Diagnostic, demographic, memory quality, and cognitive variables associated with Acute Stress

Disorder in children and adolescents

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Abstract

To date, no studies have investigated factors associated with Acute Stress Disorder (ASD) in children and adolescents. Relationships between ASD and a number of demographic, trauma, cognitive, and trauma memory variables were therefore investigated in a sample ($N = 93$) of children and adolescents involved in assaults and motor vehicle accidents. Several cognitive variables and the quality of trauma memories, but not demographic or trauma variables, were correlated with ASD and also mediated the relationship between peri-traumatic threat and ASD. Finally, nosological analyses comparing ASD with indices of posttraumatic stress disorder (PTSD) in the month post-trauma revealed little support for the Dissociation mandate that uniquely characterizes ASD. The results are discussed with respect to assessment and treatment for the acute traumatic stress responses of children and young people.

Acute Stress Disorder (ASD) was entered into the DSM-IV (American Psychiatric Association [APA], 1994) as a means of identifying individuals in the first month post-trauma who are suffering a clinically significant traumatic stress response (Bryant, 2003). The ASD diagnosis retains the core symptom clusters of the pre-existing posttraumatic stress disorder (PTSD) diagnosis (reexperiencing of the trauma, avoidance of the trauma and its reminders, and hyperarousal; APA, 1994). Critically, however, a diagnosis of ASD also requires the presence of dissociative symptoms (e.g. derealization, depersonalization, dissociative amnesia), thus distinguishing it from PTSD in terms of the symptom profile as well as the time window for diagnosis (PTSD can only be diagnosed *after* one month post-trauma). The dissociation mandate that distinguishes ASD has been the focus of considerable controversy in the adult literature with critics arguing that it provides little or no additional clinical utility over and above the symptoms common to both ASD and PTSD in the acute post-trauma phase (see Harvey & Bryant, 2002).

To date, despite a growing research focus on ASD in adults (Bryant, 2003), there have been relatively few studies focusing on the disorder in younger samples. ASD appears to prevail in 13% to 19% of adult trauma survivors (Brewin, Andrews, Rose, & Kirk, 1999; Harvey & Bryant, 1998), with comparable prevalence rates (8-19%) in the three published studies recording the diagnosis in child and adolescent trauma victims (Bryant, Mayou, Wiggs, Ehlers, & Stores, 2004; Kassam-Adams & Winston, 2004; Meiser-Stedman, Yule, Smith, Glucksman, & Dalgleish, 2005). ASD is therefore a problem for a significant number of trauma-exposed youth as well as adults. The present study therefore examined two key research questions concerning ASD in youth that have yet to be addressed. First, what are the demographic, trauma-related, and cognitive correlates and mediators of the disorder in younger populations? Second, does the

controversial dissociation criterion of ASD possess unique explanatory power in children and adolescents over and above measures of PTSD symptoms, in the first weeks post trauma?

Correlates and mediators of ASD in children and adolescents

A critical research focus in understanding the psychological sequelae of traumatic events is to identify those factors underlying individual differences in post-trauma response and, in particular, those factors that predict the development of PTSD and ASD. This research agenda is important for theoretical reasons in terms of understanding not only psychiatric vulnerability, but also resilience (Charney, 2004). However, elucidating the relevant predictor variables also has significant health care implications, allowing clinicians to identify vulnerable individuals as early as possible post-trauma, thus facilitating the appropriate provision of services (Costello & Angold, 2000). Despite a wealth of research examining predictors of PTSD using representative samples[1] (see Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003), to the best of our knowledge there exists only one published study of this nature focusing on predictors of ASD in adults (Harvey & Bryant, 1999), and none in younger samples. The present study focused on three clusters of potential predictors of ASD in children and adolescents: demographic and trauma-related variables; cognitive variables; and memory variables. These are now considered in turn.

Demographic and trauma-related factors

Existing studies of ASD in adults and of acute PTSD symptoms in children and adolescents have identified a number of demographic and trauma-related predictors that are likely to also be important in the prediction of ASD in younger samples. Harvey and Bryant (1999) revealed that higher levels of depression and neuroticism, prior trauma exposure, a history of PTSD, and greater use of avoidant coping were significantly associated with the

presence of the ASD diagnosis in their representative sample of adult motor vehicle accident (MVA) survivors. These findings concord with other data from case-control studies showing that groups of adults with ASD present with greater pre-traumatic psychopathology (Barton, Blanchard, & Hickling, 1996), greater peri-traumatic panic and anxiety sensitivity (Bryant & Panasetis, 2001; Nixon & Bryant, 2003), and more persistent panic attacks (Nixon & Bryant, 2003), relative to matched groups of adults exposed to trauma but without ASD.

In the child and adolescent literature, where the focus has been on acute PTSD symptoms rather than ASD, Pynoos et al. (1987) and Daviss et al. (2000) found that severity of acute PTSD was related to measures of trauma severity, in witnesses to a sniper shooting and in accident survivors, respectively, while in contrast Winston et al. (2002) reported no such relationship in MVA survivors. Pynoos et al. (1987) also reported that a history of prior trauma was *unrelated* to acute posttraumatic stress, while Daviss et al. (2000), Di Gallo, Barton, and Parry-Jones (1997), in MVA survivors, and Aaron, Zaglul, and Emery (1999), in patients with acute physical injuries, all showed that a prior history of psychological problems was associated with acute PTSD symptom severity. Finally, Aaron et al. (1999) and Di Gallo et al. (1997) reported that indices of subjective distress were associated with the acute PTSD response.

After reviewing the data from these various strands of research as well as from the meta-analytic studies on adults with PTSD (Brewin et al., 2000; Ozer et al. 2003), we included in the current study of ASD the demographic factors of age, sex, history of prior trauma, and psychiatric history, alongside factors indexing the objective severity of the trauma (e.g. injury severity, hospital admission), as well as measures of self-reported peri-traumatic anger and subjective sense of threat. Our specific predictions arising from the previous research were that self-reported peritraumatic subjective threat and anger, a previous history of trauma, the presence

of prior mental health problems, female sex (Brewin et al., 2000), and higher objective trauma severity, would all be significantly associated with the presence of ASD in children and adolescents.

Cognitive factors

Cognitive theoretical approaches to the stress disorders in adults (e.g. Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clark, 2000; Wells & Sembi, 2004; see Dalgleish, 2004, for a critical review) argue, in particular, that the way exposed individuals think about and interpret both their experience of trauma and their initial reactions to that experience are critical in terms of their immediate and long-term mental health, including the likelihood of developing a stress disorder. There is now a growing list of representative sample studies supporting a key role for such cognitive processes in the development of PTSD (Andrews, Brewin, Rose, & Kirk, 2000; Dunmore, Clark, & Ehlers, 2001; Ehlers, Mayou, & Bryant, 1998; Steil & Ehlers, 2000). Although, as yet, there are no comparable studies for ASD (with the exception of the coping style data reported by Harvey and Bryant, 1999), Holeva, Tarrier and Wells (2001) have shown that the use of maladaptive strategies to control unwanted thoughts is associated with the severity of acute traumatic stress symptoms in adults in the first few weeks following trauma indicating that such aspects of cognitive style are also likely to be important in ASD[2].

Based on these different strands of research and on the theoretical arguments outlined above, a decision was made to focus on a number of cognitive style variables in the present study that index putative maladaptive responses and interpretations of the initial traumatic stress reaction in children and adolescents. Three such constructs were selected: (a) Anxiety sensitivity: The construct of anxiety sensitivity reflects beliefs that the experience of anxiety/fear may cause illness, embarrassment or additional anxiety. Anxiety sensitivity has been linked with the

etiology of several anxiety disorders in adults including PTSD (Silverman & Weems, 1999; Taylor, Koch, & McNally, 1992). Our prediction was that greater anxiety sensitivity would be associated with the presence of ASD. (b) Rumination: Research in trauma-exposed adults has indicated that ruminative responses in the acute aftermath of trauma are associated with the later development of PTSD (e.g. Murray, Ehlers, & Mayou, 2002) and that a ruminative response style in response to negative mood (as indexed by the Response Styles Questionnaire, Rumination subscale [RSQ]; Nolen-Hoeksema, 1991) predicts PTSD symptoms in the immediate aftermath of trauma (Nolen-Hoeksema & Morrow, 1991). In this study we adapted the RSQ for use with children and adolescents to examine the role played by ruminative response style in the aftermath of trauma in this population. In line with the adult data on PTSD, our prediction in the present study was that greater rumination about affective disturbance would be associated with ASD. (c) Positive beliefs about worry: Endorsement of worry as an effective coping strategy following trauma has been shown to be associated with greater posttraumatic stress (e.g. Roussis & Wells, 2006), and is also implicated in a range of other psychopathologies (e.g. anxiety, obsessions, and proneness towards delusions and hallucinations; Cartwright-Hatton & Wells, 1997; Laroi & Van der Linden, 2005). Our prediction was that greater endorsement of worry as a coping strategy would be associated with presence of ASD.

