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Maladaptive cognitive appraisals mediate the evolution of posttraumatic stress reactions: A 6-month follow up of child and adolescent assault and motor vehicle accident survivors

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ABSTRACT

A prospective longitudinal follow-up study (n=59) of child and adolescent survivors of physical assaults and motor vehicle accidents assessed whether cognitive processes predicted posttraumatic stress symptomatology (PTSS) at 6 months post-trauma in this age group. In particular, the study assessed whether maladaptive post-traumatic appraisals mediated the relationship between initial and later post-traumatic stress. Self-report measures of PTSS, maladaptive appraisals and other cognitive processes, as well as structured interviews assessing for Acute Stress Disorder (ASD) and Posttraumatic Stress Disorder (PTSD), were completed at 2-4 weeks and 6 months post-trauma. PTSS and PTSD at 6 months were associated with maladaptive appraisals and other cognitive processes, but not demographic or objective trauma severity variables. Only maladaptive appraisals were found to associate with PTSS/PTSD after partialling out initial symptoms/diagnosis, and to mediate between initial and later PTSS. On this basis it was argued that maladaptive appraisals are involved in the development and maintenance of PTSS over time, while other cognitive processes (e.g. subjective threat, memory processes) may only have an effect in the acute phase. The implications of this study for the treatment of PTSS in youth are discussed.

Keywords: posttraumatic stress disorder, PTSD, children, memory, cognitive processes, appraisals.

INTRODUCTION

In contrast to the substantive literature on factors associated with the development of posttraumatic stress disorder (PTSD) in adult trauma survivors (see Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003), relatively little is known about such processes in child and adolescent survivors (see Dalgleish, Meiser-Stedman, & Smith, 2005; Meiser-Stedman, 2002; Salmon & Bryant, 2002).

Recent progress on this issue in adult survivors has been driven by various clearly-articulated cognitive accounts of PTSD (see Dalgleish, 2004). A key feature of a number of these theories (e.g. Ehlers & Clark, 2000; Foa & Rothbaum, 1998) is that a repertoire of maladaptive appraisals about the trauma and its impact *mediates* the relationship between initial reactions to a traumatic event and later posttraumatic stress; in other words, those processes play a causal role in the maintenance and exacerbation of initial stress reactions and thus drive the onset and maintenance of trauma-related psychopathology. These appraisals may concern a variety of domains relating to the experience of a traumatic event, e.g. the meaning of posttraumatic stress symptoms (PTSS) in the aftermath of trauma (e.g. "I am going mad", "I will never be the same again", etc.), perceived negative reactions from others ("nobody is there for me"), or future vulnerability (e.g. "people can't be trusted", "I am a weak person"). It is suggested that such appraisals would sustain and augment levels of anxiety as well as motivate the sustained use of maladaptive coping strategies that also serve to maintain symptoms (e.g. cognitive or behavioral avoidance)(Ehlers & Clark, 2000).

Recently, impressive empirical support for the operation of such maladaptive appraisal processes in adults has emerged (e.g. Bryant & Guthrie, 2005; Bryant & Guthrie, 2007; Clohessy & Ehlers, 1999; Dunmore, Clark, & Ehlers, 1999; Dunmore, Clark, & Ehlers, 2001; Ehlers, Mayou, & Bryant, 1998; Ehring, Ehlers, & Glucksman, 2006; Ehring, Ehlers, & Glucksman, 2008; Halligan, Michael, Clark, & Ehlers, 2003; Laposa & Alden, 2003;

Murray, Ehlers, & Mayou, 2002). Importantly, a number of these studies have utilized prospective longitudinal designs to demonstrate that negative cognitions about the trauma and its consequences independently predict long-term PTSS over and above initial symptom levels (Dunmore et al., 2001; Ehlers et al., 1998; Ehring et al., 2006; 2008; Halligan et al., 2003). Surprisingly, however, despite this impressive support for the non-specific independent prediction of later PTSS by maladaptive appraisals, to the best of our knowledge no studies have examined the key mediation hypothesis outlined above using such designs.

Research addressing the role of maladaptive appraisals in the unfolding of PTSS over time in children and adolescents has lagged behind the work conducted with adults. To date, three studies have applied these ideas to younger samples using prospective longitudinal designs. Ehlers, Mayou and Bryant (2003) and Stallard (2003) both found that maladaptive appraisals of the trauma and its impact were related to later PTSS in younger populations. However, neither study was able to show that the proposed cognitive factors accounted for unique variance in later PTSS, *over and above* the contribution of initial PTSS levels. In contrast, Bryant, Salmon, Sinclair and Davidson (2007) showed that maladaptive appraisals about the trauma measured within the first month post-trauma, independently predicted PTSS at 6 months even after controlling for initial Acute Stress Disorder diagnosis. By using a standardized measure of maladaptive appraisals in trauma-exposed youth, the Child Post-Traumatic Cognitions Inventory (CPTCI; Meiser-Stedman et al., in press), Bryant and colleagues were also able to investigate which types of appraisal implicated in cognitive models of PTSD were the most significant in driving subsequent PTSS in this age group. They found that the CPTCI sub-scale relating to future vulnerability and harm accounted for unique variance in 6-month PTSS, while the sub-scale relating to a sense of disturbing change as a result of the trauma and its sequelae did not. However, critically for the purposes

of the present research, none of these three studies examined the mediation hypothesis concerning the causal role of maladaptive appraisals in the development of PTSS over time.

