Journal of Child Psychology and Psychiatry*, 46, 631–645.
- \*Linning, L. M., & Kearney, C. A. (2004). Post-traumatic stress disorder in maltreated youth: A study of diagnostic comorbidity and child factors. *Journal of Interpersonal Violence*, 19, 1087–1101 (vn).
- \*Lonigan, C. J., Shannon, M. P., Finch, A. J., Jr., Daugherty, T. K., & Taylor, C. M. (1991). Children's reactions to a natural disaster: Symptom severity and degree of exposure. *Advances in Behaviour Research and Therapy*, 13, 135–154.
- \*Magal-Vardi, O., Laor, N., Toren, A., Strauss, L., Wolmer, L., Bielorai, B., et al. (2004). Psychiatric morbidity and quality of life in children with malignancies and their parents. *The Journal of Nervous and Mental Disease*, 192, 872–875.
- \*Max, J. E., Castillo, C. S., Robin, D. A., Lindgren, S. D., Smith, W. L., Sato, Y., et al. (1998). Posttraumatic stress symptomatology after childhood traumatic brain injury. *The Journal of Nervous and Mental Disease*, 186, 589–596.
- \*McDermott, B. M., Lee, E. M., Judd, M., & Gibbon, P. (2005). Posttraumatic stress disorder and general psychopathology in children and adolescents following a wildfire disaster. *Canadian Journal of Psychiatry*, 50, 137–143.
- Meiser-Stedman, R. (2002). Towards a cognitive-behavioral model of PTSD in children and adolescents. *Clinical Child and Family Psychology Review*, 5, 217–232.
- Meiser-Stedman, R., Dalgleish, T., Glucksman, E., Yule, W., & Smith, P. (2009). Maladaptive cognitive appraisals mediate the evolution of posttraumatic stress reactions: A

<sup>1</sup> References marked with an asterisk indicate studies included in the meta-analysis.



- 6-month follow-up of child and adolescent assault and motor vehicle accident survivors. *Journal of Abnormal Psychology*, 118, 778–787.
- Meiser-Stedman, R., Smith, P., Glucksman, E., Yule, W., & Dalgleish, T. (2008). The posttraumatic stress disorder diagnosis in preschool- and elementary school-age children exposed to motor vehicle accidents. *The American Journal of Psychiatry*, 165(10), 1326–1337.
- \*Meiser-Stedman, R. A., Yule, W., Dalgleish, T., Smith, P., & Glucksman, E. (2005). The role of the family in child and adolescent posttraumatic stress following attendance at an emergency department. *Journal of Pediatric Psychology*, 31(1), 1–6.
- \*Mirza, K. A. H., Bhadrinath, I. M., Goodyear, I. M., & Gilmour, C. (1998). Post-traumatic stress disorder in children and adolescents following road traffic accidents. *The British Journal of Psychiatry*, 172, 443–447.
- National Institute for Health & Clinical Excellence (2005). *Post-traumatic stress disorder: the management of PTSD in adults and children in primary and secondary care*. London: Gaskell and the British Psychological Society.
- National Research Council (1992). *Combining information: Statistical issues and opportunities for research*. Washington, D.C.: National Academy Press.
- Nixon, R. D. V., Ellis, A. A., Nehmy, T. J., & Ball, S. -A. (2010). Screening and predicting posttraumatic stress and depression in children following single-incident trauma. *Journal of Clinical Child and Adolescent Psychology*, 39, 588–596.
- Nolen-Hoeksema, S., & Girgus, J. S. (1994). The emergence of gender differences in depression during adolescence. *Psychological Bulletin*, 115, 424–443.
- \*Nugent, N. R., Christopher, N. C., & Delahanty, D. L. (2006). Initial physiological responses and perceived hyperarousal predict subsequent emotional numbing in pediatric injury patients. *Journal of Traumatic Stress*, 19, 349–359.
- \*Nugent, N. R., Ostrowski, S., Christopher, N. C., & Delahanty, D. L. (2007). Parental posttraumatic stress symptoms as a moderator of child's acute biological response and subsequent posttraumatic stress symptoms in pediatric injury patients. *Journal of Pediatric Psychology*, 32, 309–318.
- Osburn, H. G., & Callender, J. (1992). A note on the sampling variance of the mean uncorrected correlation in meta-analysis and validity generalization. *The Journal of Applied Psychology*, 77, 115–122.
- \*Ostrowski, S. A., Christopher, N. C., & Delahanty, D. L. (2007). 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, 338–342.