As well as predicting simple associations between these various cognitive indices and ASD, the theories of PTSD outlined above (e.g. Brewin et al., 1996; Ehlers & Clark, 2000) also propose that such cognitive processes should *mediate* between aspects of the peri-traumatic experience and the presence of ASD. For example, these theorists would argue that the tendency to maladaptively appraise the experience of intense fear and the sense of threat at the time of the trauma would increase the likelihood of developing a pathological acute stress reaction; i.e. such

maladaptive appraisals should mediate the relationship between peri-traumatic threat and fear and ASD (e.g. Ehlers & Clark, 2000, Wells & Sembi, 2004). To our knowledge, despite these strong mediational hypotheses in the theoretical literature, there are no published studies examining these questions in trauma-exposed samples (though see Roussis & Wells, 2006). The present study therefore sought to examine the mediational role played by the cognitive variables identified above, with respect to ASD. Of course, any mediational analysis on purely cross-sectional data must be conducted with some caution. However, the presence of a clear theoretical rationale about the causal relationship between variables in the present case, along with the temporal relationship between the variables (with the predictor chronologically preceding the mediators and criteria), justifies examination of the mediating relationships in the data (Preacher & Hayes, 2004).

Memory factors

An additional important theoretical prediction in the PTSD literature (e.g. Brewin et al., 1996; Dalgleish, 2004; Ehlers & Clark, 2000) is that the *nature* of the trauma memories that trauma-exposed individuals experience is significantly related to the presence of pathological stress reactions. For example, both Brewin et al. (1996) and Ehlers and Clark (2000), based on clinical data, have proposed that a preponderance of sensory-based memories of the trauma (characterized by visual, auditory and olfactory elements), combined with a paucity of verbally-accessible 'propositional' memories, is a risk factor for the development of traumatic stress disorders[3]. Again, these theoretical approaches argue that susceptibility to laying down sensory-laden memories rather than verbally-accessible memories should *mediate* (via 'data-driven' processing; Ehlers & Clark, 2000) between reported cognitive-affective reactions at the time of the trauma and the severity of any acute stress response. The present study therefore examined

both the correlational and mediational relationships between more sensory (less verbal) trauma memory quality and the presence of ASD.

The dissociation criterion in ASD in youth

As well as a need to represent clinically significant stress responses in the first few weeks post-trauma, an additional motivation for the development of the ASD diagnosis in the DSM-IV was its hypothesized role as a strong predictor of later PTSD. The research findings to date indicate that ASD does indeed appear overall to be a good predictor of later PTSD in both adults (e.g. Brewin et al., 1999; Harvey & Bryant, 1998) and children (Kassam-Adams & Winston, 2004; Meiser-Stedman et al., 2005). Increasingly, however, there is marked concern over the importance the ASD diagnosis places on dissociative responses to trauma (Harvey & Bryant, 2002) and regression modelling has indicated that this particular symptom cluster adds little to the predictive utility of ASD (Brewin, Andrews, & Rose, 2003; Meiser-Stedman et al., 2005). Indeed, there is evidence to suggest that continuous measures of acute posttraumatic stress that omit the dissociative symptoms altogether might be the best predictor of later PTSD, rather than categorical measures such as the ASD diagnosis (Brewin et al., 2003). Furthermore, it has been argued that a PTSD diagnosis in the first four weeks post-trauma (i.e. removing the current duration criterion for a diagnosis of PTSD; APA, 1994) may be just as useful as the ASD diagnosis, with the additional benefit that it does not require the derivation of a new disorder in the form of ASD (Brewin et al., 2003). For these reasons, the second aim of the present study was to examine the relationships between these alternative conceptualizations of the acute stress response and ASD and, in particular, to examine whether the presence of the dissociation criterion in ASD possesses unique explanatory power.

To this end, in the present study we obtained two further measures of acute post-trauma response. Firstly, a *continuous* measure of levels of post-traumatic stress symptomatology that excluded dissociative symptoms (henceforth, acute posttraumatic stress symptomatology [APTSS]), obtained using a self-report questionnaire – the Children's Revised Impact of Event Scale (RIES-C; Dyregov & Yule, 1995). Secondly, an assessment of whether participants met criteria for a diagnosis of PTSD without the duration criterion (henceforth early PTSD), obtained using a structured clinical interview. These additional measures enabled us to address two sets of questions. First, how strongly are the three indices of acute trauma response (ASD, APTSS, early PTSD) related? To what extent do participants who meet criteria for ASD also meet criteria for early PTSD? And, related to this, does the Dissociation criterion for ASD explain any unique variance in the early PTSD diagnosis? Secondly, how comparable are the relationships (including any mediational effects) between ASD and the cognitive, memory quality, demographic and trauma-related variables outlined above, to the relationships between those same variables and APTSS or early PTSD? And, is the Dissociation criterion of ASD independently associated with these variables, over and above the variance accounted for by their associations with early PTSD or APTSS?

The present sample

As there were no existing studies of ASD in children and adolescents at the time of designing the research protocol, we elected to be relatively conservative in this preliminary study and investigate 10-16 year olds, for whom comprehension of the various assessment measures would present no significant obstacles. The study was conducted with a mixed sample of physical assault and MVA survivors. The rationale for recruiting survivors from distinct types of trauma was fourfold. First, both events are common, civilian, single-incident traumas (at least in

the present samples). Second, both events give rise to similar rates of ASD in the adult population (Brewin et al., 2003; Harvey & Bryant, 1999). Third, the theoretically- and empirically-driven hypotheses outlined above would be the same for both types of event. And, fourth, the ASD diagnosis was designed to be agnostic to the type of trauma (APA, 1994). Notwithstanding this intention to use a combined sample, the relevant analyses for the sub-samples of MVA and assault survivors will also be presented.

Method

Participants

Children and adolescents aged 10-16 years who were consecutive attendees at an emergency department (ED) in London, UK, following an assault or MVA, were invited to participate in this study. Exclusion criteria were: severe learning disability or organic brain disorder, sexual assault (the main investigator was male and no female investigator was available), investigation by social services into the child's family circumstances (either initiated prior to their attendance at the ED, or as a result of their attendance), and inability to speak English.

Three hundred and forty-three children and adolescents met the criteria for entry into the study. Of these 119 (34.7%) were not contactable due to inaccurate records within the ED, 116 (33.8%) did not wish to participate, two (0.6%) were immediately referred for treatment for the effects of prior trauma, and 106 (30.9%) agreed to participate. Of these 106 participating children, 93 (27.1%) were able to attend an initial assessment session.

Participants did not differ from non-participants in terms of sex, ethnicity, the type of trauma experienced (i.e. assault or MVA), or triage category (a nurse's rating of how urgently

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the individual needs treatment), though participants (mean age = 13.9, SD = 1.9) were found to be younger than non-participants (mean age = 14.8, SD = 1.9; t=3.54, df=341, p<.001).

The age of the participants ranged from 10.1-16.9 years (M = 13.9, SD = 1.9). Fifty-two (55.9%) participants were subjected to assaults, while 41 (44.1%) were involved in MVAs. Other demographic and trauma-related characteristics of the sample are displayed in Table 1.

Measures

Demographic/trauma variables

Objective indices of trauma severity and demographic information were assessed by collecting clinical information from the ED and from interviews with participating families. These variables are presented in Table 1.

Psychopathology measures

Anxiety Disorders Interview Schedule for the DSM-IV: Child and Parent Versions (ADIS-C). When the study commenced no standardized interview for assessing ASD in children was available. An existing measure of PTSD - the ADIS-C - was therefore amended to assess ASD. The ADIS-C (Silverman & Albano, 1996) is a structured interview schedule designed for the assessment of anxiety disorders in children and adolescents, where diagnoses are derived from both child and parent reports. The ADIS-C has excellent test-retest reliability (Silverman, Saavedra, & Pina, 2001).

A number of supplementary interview items were added to the ADIS-C to assess the dissociation symptoms specific to the ASD diagnosis. The design of these items was guided by the DSM-IV and by an existing adult ASD interview schedule (Bryant, Harvey, Dang, & Sackville, 1998). As there is no standardized interview for pediatric ASD in the published literature, these supplementary items are included here as an appendix.

Interviews were conducted by the first author, a doctoral level psychologist. Training and supervision in administering the ADIS-C was provided by clinicians at the Maudsley Hospital Child Traumatic Stress Clinic, London. The relative maturity of the children and adolescents who participated in the study (for whom parent-child agreement for anxiety disorders is often poor; Comer & Kendall, 2004; Grills & Ollendick, 2003) meant that parent reports were not considered in deriving diagnoses.

The internal reliability of the ASD items was found to be high (Cronbach's alpha = .85). Tape recordings of 11 interviews were assessed by another clinician so as to assess inter-rater reliability. The clinician (Patrick Smith) had seven years' experience of assessing and treating traumatic stress reactions in children and adolescents, and was blind to the principal assessor's diagnosis. There was unanimous agreement between assessors for ASD diagnosis (Kappa = 1.00).

In addition to the assessment of ASD, the full set of standard PTSD questions from the ADIS-C was also administered in order to derive an early PTSD 'diagnosis' (Brewin et al., 2003), as outlined in the Introduction.

Revised Impact of Event Scale – Child Version (RIES-C). The 13 item RIES-C (Dyregrov & Yule, 1995) was used to assess APTSS. The RIES-C contains subscales pertaining to the 3 core symptom clusters of APTSS (reexperiencing, avoidance, hyperarousal). Children respond either "not at all", "rarely", "sometimes", or "often", to each item (scored 0, 1, 3, and 5 respectively). Smith, Perrin, Dyregrov, and Yule (2003) found that the RIES-C total and subscale scores had satisfactory to good internal reliability (Cronbach's alpha = .60 - .80). This was confirmed in the present study (for RIES-C total score, Cronbach's Alpha = .91). The RIES-C also has good convergent validity, correlating .79 with the Children's PTSD Reaction Index

(Nader, 1996) – an established measure of PTSD symptoms in youth (Giannopoulou et al., 2006). In a U.K. clinic sample (*N*= 52), Perrin, Meiser-Stedman and Smith (2005) reported that the RIES-C had good criterion validity against a diagnosis of PTSD derived from structured clinical interview, classifying 83% of children correctly.

Trauma-related measures

Six items were included to assess particular appraisals and emotions that children may have experienced during, or immediately after, a traumatic event, and that have been hypothesized to relate to traumatic stress reactions (e.g. Ehlers & Clark, 2000). Subjective severity of threat was assessed using a 3-item measure ("*I really thought that I was going to die*"; "*I was really scared*"; and "*I thought that I was going to be very badly hurt*") that was found to have satisfactory internal reliability in the present data (Cronbach's alpha = .70). In addition, two items were used to assess anger directed towards the person responsible for the accident, and anger directed towards self (e.g. "*Just after the frightening event, I was really angry with myself*")(Andrews et al., 2000).

Children could respond "disagree a lot", "disagree a bit", "agree a bit, or "agree a lot" (scored 1, 2, 3, or 4) to each item, such that higher scores represented stronger endorsement of that state or process. Bespoke measures of this kind, with small numbers of targeted items, have proved useful in the adult literature in testing specific theoretical predictions and we derived the present items directly from these earlier studies (Andrews et al., 2000; Ehlers et al., 1998; Dunmore et al., 2001; Steil & Ehlers, 2000).

Memory quality

Memory quality was examined in the present study using an 11-item self report measure of the nature of the memories that children report concerning their trauma - the Trauma Memory

Quality Questionnaire (TMQQ; Meiser-Stedman, Smith, Yule, & Dalgleish, 2006). The TMQQ

is a unifactorial measure containing items pertaining to the visual quality, degree of verbal

encoding, temporal context (the extent to which the event feels like an event in the past or as if it

is occurring now), and non-visual sensory (e.g. olfactory, auditory etc) quality of the memories

children report having of a traumatic event (e.g. "*My memories of the frightening event are*

mostly pictures or images"; "*When I remember the frightening event I feel like it is happening*

right now"; "*When I think about the frightening event I can sometimes smell things that I smelt*

when the frightening event happened").

Children respond "don't agree at all", "don't agree very much", "agree a bit", or

"completely agree" (scored 1, 2, 3 and 4, respectively), with higher scores representing

memories of the trauma that are more sensory and fragmented, as well as being less verbally

accessible (i.e. items reflecting verbally-encoded memories are reverse-scored). Meiser-Stedman

et al. (in press) reported that the TMQQ had good internal reliability, Cronbach's alpha = .76,

and good convergent validity (correlating .40 with a measure of intrusive memory frequency, .58

with the RIES-C Intrusions sub-scale, and .36 with self-reported fear experienced during

intrusions), in a sample of children and adolescents (age range 10-18 years; $N = 254$). The

TMQQ also possessed good criterion validity, distinguishing between children and adolescents

with or without PTSD. Cronbach's alpha for the TMQQ in the present sample was .82.

Trait cognitive style measures

Childhood Anxiety Sensitivity Index. The Childhood Anxiety Sensitivity Index (CASI;

Silverman, Fleisig, Rabian, & Peterson, 1991) is a widely-used eighteen-item measure with good

psychometric properties (Silverman et al., 1991) where one of three responses can be made

("none", "some", or "a lot"; scored 1, 2, or 3 respectively, with higher scores representing greater

anxiety sensitivity) to each item. The CASI possesses good internal reliability (Cronbach's alpha = .87). Cronbach's alpha for the CASI in the present sample = .88.

Response Styles Questionnaire, Child Version (CRSQ). The RSQ – Rumination subscale (Nolen-Hoeksema, 1991) is a unifactorial measure of ruminative responses to negative mood. As noted above, the RSQ was adapted for this study (CRSQ). Firstly, we employed minor changes in wording for use with British children. Secondly, we broadened the scope of the questionnaire which predominantly focuses on feelings of depression, to also include feelings of fear. This was because children's responses to trauma are characterized by fear and anxiety in addition to depressed mood. Consequently, of the original 22 RSQ items, 1 ("*Listen to sad music*") was dropped and 6 were amended to include feelings of fear. For example, "*Think about how sad you feel*" was changed to "*Think about how sad or afraid you feel*" and "*Isolate yourself and think about the reasons why you feel sad*" was changed to "*Isolate yourself and think about the reasons why you feel sad and afraid*". Other items were subjected to wording changes; for example, "*I think I won't be able to do my job/work because I feel so badly*" was changed to "*I think I won't be able to do my work at school because I feel so bad*".

The original response format of the RSQ was retained such that four responses to each of 21 items could be made: "never", "sometimes", "often", and "always" (scored 1, 2, 3 and 4, respectively), with higher scores indicating a more ruminative response to negative emotions. The CRSQ possessed good internal reliability in the present study (Cronbach's alpha = .93), which is comparable to research in adults using the original measure (Nolen-Hoeksema, 2000). A key feature of the ruminative response to mood construct is its ability to predict later depressed affect, over and above current symptomatology (Nolen-Hoeksema & Morrow, 1991). A subset of the present sample ($n = 39$) completed a self-report measure of depressed mood (the Birleson

Depression Scale [BDS]; Birleson, 1981) both immediately post-trauma and 3 months after their trauma, as part of another study. This provided an opportunity to investigate the validity of our adapted RSQ (the CRSQ) by examining its power to independently predict later depressed mood in young people, as it does in adult samples. The correlation between RSQ scores post-trauma and later depressed affect on the BDS, after partialling out post-trauma BDS scores was significant, r (37) = .54, $p < .0001$. This provides support for the construct validity of the CRSQ.

Meta-Cognitions Questionnaire (MCQ). The 'positive beliefs about worry' sub-scale of the MCQ (Cartwright-Hatton & Wells, 1997) was adapted slightly for this study in order to measure positive beliefs about worrying in our younger sample. It was hypothesized that views concerning the merits of worry may encourage young people who have experienced a traumatic event to elaborate on further possible danger, contributing to the maintenance of a sense of current threat and thereby to posttraumatic stress (Ehlers & Clark, 2000). Ten of the 19 items were slightly reworded so as to make them more comprehensible to children. For example, "*I do my clearest thinking when I am worrying*" was changed to "*I do my best thinking when I am worrying*" and "*If I stopped worrying I would become glib, arrogant and offensive*" was changed to "*If I stopped worrying I would become rude and arrogant*". The original response format was retained such that children responded either "*do not agree*", "*agree slightly*", "*agree moderately*", or "*agree very much*" (scored 1, 2, 3, or 4 respectively). The MCQ worry subscale possessed good internal reliability (Cronbach's alpha = .90) in the present sample.

Procedure

The parents of children who met criteria for the study were approached by post, and then by telephone, in the days following their child's attendance at the ED. The consent of both child and parent was required for the child to participate in the study. Children were assessed either at

the investigator's department or, in the majority of cases, their own home. Families did not

receive payment for participating. The assessment comprised a structured clinical interview with

the first author, and the completion of the self-report questionnaires.