- \*Ostrowski, S. A., Christopher, N. C., & Delahanty, D. L. (2007). Acute child and mother psychophysiological responses and subsequent PTSD symptoms following a child's traumatic event. *Journal of Traumatic Stress*, 20, 677–687.
- \*Otto, M. W., Henin, A., Hirshfeld-Becker, D. R., Pollack, M. H., Biederman, J., & Rosenbaum, J. F. (2007). Posttraumatic stress disorder symptoms following media exposure to tragic events: Impact of 9/11 on children at risk for anxiety disorders. *Journal of Anxiety Disorders*, 21, 888–902.
- \*Overstreet, S., Dempsey, M., Graham, D., & Moely, B. (1999). Availability of family support as a moderator of exposure to community violence. *Journal of Clinical Child Psychology*, 28, 151–159.
- Overton, R. C. (1998). A comparison of fixed-effects and mixed (random-effects) models for meta-analysis tests of moderator variable effects. *Psychological Methods*, 3(3), 354–379.
- 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.
- \*Pelcovitz, D., Kaplan, S. J., DeRosa, R. R., Mandel, F. S., & Salzinger, S. (2000). Psychiatric disorders in adolescents exposed to domestic violence and physical abuse. *The American Journal of Orthopsychiatry*, 70, 360–369.
- Perrin, S., Smith, P., & Yule, W. (2000). Practitioner review: The assessment and treatment of post-traumatic stress disorder in children and adolescents. *Journal of Child Psychology and Psychiatry*, 41, 277–289.
- Pfefferbaum, B. (1997). Posttraumatic stress disorder in children: A review of the past 10 years. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36(11), 1503–1511.
- \*Pfefferbaum, B. (2001). The impact of the Oklahoma City bombing on children in the community. *Military Medicine*, 166, 49–50.
- \*Pfefferbaum, B., Nixon, S. J., Tucker, P. M., Tivis, R. D., Moore, V. L., Gurwitsch, R. H., et al. (1999). Posttraumatic stress responses in bereaved children after the Oklahoma City bombing. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 1372–1379.
- \*Pfefferbaum, B., Seale, T. W., McDonald, N. B., Brandt, E. N., Rainwater, S. M., Jr., Maynard, B. T., et al. (2000). Posttraumatic stress two years after the Oklahoma city bombing in youths geographically distant from the explosion. *Psychiatry*, 63(4), 358–370.
- Pine, D. S., & Cohen, J. A. (2002). Trauma in children and adolescents: Risk and treatment of psychiatric sequelae. *Biological Psychiatry*, 51, 519–531.
- \*Punamaki, R. -L., Qouta, S., Sarraj, E. E., & Montgomery, E. (2006). Psychological distress and resources among siblings and parents exposed to traumatic events. *International Journal of Behavioral Development*, 30, 385–397.
- Pynoos, R. S., Steinberg, A. M., & Piacentini, J. C. (1999). A developmental psychopathology model of childhood traumatic stress and intersection with anxiety disorders. *Biological Psychiatry*, 46, 1542–1554.
- R Development Core Team (2010). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing.
- Rees, G., Gledhill, J., Garralda, M. E., & Nadel, S. (2004). Psychiatric outcome following paediatric intensive care unit (PICU) admission: a cohort study. *Intensive Care Medicine*, 30, 1607–1614.
- Rosenthal, R. (1979). The 'File Drawer Problem' and tolerance for null results. *Psychological Bulletin*, 86, 638–641.
- Rosenthal, R. (1991). *Meta-analytic procedures for social research* (revised ed.). Newbury Park, CA: Sage.
- Rosenthal, R. (1995). Writing meta-analytic reviews. *Psychological Bulletin*, 118, 183–192.
- Rosenthal, R., & DiMatteo, M. R. (2001). Meta-analysis: Recent developments in quantitative methods for literature reviews. *Annual Review of Psychology*, 52, 59–82.
- \*Roussos, A., Goenjian, A. K., Steinberg, A. M., Sotiropoulou, C., Kakaki, M., Kabakos, C., et al. (2005). Posttraumatic stress and depressive reactions among children and adolescents after the 1999 earthquake in Ano Liosia, Greece. *The American Journal of Psychiatry*, 162, 530–537.
- \*Runyon, M. K., & Kenny, M. C. (2002). Relationship of attributional style, depression, and posttrauma distress among children who suffered physical or sexual abuse. *Child Maltreatment*, 7, 254–264.
- Salmon, K., & Bryant, R. (2002). Posttraumatic stress disorder in children. The influence of developmental factors. *Clinical Psychology Review*, 22, 163–188.