Results

All analyses were two-tailed. Alpha was set at 0.05 for the examination of the a priori

predictions outlined in the Introduction. For exploratory analyses a corrected level of alpha was

employed and this is noted at the appropriate points in the text.

Characteristics of the study sample

The demographic and trauma-related characteristics of the study sample, along with the

numbers and percentages of participants meeting criteria for ASD, the Dissociation criterion of

ASD, criteria for early PTSD, along with the mean RIES-C scores, all separated by type of

trauma, are presented in Table 1.

Comparisons across all measures in Table 1 for the two types of trauma (with a

Bonferroni corrected level of alpha of .05/15 = .003, in light of the number of comparisons)

revealed that assault participants were significantly older than MVA participants, t (91) = 4.18, *p*

<.0001. Importantly, there were no significant differences on the measures of acute stress as a

function of trauma type. It was therefore considered appropriate to combine assault and MVA

participants for subsequent analyses. To this end, mean scores for the key study variables,

conflated across trauma type, but differentiated by ASD and early PTSD status are displayed in

Table 2 [4].

Correlates of ASD

Table 3 displays the correlates of ASD. Notably, in contrast to our predictions, no

demographic or objective trauma-severity variables, nor self-reported anger at the time of the

trauma, were significantly correlated with ASD. However, in support of our predictions, subjective severity of threat at the time of the trauma, more sensory memories on the TMQQ, ruminative responses to negative affect on the CRSQ, positive endorsement of worry on the MCQ, and anxiety sensitivity on the CASI, were all significantly correlated with ASD.

Using these correlational data (Table 3) as an initial stage of variable reduction, those variables that were found to be statistically significant correlates of ASD were entered together in a single block in a logistic regression model, using a backward stepwise method, with ASD diagnosis as the dependent variable, in order to explore which correlates accounted for unique variance in ASD. The resultant model was significant, $\chi^2 = 25.26$, df = 2, p<.0001. Only subjective severity of threat and the TMQQ were retained in the model - i.e. accounted for unique variance (Wald statistics of 2.89 and 10.17, respectively). The model successfully predicted 84.8% of ASD cases. The final model was validated by repeating the regression using the forward stepwise method, with all of the variables entered in a single block. The pattern of results was the same[5].

Mediational analyses involving ASD

A multiple mediation model was derived to examine our hypothesis that the combination of CRSQ, MCQ and CASI would significantly mediate the relationship between subjective threat severity at the time of the trauma and ASD (Hayes & Preacher, 2006; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Preacher & Hayes, 2004). This approach used the bootstrapping method devised by Hayes and Preacher (2006), such that 1000 re-samples of the data (with replacement) were executed using their SPSS macro. The model revealed a near significant trend for an indirect effect of the mediators considered together for ASD, Sobel = .01, S.E. = .01, 95% bias corrected CI = -.01 to .03 (statistical significance is indicated if the CI does not cross zero).

Next, a simple mediation model was generated, again using the bootstrap method (Mackinnon et al., 2002, Preacher & Hayes, 2004), to examine whether the relationship between peri-traumatic subjective threat severity and ASD was mediated by TMQQ scores. Again 1000 bootstrap re-samples (with replacement) were examined, using the SPSS macro of Preacher and Hayes (2004). The results revealed the TMQQ to be a significant mediator of the relationship between subjective threat and ASD: Sobel = .03, S.E. = .01, 95% CI = .01 to .06.

Relationships between ASD, early PTSD and APTSS

To examine our predictions concerning the inter-relationships between ASD, APTSS (on the RIES-C) and early PTSD we initially performed zero-order correlations. ASD and early PTSD, Phi (93) = 0.73, $p < .001$, ASD and APTSS, r (85) = 0.53, $p < .001$, and early PTSD and APTSS, r (86) = 0.58, $p < .001$, were all significantly associated as predicted. However, counter to our prediction, there were *no* cases of ASD that were not also cases of early PTSD, thus suggesting some redundancy in the ASD diagnosis. Furthermore, regressing a sub-ASD diagnosis (without the Dissociation criterion) followed on the next step by the Dissociation criterion, onto early PTSD, revealed that Dissociation did not account significantly for unique variance in early PTSD, Wald = .52, $p > .47$, over and above sub-ASD, Wald = 30.77, $p < .001$, and indeed the regression model without Dissociation included (i.e. sub-ASD alone) predicted the same percentage of early PTSD cases as the model reflecting the whole ASD diagnosis, 95.7% in each case. These data therefore cast some doubt on the nosological utility of the ASD Dissociation criterion.

We next examined the patterns of correlations between the demographic, trauma-related, cognitive and memory variables, on the one hand, and early PTSD and APTSS on the other, to

assess their similarity to the same data involving ASD. These correlations are displayed in Table 3. As can be seen from the table, the patterns of correlations for early PTSD and APTSS almost exactly mirror the pattern for ASD. However, comparisons of the *magnitudes* of the significant correlations for the three different indices across the different variables (with a Bonferroni corrected level of alpha = .003), revealed a significant difference for the TMQQ, $p < .001$, and weak trends for the CASI, $p < .01$, and the CRSQ, $p = .01$ (other comparisons; ps > .25). In all 3 cases, the correlation with APTSS was significantly greater than the correlations for early PTSD and ASD, which did not differ significantly from each other.

We next explored whether the ASD Dissociation criterion was independently associated with the significant cognitive and memory quality measures presented in Table 3, via a series of partial correlations with presence of early PTSD partialled out. These data revealed that ASD Dissociation was independently significantly associated with the MCQ, pr (77) = .28, $p < .02$, the TMQQ, pr (80) = .31, $p < .01$, and subjective appraisal of threat, pr (80) = .22, $p < .05$, with a trend for an independent association with the CRSQ, pr (78) = .21, $p = .06$.

As with ASD, we then entered the significant correlates of early PTSD and APTSS into two backward stepwise regression models. For early PTSD, the significant resultant model, $\chi^2 = 27.35$, df = 2, $p < .0001$, was the same as for ASD (see above) with only subjective threat and the TMQQ retained (Wald statistics of 3.73 and 10.61, respectively), and the model correctly identifying 82.7% of cases of early PTSD. In the case of APTSS, the final model was again significant F (3, 79) = 58.73, $p < .001$, and accounted for 69% of the variance in APTSS. This time the final model was almost the same as for ASD with subjective threat, the TMMQ and the CRSQ being retained, betas = .21, .50 and .29, respectively. As with the ASD analysis, the models were validated by forward stepwise regressions which retained the same variables.

To examine mediation effects, we first considered whether the cognitive style variables (CRSQ, MCQ and CASI) would significantly mediate the relationship between subjective threat at the time of the trauma and early PTSD or APTSS using the bootstrap procedure described above. The results revealed significant mediating effects for the cognitive variables for both early PTSD, Sobel = 0.02, S.E. = 0.01, 95% bias corrected CI = .00 to 0.05, and for APTSS, Sobel = 1.35, S.E. = 0.45, 95% bias corrected CI = .38 to 2.20. We then computed simple mediation models examining whether TMQQ scores mediated the relationship between subjective threat and early PTSD or APTSS. Again, in both cases the models were significant: early PTSD, Sobel = .03, S.E. = .01, 95% bias corrected CI = .01 to .06; APTSS, Sobel = 2.01, S.E. = .50, 95% bias corrected CI = 1.07 to 3.05. As with the correlational and regression analyses, these results for early PTSD and APTSS broadly mirror the data for ASD.

Discussion

The present findings with child survivors of assaults and MVAs provided broad support for our study predictions that a greater subjective sense of threat at the time of trauma and higher scores on a range of trait cognitive style measures would be associated with the presence of an ASD diagnosis. The data also supported our prediction that the presence of relatively more sensory-laden memories would be associated with ASD. In contrast, there was no support for our predictions that a number of key demographic and trauma-related variables (previous history of trauma, prior mental health problems, female sex, and objective trauma severity) would be associated with ASD.

A simple mediational analysis revealed that the presence of more sensory-laden memories mediated the relationship between subjective severity of threat at the time of the

trauma and ASD. Furthermore, a multiple mediator analysis revealed a trend for the combined cognitive style variables to mediate this same relationship.

To the best of our knowledge, this is the first study to highlight factors associated with the presence of ASD in children. As far as we are aware, it is also one of the first studies in any age group to examine broadly the importance of cognitive variables in ASD using a representative sample (though see Harvey & Bryant, 1999, for some data on coping style, and Holeva et al., 2001, for data on a number of meta-cognitive variables in relation to a proxy measure of ASD). Finally, as far as we are aware, this is the first study to attempt to quantify the relationship between memory quality and traumatic stress responses in a younger sample.

The present results also revealed strong similarities between ASD and two other indices of the acute stress response – a 'diagnosis' of early PTSD (i.e. PTSD without the duration criterion; APA, 1994) and a continuous measure (APTSS) of symptomatology (without the ASD dissociation symptoms) as assessed by the RIES-C. As expected, all three measures inter-correlated highly. However, the early PTSD diagnosis captured *all* cases of ASD and the Dissociation criterion of ASD did not explain any unique variance in the early PTSD diagnosis. The patterns of correlations, regressions and mediational analyses between these three indices, on the one hand, and the cognitive, memory quality and demographic and trauma-related variables in the study, on the other hand, were almost identical, though for memory quality (on the TMQQ) the zero-order correlation for APTSS was stronger than in the case of the binary diagnostic variables. However, the Dissociation criterion of ASD did show an independent association with the measure of memory quality (the TMQQ), subjective threat, and the measure of positive endorsement of worry (the MCQ).

In the remainder of this Discussion section we shall consider each of these broad sets of findings in turn.

The importance of a variety of cognitive factors in the present study extends a rapidly growing body of research on the key role of cognitive processes from the child and adult PTSD literatures (e.g. Ehlers et al., 1998; Ehlers, Mayou, & Bryant, 2003) and from the adult ASD literature (e.g. Holeva et al., 2001; Moulds & Bryant, 2002) to the domain of ASD in children. The current findings on subjective appraisal of threat also accord with previous research on APTSS in younger populations (Aaron, Zaglul, & Emery, 1999; Di Gallo, Barton, & Parry-Jones, 1997).

Taken together the current data on cognitive variables indicate that the degree of fear and threat recalled from the time of the trauma (which accounted for unique variance in regression modelling across all three indices of acute stress), the way in which children respond to their experiences of negative emotions such as anxiety, their meta-cognitive beliefs about the utility of worry, and their tendency to ruminate in response to affective disturbance may all have an important role to play in children's early symptom response to a traumatic experience. It seems very likely that a majority of traumatized children experience an immediate and significant affective response to their experience of trauma. However, the present data suggest that *even in the first few weeks post-trauma* individual differences within the cognitive domain can have a profound influence on the evolution of early traumatic stress reactions. It also seems likely that such cognitive factors lay the foundations for more chronic dysfunctional appraisals about the trauma and about the stress response, that then leave the child vulnerable to the development of later PTSD (e.g. Ehlers et al., 2003; Stallard, 2003).

In this regard, the mediational results involving the cognitive variables from the present study are potentially important. These analyses revealed that the relationship between the degree of fear and threat reported at the time of the trauma and the development of the acute stress response was broadly mediated by our trait measures of cognitive style. This finding is in line with predictions from cognitive models of posttraumatic stress which propose that those individuals who interpret a given level of fear and threat at the time of the trauma in a maladaptive way are at greater risk of psychopathology in the ensuing weeks and months (e.g. Ehlers & Clark, 2000).

The finding that a number of key demographic and trauma-related variables were not significantly associated with ASD, APTSS or early PTSD in children and adolescents sits against a backdrop of mixed results in the existing literature. In the present data, prior psychiatric problems were not significantly related to the acute stress response and this contrasts with previous research in both child and adult samples in the acute aftermath of trauma (Aaron et al., 1999; Daviss et al., 2000; Foy, Madvig, Pynoos, & Camilleri, 1996; Harvey & Bryant, 1999; Stallard, Velleman, & Baldwin, 1998). However, the current findings that neither prior exposure to trauma nor objective indices of trauma severity were associated with the acute stress response are consistent with some prior studies on APTSS in younger populations (Pynoos et al., 1987; Winston et al., 2002). Finally, the finding that female sex was not related to acute stress in the current sample is at odds with data from the adult PTSD literature where female sex is a consistently strong predictor of the disorder (Brewin et al., 2000).

Reasons for these discrepancies between the present findings and those form previous studies may be that, overall, demographic and trauma-related factors are less clearly associated with acute stress responses than they are with later PTSD (Brewin et al., 2000; Ozer et al., 2003)

or that demographic factors play a less significant role in younger populations or in acute

responses in younger populations. These issues will become clearer as the research database on

predictors of stress responses in youth grows.

The data indicating that the presence of relatively sensory-laden trauma memories

(according to the TMQQ) was associated with ASD, APTSS and early PTSD, and that TMQQ

scores mediated the relationship between subjective threat severity and the acute stress response,

are consistent with theoretical predictions in the PTSD literature (e.g. Brewin et al., 1996; Ehlers

& Clark, 2000). The broad theoretical rationale is that trauma memories that are encoded with a

rich preponderance of sensory elements are more intrusive, more affect laden, and also more

difficult to 'emotionally process' (Rachman, 1980) during attempts to recover from the trauma.

Furthermore, for a given level of fear/threat at the time of trauma, those individuals who are

more predisposed to lay down sensory-based memories are at greater risk. The fact that TMQQ

scores accounted for unique variance in ASD, APTSS and early PTSD in regression modelling in

our sample of youth strongly suggests that the way that the trauma is initially encoded is

potentially a critical variable in determining and mediating the onset and maintenance of

posttraumatic stress responses in younger populations.

The nosological data involving the three different indices of the acute stress response

provided little support for the Dissociation mandate in the ASD diagnosis (APA, 1994), with all

three stress indices performing in a similar manner in the current study. The present findings

indicated that relaxing the duration criterion for PTSD to provide an 'early' PTSD diagnosis

would capture all of the cases currently identified by an ASD diagnosis. However, the

dissociation element of ASD did show some independent association with a number of the

cognitive variables in the present study, indicating that it may not be entirely redundant in

interpreting the pattern of cognitive-affective responses in the aftermath of trauma. These question marks over the utility of the ASD Dissociation criterion sit against a backdrop of similar doubts arising from research in the adult literature (e.g. Brewin et al., 2003; see Harvey & Bryant, 2002, for a detailed critique).

The current study has a number of clinical implications regarding children and adolescents recently exposed to trauma. The importance of memory quality in accounting for acute stress suggests that early assessment of traumatized youth would possibly be improved by the inclusion of some measure of the nature of trauma memories. The TMQQ is perhaps a promising measure in this regard (Meiser-Stedman et al., in press). The fact that ruminative and worrisome cognitive styles were related to acute stress (c.f. Holeva et al., 2001) suggests that psychological interventions may also be improved if some attempt is made at limiting a child's perseverative thinking about the trauma and its cognitive and affective sequelae. These data can also potentially speak to the issue of resilience (e.g. Charney, 2004). For example, it may be that a meta-cognitive style that works in the opposite direction to the kinds of maladaptive cognitions assessed here and/or a tendency to lay down more propositional memories of the trauma (Brewin, 2001; Dalgleish, 2004) would be protective in terms of acute and longer-term stress responses. These important issues concerning resilience merit future investigation.

There are a number of caveats and limitations pertaining to the present study that merit some comment. The age range of the recruited participants (10-16 years) necessarily restricts the application of the study's findings to older cohorts of children and adolescents. The strength of the relationships between a variety of cognitive processes and the indices of acute stress response suggests that investigating these processes in samples of younger children exposed to trauma is warranted and we are currently conducting a similar study in a younger sample. Furthermore, as

with the majority of studies in this area (Dalgleish et al., 2005), it is important to seek to replicate these findings in more socially and culturally diverse samples.

The type of traumas to which participants in this study were exposed also limits the generalizability of the findings. While the study sample comprised children and adolescents who had been exposed to two different types of trauma (assaults and MVAs) that were associated with comparable levels of ASD, early PTSD and APTSS, and with similar profiles of performance across the various predictor variables, these traumas do not have the widespread consequences of larger-scale events (e.g. natural disasters, war), with all the impact on support networks and day-to-day life that such events can have (e.g. La Greca et al., 1996; Vernberg et al., 1996). Investigation of the cognitive processes identified here in children and adolescents exposed to such large-scale trauma is therefore indicated. In addition, the degree of physical injury sustained by participants in this study was relatively mild, and may mean that the study's findings do not generalize clearly to more severely injured youth.

The measures used in the study were all based on participant self-report, either via questionnaire or clinical interview. Furthermore, two of these measures were adapted slightly for use with younger samples (the MCQ and the CRSQ). While the strength of the present findings involving these adapted measures, the psychometric data on them reported in the Measures section, and their consistency both with the theoretical predictions and across the different acute stress indices, suggest that the data are valid and reliable, it is important that future studies triangulate the same effects using different measures, ideally including non-self-report indices of cognitive processing (see Dalgleish et al., 2005, for some specific recommendations).