- \*Saltzman, K. M., Weems, C. F., & Carrion, V. G. (2006). IQ and posttraumatic stress symptoms in children exposed to interpersonal violence. *Child Psychiatry and Human Development*, 36, 261–272.
- \*Saxe, G. N., Stoddard, F., Hall, E., Chawla, N., Lopez, C., Sheridan, R., et al. (2005). Pathways to PTSD, part I: Children with burns. *The American Journal of Psychiatry*, 162, 1299–1304.
- \*Schafer, I., Barkmann, C., Riedesser, P., & Schulte-Markwort, M. (2004). Peritraumatic dissociation predicts posttraumatic stress in children and adolescents following road-traffic accidents. *Journal of Trauma & Dissociation*, 5, 79–92.
- \*Schafer, I., Barkmann, C., Riedesser, P., & Schulte-Markwort, M. (2006). Posttraumatic syndromes in children and adolescents after road traffic accidents – A prospective cohort study. *Psychopathology*, 39, 159–164.
- Scheeringa, M. S., Zeanah, C. H., Myers, L., & Putnam, F. W. (2003). 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., 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.
- \*Shannon, M. P., Lonigan, C. J., Finch, A. J., & Taylor, C. M., Jr. (1994). Children exposed to disaster: I. Epidemiology of post-traumatic symptoms and symptom profiles. *Journal of the American Academy of Child and Adolescent Psychiatry*, 33, 80–93.
- \*Shemesh, E., Newcorn, J. H., Rockmore, L., Shneider, B. L., Emre, S., Gelb, B. D., et al. (2005). Comparison of parent and child reports of emotional trauma symptoms in pediatric outpatient settings. *Pediatrics*, 115, 582–589.
- \*Smith, S., Perrin, S., Yule, W., & Rabe-Hesketh, S. (2001). War exposure and maternal reactions in the psychological adjustment of children from Bosnia-Herzegovina. *Journal of Child Psychology and Psychiatry*, 42(3), 395–404.
- \*Solomon, Z., & Lavi, T. (2005). Israeli youths in the second intifada: PTSD and future orientation. *Journal of the American Academy of Child and Adolescent Psychiatry*, 44, 1167–1175.
- \*Stallard, P., Salter, E., & Velleman, R. (2004). Post-traumatic stress disorder following road traffic accidents: A second prospective study. *European Child & Adolescent Psychiatry*, 13, 172–178.
- \*Stallard, P., & Smith, E. (2007). Appraisals and cognitive coping styles associated with chronic post-traumatic symptoms in child road traffic accident survivors. *Journal of Child Psychology and Psychiatry*, 48, 194–201.
- \*Stallard, P., Velleman, R., Langsford, J., & Baldwin, S. (2001). Coping and psychological distress in children involved in road traffic accidents. *The British Journal of Clinical Psychology*, 40, 197–208.
- Steinberg, A. M., Brymer, M. J., Decker, K. B., & Pynoos, R. S. (2004). The University of California at Los Angeles post-traumatic stress disorder reaction index. *Current Psychiatry Reports*, 6, 96–100.
- \*Thabet, A. A., Abed, Y., & Vostanis, P. (2002). Emotional problems in Palestinian children living in a war zone: A cross-sectional study. *Lancet*, 25, 1801–1804.
- \*Thabet, A. A. M., Abed, Y., & Vostanis, P. (2004). Comorbidity of PTSD and depression among refugee children during war conflict. *Journal of Child Psychology and Psychiatry*, 45, 533–542.
- \*Thabet, A. A., & Vostanis, P. (1999). Posttraumatic stress reactions in children of war. *Journal of Child Psychology and Psychiatry*, 40, 385–391.
- \*Udwin, O., Boyle, S., Yule, W., Bolton, D., & O'Ryan, D. (2000). Risk factors for long-term psychological effects of a disaster experienced in adolescence: Predictors of post traumatic stress disorder. *Journal of Child Psychology and Psychiatry*, 41, 969–979.
- \*Vernberg, E. M., LaGreca, A. M., Silverman, W. K., & Prinstein, M. J. (1996). Prediction of posttraumatic stress symptoms in children after Hurricane Andrew. *Journal of Abnormal Psychology*, 105(2), 237–248.
- Vevea, J. L., & Woods, C. M. (2005). Publication bias in research synthesis: Sensitivity analysis using a priori weight functions. *Psychological Methods*, 10, 428–443.
- \*Wickrama, K. A. S., & Kaspar, V. (2007). Family context of mental health risk in tsunami-exposed adolescents: Findings from a pilot study in Sri Lanka. *Social Science & Medicine*, 64, 713–723.
- Winston, F. K., Kassam-Adams, N., Garcia-España, 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, 643–649.