Finally, the present data were cross-sectional. A clear focus for future research is the requirement for prospective-longitudinal studies of *acute* stress responses in both adults and

children. Ideally, these would involve data collected pre-trauma to allow consideration of factors involved in the development of ASD and/or early PTSD. Of course, such studies are very hard to conduct due to the requirement to 'predict' the future occurrence of trauma in younger samples. Indeed, to our knowledge, only one study to date has been able to implement this kind of research design (La Greca, Silverman, & Wasserstein, 1998).

In summary, the present study has highlighted for the first time the important of cognitive variables and the quality of trauma memories in the acute stress response in children and adolescents. Furthermore, preliminary data suggest that the Dissociation mandate in the ASD diagnosis (APA, 1994) for younger participants is of questionable utility. Future research is indicated to extend these findings to other young trauma-exposed populations, to expand the range of measures to include experimental and observational data, and ideally to implement prospective-longitudinal designs involving data collected pre-trauma.

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Table 1. Demographic and trauma-related characteristics of the study sample, as a function of trauma type

Characteristic	Frequency or Mean score		
	Assault (*N*=52)	MVA (*N*=41)	Total sample (*N*=93)
Age	M=14.5	M=13.0	M=13.9
	(SD=1.7)	(SD=1.7)	(SD=1.9)
Female Sex	15 (28.8%)	18 (43.9%)	33 (35.5%)
Injury severity			
Fracture	4 (7.7%)	9 (22.0%)	13 (14.0%)
Admission to hospital	4 (7.7%)	9 (22.0%)	13 (14.0%)
Triage category			
1	0 (0.0%)	6 (14.6%)	6 (6.5%)
2	0 (0.0%)	0 (0.0%)	0 (0.0%)
3	5 (9.6%)	10 (24.4%)	15 (16.1%)
4	43 (82.7%)	22 (53.7%)	65 (69.9%)
Ambulance arrival	4 (7.7%)	2 (4.9%)	6 (6.5%)
Missing data	0 (0.0%)	1 (2.5%)	1 (1.1%)
Loss of consciousness			
Lost consciousness	0 (0.0%)	6 (14.6%)	6 (6.5%)
Missing data	5 (9.6%)	4 (9.8%)	9 (9.7%)
Ethnicity			
Black African	8 (15.4%)	7 (17.1%)	15 (16.1%)

Black Caribbean	9 (17.3%)	7 (17.1%)	16 (17.2%)
Black Other	12 (23.1%)	9 (22.0%)	21 (22.6%)
Other	8 (15.4%)	2 (4.9%)	10 (10.8%)
Caucasian	15 (28.8%)	16 (39.0%)	31 (33.3%)
Parent directly exposed to same trauma as child	5 (9.6%)	3 (7.3%)	8 (8.6%)
Prior exposure to trauma			
Prior trauma	24 (46.2%)	13 (31.7%)	37 (39.8%)
Missing	3 (5.8%)	0 (0.0%)	3 (3.2%)
Prior contact with mental health services			
Some prior contact with mental health services	9 (17.3%)	2 (4.9%)	11 (11.8%)
Missing data	3 (5.8%)	0 (0.0%)	3 (3.2%)
MVA type			
Bicycle rider, hit by motor vehicle	-	4 (9.8%)	-
Fall from bicycle	-	1 (2.4%)	-
Motor vehicle passenger	-	8 (19.5%)	
Motorbike rider	-	1 (2.4%)	-
Motorbike passenger	-	1 (2.4%)	-
Pedestrian	-	26 (63.4%)	-
Assault type			
Weapon used	17 (32.7%)	-	-
Assailant known to participant	27 (51.9%)	-	-

Post-traumatic stress psychopathology

ASD	11 (21.2%)	7 (17.1%)	18 (19.4%)
Met ASD Criterion B (Dissociation)	25 (48.1%)	25 (61.0%)	50 (53.8)
Early PTSD	14 (25.9%)	9 (22.0%)	23 (24.2%)
RIES-C	M=31.19	M=30.48	M=30.88
	(SD=18.36)	(SD=15.25)	(SD=16.96)

Note. MVA = Motor Vehicle Accident. ASD = Acute Stress Disorder. PTSD = Posttraumatic Stress Disorder. RIES-C = Revised Impact of Event Scale – Child version. Triage category represents a nurse's rating of how urgently the individual needs treatment, i.e. a triage category of 1 (or "red") indicates immediate treatment required, 2 (or "orange") indicates very urgent treatment, 3 (or "yellow") indicates urgent treatment, and 4 (or "green") indicates standard treatment.

Table 2. Comparisons between ASD and non-ASD participants and between early PTSD and non-PTSD participants on demographic/trauma variables, APTSS, peri-traumatic variables, memory quality and trait cognitive style variables.

Variable	Mean score (SD) [a]			Mean score (SD) [a]		
	ASD (*N*=18)	Non-ASD (*N*=75)	Test statistic [b]	Early PTSD (*N*=23)	Non-PTSD (*N*=70)	Test statistic
Demographic variables						
Age (years)	14.18 (2.24)	13.80 (1.79)	$t(91)=.75$, ns	14.33 (1.90)	13.73 (1.86)	$t(91)=1.34$, ns
Female sex	*N*=8 (44.4%)	*N*=25 (33.3%)	$\chi^2=.78$, df=1, ns	*N*=9 (39.1%)	*N*=24 (34.3%)	$\chi^2=.18$, df=1, ns
Prior exposure to trauma	*N*=7 (41.2%)	*N*=10 (41.1%)	$\chi^2=.01$, df=1, ns	*N*=8 (34.8%)	*N*=29 (43.3%)	$\chi^2=.51$, df=1, ns
Prior mental health problem	*N*=2 (12.5%)	*N*=9 (12.2%)	$\chi^2=.01$, df=1, ns	*N*=3 (13.6%)	*N*=8 (11.8%)	$\chi^2=.05$, df=1, ns
Trauma-related variables						
Triage category	3.33 (1.14)	3.47 (1.00)	$t(90)=.52$, ns	3.35 (1.15)	3.48 (.98)	$U = 628.50$, ns
Admitted to hospital	*N*=5 (27.8%)	*N*=8 (10.7%)	$\chi^2=3.53$, df=1, ns	*N*=6 (26.1%)	*N*=7 (10.07%)	$\chi^2=3.73$, df=1, ns
Fracture	*N*=2 (11.1%)	*N*=11 (14.7%)	$\chi^2=.15$, df=1, ns	*N*=3 (13.0%)	*N*=10 (14.3%)	$\chi^2=.02$, df=1, ns

APTSS						
RIES-C	48.56 (12.04)	26.17 (15.15)	t(83)=5.66, p<.001	48.83 (10.99)	25.05 (14.56)	t(83)=6.72, p<.001
Peritraumatic processes						
Subjective threat	9.65 (1.87)	7.52 (2.54)	t(81)=3.24, p<.002	9.70 (1.78)	7.39 (2.50)	t(81)=3.79, p<.001
Angry with others	3.41 (.93)	3.03 (1.25)	t(80)=1.17, ns	3.40 (.94)	3.00 (1.26)	U = 535.50, ns
Angry with self	2.35 (1.17)	2.20 (1.12)	t(80)=.50, ns	2.55 (1.15)	2.14 (1.11)	U = 503.00, ns
Memory quality						
MQQ	32.00 (5.61)	23.29 (6.99)	t(81)=4.75, p<.0001	31.97 (5.77)	23.03 (6.82)	t(81)=5.19, p<.001
Trait cognitive style measures						
CRSQ	44.74 (10.22)	34.17 (10.75)	t(79)=.3.64, p<.001	45.02 (9.94)	33.74 (10.58)	t(79)=4.12, p<.001
CASI	33.62 (7.39)	28.17 (6.72)	t(80)=.2.91, p<.005	34.88 (7.94)	27.62 (6.03)	t(80)=4.26, p<.001
MCQ	39.71 (12.31)	33.06 (9.43)	t(78)=2.41, p<.02	38.67 (12.11)	33.26 (9.61)	t(78)=1.98, ns

Note. ASD = Acute Stress Disorder; PTSD = Posttraumatic Stress Disorder; APTSS = Acute Posttraumatic Stress Symptomatology; RIES-C = Revised Impact of Event Scale, child version; TMQQ = Trauma Memory Quality Questionnaire; CRSQ = Response Styles Questionnaire; CASI = Childhood Anxiety Sensitivity Index; MCQ = Meta-cognitions Questionnaire.
[a] Where dichotomous data are included, frequencies instead of mean scores are presented, and percentages instead of standard deviations. [b] Where degrees of freedom differ this is due to missing data.

Table 3. Correlations of APTSS, ASD and early PTSD, with demographic/trauma variables, peri-traumatic factors, memory quality, and trait cognitive style variables (sample sizes in parentheses)

Measure	APTSS (RIES-C)	ASD diagnosis	Early PTSD
Demographic variables			
Age	-.11 (85)	.08 (93)	.14 (93)
Sex [a]	-.16 (85)	-.09 (93) [h]	-.04 (93) [h]
Prior exposure to trauma [b]	-.08 (82)	.00 (90) [h]	-.08 (90) [h]
Prior mental health problem [c]	-.03 (82)	.00 (90) [h]	.03 (90) [h]
Trauma-related variables			
Triage	-.02 (89)	-.05 (92) [h]	-.02 (94) [h]
Admission to hospital [d]	.08 (85)	.20 (93) [h]	.20 (93) [h]
Fracture [e]	-.14 (85)	-.04 (93) [h]	-.02 (93) [h]
Loss of consciousness [f]	.06 (77)	-.01 (84) [h]	.06 (84) [h]
Presence of parent [g]	.02(85)	.04 (93) [h]	-.09 (93) [h]
APTSS			
RIES-C	n/a	.53*** (85)	.58*** (86)
Peri-traumatic variables			
Subjective trauma severity	.54*** (83)	.34** (83)	.39** (83)
Anger at others	.11 (87)	.11 (82)	.12 (83)
Anger at self	.26* (87)	.05 (82)	.16 (83)
Memory quality			

MQQ	.78*** (83)	.47*** (83)	.50*** (83)
Trait cognitive measures at 2-4 weeks			
CRSQ	.68*** (81)	.38*** (81)	.42*** (81)
CASI	.68***(82)	.31** (82)	.43*** (82)
MCQ	.34*** (80)	.26* (80)	.22 (80)

Note.

For the Triage variable and the two anger variables, Spearman correlation coefficients are reported as the data were not normally distributed. Other correlations are Pearson coeffficents. APTSS = Acute Posttraumatic Stress Symptomatology; RIES-C = Revised Impact of Event Scale, child version; ASD = Acute Stress Disorder; PTSD = Posttraumatic Stress Disorder; TMQQ = Trauma Memory Quality Questionnaire; CTCQ = Thought Control Questionnaire, child version; CRSQ = Response Styles Questionnaire, child version; CASI = Childhood Anxiety Sensitivity Index; MCQ = Meta-Cognitions Questionnaire - Positive beliefs sub-scale – child version.
[a] Scored female = 0, male = 1; [b] Scored no prior trauma = 0, prior trauma = 1; [c] Scored no prior mental health difficulty = 0, prior mental health difficulty = 1; [d] Scored no admission = 0, admission = 1; [e] Scored no fracture = 0, fracture = 1; [f] Scored no loss of consciousness = 0, loss of consciousness = 1; [g] Scored no parent present = 0, parent present = 1; [h] Phi statistics are presented for these comparisons which involve two dichotomous variables.
* p<.05; ** p<.01, ***p<.001

Appendix. Supplementary interview items for the ADIS for assessing Acute Stress Disorder dissociation symptoms (Criterion B; APA, 1994).

Criterion B symptom	Question
B1. Detachment	When the [trauma] was happening did you feel numb or empty inside?
	When the [trauma] was happening, did you feel so shocked that you didn't feel anything?
	Since the [trauma] happened, have you ever felt numb or empty inside?
	Since the [trauma] happened, have you ever felt so shocked that you haven't felt anything?
B2. Reduced awareness	When the [trauma] was happening, did you feel as if you were in a daze?
	When the [trauma] was happening, did you feel as if you weren't noticing what was going on around you?
	Since the [trauma] happened, have you ever felt as if you were in a daze?
	Since the [trauma] happened, have you felt as if you weren't noticing what was going on around you?
B3. Derealization	When the [trauma] was happening, did you feel as if things around you weren't real?
	When the [trauma] was happening, did you feel as if you were in a dream or a movie?

	Since the [trauma] happened, have you felt as if things around you weren't real?
	Since the [trauma] happened, have you felt as if you were in a dream or a movie?
B4. Depersonalization	When the [trauma] was happening, did you feel as if your body didn't really belong to you?
	When the [trauma] was happening, did you feel that you were outside your body?
	When the [trauma] was happening, did you feel that you weren't really there?
	Since the [trauma] happened, have you felt as if your body doesn't really belong to you?
	Since the [trauma] happened, have you felt as if you were outside your body?
	Since the [trauma] happened, have you felt as if you're not really where you actually are?
B5. Amnesia	Is there a gap in your memory of what happened during the [trauma]?

Note. All responses were rated either yes or no.

References

Aaron, J., Zaglul, H., & Emery, R. E. (1999). Posttraumatic stress in children following acute physical injury. *Journal of Pediatric Psychology, 24,* 335-343.

American Psychiatric Association (1994). *Diagnostic and Statistical Manual of Mental Disorders (4th Edition).* Washington D.C.: American Psychiatric Association.

Andrews, B., Brewin, C. R., Rose, S., & Kirk, M. (2000). Predicting PTSD symptoms in victims of violent crime: the role of shame, anger, and childhood abuse. *Journal of Abnormal Psychology, 109,* 69-73.

Barton, K. A., Blanchard, E. B., & Hickling, E. J. (1996). Antecedents and consequences of Acute Stress Disorder among motor vehicle accident victims. *Behaviour Research and Therapy, 34,* 805-813.

Birleson, P. (1981). The validity of depressive disorder in childhood and the development of a self-rating scale: a research report. *Journal of Child Psychology and Psychiatry, 22,* 73-88.

Brewin, C. R. (2001). A cognitive neuroscience account of posttraumatic stress disorder and its treatment. *Behaviour Research and Therapy, 39,* 373-393.

Brewin, C. R., Andrews, B., & Rose, S. (2003). Diagnostic overlap between acute stress disorder and PTSD in victims of violent crime. *American Journal of Psychiatry, 160,* 783-785.

Brewin, C. R., Andrews, B., Rose, S., & Kirk, M. (1999). Acute stress disorder and posttraumatic stress disorder in victims of violent crime. *American Journal of Psychiatry, 156,* 360-366.

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 posttraumatic stress disorder. *Psychological Review, 103,* 670-686.

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

Bryant, R. A. (2003). Early predictors of posttraumatic stress disorder. *Biological Psychiatry, 53,* 789-795.

Bryant, R. A., Harvey, A. G., Dang, S. T., & Sackville, T. (1998). Assessing Acute Stress Disorder: Psychometric properties of a structured clinical interview. *Psychological Assessment, 10,* 215-220.

Bryant, R. A. & Panasetis, P. (2001). Panic symptoms during trauma and acute stress disorder. *Behaviour Research and Therapy, 39,* 961-966.

Cartwright-Hatton, S. & Wells, A. (1997). Beliefs about worry and intrusions: the Meta-Cognitions Questionnaire and its correlates. *Journal of Anxiety Disorders, 11,* 279-296.

Charney, D. S. (2004). Psychobiological mechanisms of resilience and vulnerability: implications for successful adaptation to extreme stress. *American Journal of Psychiatry, 161,* 195-216.

Comer, J. S. & Kendall, P. C. (2004). A symptom-level examination of parent-child agreement in the diagnosis of anxious youths. *Journal of the American Academy of Child and Adolescent Psychiatry, 43,* 878-886.

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

Dalgleish, T., Meiser-Stedman, R., & Smith, P. (2005). Cognitive Aspects of

Posttraumatic Stress Reactions and their Treatment in Children and Adolescents: An Empirical

Review and Some Recommendations. *Behavioural and Cognitive Psychotherapy, 33,* 459-486.

Daviss, W. B., Racusin, R., Fleischer, A., Mooney, D., Ford, J. D., & McHugo, G. J.

(2000). Acute stress disorder symptomatology during hospitalization for pediatric injury. *Journal

of the American Academy of Child and Adolescent Psychiatry, 39,* 569-575.

Di Gallo, A., Barton, J., & Parry-Jones, W. L. (1997). Road traffic accidents: early

psychological consequences in children and adolescents. *British Journal of Psychiatry, 170,* 358-

362.

Dunmore, E., Clark, D. M., & Ehlers, A. (2001). A prospective investigation of the role

of cognitive factors in persistent posttraumatic stress disorder (PTSD) after physical or sexual

assault. *Behaviour Research and Therapy, 39,* 1063-1084.

Dyregrov, A. & Yule, W. (1995). Screening measures: The development of the UNICEF

battery. In *Proceedings of the Fourth European Conference on Traumatic Stress*.

Ehlers, A. & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder.

Behaviour Research and Therapy, 38, 319-345.

Ehlers, A., Mayou, R. A., & Bryant, B. (1998). Psychological predictors of chronic

posttraumatic stress disorder after motor vehicle accidents. *Journal of Abnormal Psychology,

107,* 508-519.

Ehlers, A., Mayou, R. A., & Bryant, B. (2003). Cognitive predictors of posttraumatic

stress disorder in children: results of a prospective longitudinal study. *Behaviour Research and

Therapy, 41,* 1-10.

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,* 133-145.

Giannopoulou, I., Smith, P., Ecker, C., Strouthos, M., Dikaiakou, A., & Yule, W. (2006). Factor structure of the Children's Revised Impact of Event Scale (CRIES) with children exposed to earthquake. *Personality and Individual Differences, 40,* 1027-1037.

Grills, A. E. & Ollendick, T. H. (2003). Multiple informant agreement and the anxiety disorders interview schedule for parents and children. *Journal of the American Academy of Child and Adolescent Psychiatry, 42,* 30-40.

Harvey, A. G. & Bryant, R. A. (1998). The relationship between acute stress disorder and posttraumatic stress disorder: a prospective evaluation of motor vehicle accident survivors. *Journal of Consulting and Clinical Psychology, 66,* 507-512.

Harvey, A. G. & Bryant, R. A. (1999). Predictors of acute stress following motor vehicle accidents. *Journal of Traumatic Stress, 12,* 519-525.

Harvey, A. G. & Bryant, R. A. (2002). Acute stress disorder: a synthesis and critique. *Psychological Bulletin, 128,* 886-902.

Harvey, A. G., Bryant, R. A., & Dang, S. T. (1998). Autobiographical memory in acute stress disorder. *Journal of Consulting and Clinical Psychology, 66,* 500-506.

Hayes, A. F. & Preacher, K. J. (2006, August). Bootstrapping specific indirect effects in multiple mediator models of media effects. Paper presented at the annual conference of the Association for Education in Journalism and Mass Communication, San Francisco, CA.

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

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

Laroi, F. & Van der Linden, M. (2005). Metacognitions in proneness towards hallucinations and delusions. *Behaviour Research and Therapy, 43,* 1425-1441.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7,* 83-104.

Meiser-Stedman, R., Smith, P., Yule, W., & Dalgleish, T. (in press). The Trauma Memory Quality Questionnaire: preliminary development and validation of a measure of trauma memory characteristics for children and adolescents. *Memory.*

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

Moulds, M. L. & Bryant, R. A. (2002). Directed forgetting in acute stress disorder. *Journal of Abnormal Psychology, 111,* 175-179.

Murray, J., Ehlers, A., & Mayou, R. A. (2002). Dissociation and post-traumatic stress disorder: two prospective studies of road traffic accident survivors. *British Journal of Psychiatry, 180,* 363-368.

Nader, K. (1996). Assessing trauma in children. In J. Wilson & T. M. Keane (Eds.), *Assessing psychological trauma and PTSD.* New York: Guilford.

Nixon, R. D. V. & Bryant, R. A. (2003). Peritraumatic and persistent panic attacks in acute stress disorder. *Behaviour Research and Therapy, 41,* 1237-1242.

Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology, 109,* 504-511.

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology, 100,* 569-582.

Nolen-Hoeksema, S. & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: the 1989 Loma Prieta Earthquake. *Journal of Personality and Social Psychology, 61,* 115-121.

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

Perrin, S., Meiser-Stedman, R., & Smith, P. (2005). The Children's Revised Impact of Event Scale (CRIES): Validity as a screening instrument for PTSD. *Behavioural and Cognitive Psychotherapy, 33,* 487-498.

Preacher, K. J. & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers, 36,* 717-731.

Pynoos, R. S., Frederick, C., Nader, K., Arroyo, W., Steinberg, A., Eth, S. et al. (1987). Life threat and posttraumatic stress in school-age children. *Archives of General Psychiatry, 44,* 1057-1063.

Rachman, S. (1980). Emotional processing. *Behaviour Research and Therapy, 18,* 51-60.

Roussis, P. & Wells, A. (2006). Post-traumatic stress symptoms: Tests of relationships with thought control strategies and beliefs as predicted by the metacognitive model. *Personality and Individual Differences, 40,* 111-122.

Silverman, W. K. & Albano, A. M. (1996). *Anxiety Disorder Interview Schedule for DSM-IV: Child and Parent Interview Schedule*. San Antonio, TX: The Psychological Corporation.

Silverman, W. K., Fleisig, W., Rabian, B., & Peterson, R. A. (1991). Childhood Anxiety Sensitivity Index. *Journal of Clinical Child Psychology, 20,* 162-168.

Silverman, W. K., Saavedra, L. M., & Pina, A. A. (2001). Test-retest reliability of anxiety symptoms and diagnoses with the anxiety disorders interview schedule for DSM-IV: Child and parent versions. *Journal of the American Academy of Child and Adolescent Psychiatry, 40,* 937-944.

Silverman, W. K. & Weems, C. F. (1999). Anxiety sensitivity in children. In S.Taylor (Ed.), *Anxiety sensitivity: Theory, research and treatment of the fear of anxiety.* (Mahwah: NJ: Lawrence Erlbaum Associates, Inc.

Smith, P., Perrin, S., Dyregrov, A., & Yule, W. (2003). Principal components analysis of the impact of event scale with children in war. *Personality and Individual Differences, 34,* 315-322.

Stallard, P. (2003). A retrospective analysis to explore the applicability of the Ehlers and Clark (2000) cognitive model to explain PTSD in children. *Behavioural and Cognitive Psychotherapy, 31,* 337-345.

Stallard, P., Velleman, R., & Baldwin, S. (1998). Prospective study of post-traumatic stress disorder in children involved in road traffic accidents. *British Medical Journal, 317,* 1619-1623.

Steil, R. & Ehlers, A. (2000). Dysfunctional meaning of posttraumatic intrusions in chronic PTSD. *Behaviour Research and Therapy, 38,* 537-558.

Taylor, S., Koch, W. J., & McNally, R. J. (1992). How Does Anxiety Sensitivity Vary Across the Anxiety Disorders. *Journal of Anxiety Disorders, 6,* 249-259.

Warda, G. & Bryant, R. A. (1998a). Cognitive bias in acute stress disorder. *Behaviour Research and Therapy, 36,* 1177-1183.

Warda, G. & Bryant, R. A. (1998b). Thought control strategies in acute stress disorder. *Behaviour Research and Therapy, 36,* 1171-1175.

Wells, A. & Sembi, S. (2004). Metacognitive therapy for PTSD: a preliminary investigation of a new brief treatment. *Journal of Behavior Therapy and Experimental Psychiatry, 35,* 307-318.

Winston, F. K., Kassam-Adams, N., Vivarelli-O'neill, C., Ford, J., Newman, E., Baxt, C. et al. (2002). Acute stress disorder symptoms in children and their parents after pediatric traffic injury. *Pediatrics, 109,* e90.

Footnotes

[1] For the present purposes a representative sample study is one in which recruitment efforts have been targeted at an entire sub-population of participants who meet selection criteria; for example, *all* motor vehicle accident survivors who present at an emergency room during a particular time

period. This contrasts with case-control studies where highly selected and matched groups of participants are compared (see Dalgleish, Meiser-Stedman, & Smith, 2005, for some discussion).

[2] There are also a number of case control studies comparing adults with ASD with matched controls that have identified cognitive associates of the disorder including over-general autobiographical memory (Harvey, Bryant, & Dang, 1998), greater directed forgetting of emotional material (Moulds & Bryant, 2002), greater use of punishment or worrisome thought control strategies (Warda & Bryant, 1998b), and rating negative events as being more likely to occur and as more serious (Warda & Bryant, 1998a).

[3] Although various cognitive theories postulate a key role for sensory-laden trauma memories, they disagree about the underlying psychological processes implicated in such representations. For example, Brewin et al. (1996) propose a separate representational system (Situationally Accessible Memories) that underpins these phenomena, whereas Ehlers and Clark (2000) argue that such memories are encoded in a data-driven manner, but reside in the same representational space as other memories (see Dalgleish, 2004, for a discussion of these issues).

[4] As a further check on the influence of trauma type, comparisons across ASD versus no ASD and 'early' PTSD versus no PTSD were repeated with trauma type as a factor. In no cases was trauma type a significant influence, ps > .2.

[5] We also examined whether interaction terms reflecting the relationship between age and the significant cognitive measures carried any unique variance but this was not the case, ps > .27.