The data from these 3 prospective-longitudinal studies concord with cross-sectional findings in the child and adolescent literature describing significant associations between trauma-related appraisal variables and PTSS (e.g. Aaron, Zaglul, & Emery, 1999; Di Gallo, Barton, & Parry-Jones, 1997; Meiser-Stedman, Dalgleish, Smith, Yule, & Glucksman, 2007a; McDermott & Cvitanovich, 2000; Salmon, Sinclair, & Bryant, 2007; see Dalgleish et al., 2005, for a review). For instance, in a previous study (Meiser-Stedman et al., 2007a) we showed that subjective appraisals of threat surrounding the trauma, along with trait anxiety sensitivity, degree of rumination in response to distressing emotions, endorsement of worry as adaptive, and the presence of highly sensory-based memories of the trauma, were all significantly associated with PTSS and with presence of ASD in the first month post-trauma in a group of child and adolescent assault and motor vehicle accident (MVA) survivors.

The purpose of the present study was to follow-up the sample described in Meiser-Stedman et al. (2007a) with a further assessment at 6 months in order to address three hypotheses. First, that those cognitive variables that were significantly associated with PTSS and ASD at 2-4 weeks would be significantly and independently associated with PTSS and/or PTSD at 6 months, even after controlling for the influence of initial symptom levels or diagnostic status. Second, that levels of maladaptive trauma-related appraisals, measured on the CPTCI and endorsed at 6 months, would significantly relate to PTSS and/or PTSD at 6 months, independent of the influence of 2-4 weeks symptoms and diagnosis. CPTCI subscales measure appraisals relating both to future vulnerability and personal weakness, and to the perception of significant and disturbing personal change. Thirdly, that levels of such appraisals would significantly *mediate* the relationship between initial symptom levels and

later symptom levels as cognitive theories of PTSD (Dalgleish, 2004; Ehlers & Clark, 2000) strongly predict.

For the purposes of the present study we opted to recruit older children and adolescents (i.e. 10-16 year olds). The maladaptive appraisals implicated in adult cognitive models of post-traumatic stress development comprise relatively abstract concepts, e.g. the perception of being psychologically "damaged". We were therefore concerned that such concepts may not be readily understood by younger participants. Focusing on older youth therefore represents a more conservative first step for exploring the downwards application of adult cognitive theory to younger age groups. This conservative approach was adopted while also bearing in mind the developmental evidence base around other anxiety disorders, such as panic disorder, that are thought to involve similarly abstract appraisals and yet do not emerge until late childhood or adolescence (Chorpita, Albano, & Barlow, 1996; Kessler et al., 2005). Given this focus on older youth only we anticipated that maladaptive appraisals would mediate the relationship between 2-4 week and 6 months PTSD symptoms, even when controlling for age.

METHOD

Participants

Full details of the sample are presented in Meiser-Stedman et al. (2007a). To summarize, consecutive 10-16 year old attendees of the Emergency Department (ED) of King's College Hospital, London over a period of 11 months, who had been involved in a physical assault or MVA, were selected to participate. Exclusion criteria were: organic brain disease or learning disability; sexual assault; investigation by social services into the child's family circumstances; inability to speak English; and physical assault by an adult living in the home.

In total, 343 children and adolescents met study criteria. Of these, 106 (30.9%) agreed to participate[i]. Sixteen participants did not complete the 2-4 week assessment. Participants did not differ from non-participants in terms of sex, ethnicity, the type of trauma experienced, or triage category (a validated rating of how urgently the individual needs treatment), though participants (mean age = 14.0, *SD* = 1.9) were significantly younger than non-participants (mean age = 14.8, *SD* = 1.9), t (340) = 3.54, $P<.001$.

Of the 90 children and adolescents who participated in the 2-4 week assessment, 59 (65.9%) completed the assessment at 6-months. These children (mean age = 14.0 years, *SD* = 1.8) formed the cohort for the current study. Importantly, no significant differences in 2-4 week PTSS were found between children who completed both assessments and children who did not complete the follow-up (completers: *M* = 31.39, *SD* = 16.41; non-completers: *M* = 30.56, *SD* = 18.10; $t(87) = .22$, *ns*).

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. Household income and other indices of socioeconomic status was not included in the initial assessment battery, so estimates of weekly household income were instead derived from census estimates (2001) for the local government electoral ward corresponding to the family's post code. These variables are presented in Table 1.

Measures of psychopathology assessed at 2-4 weeks and 6 months

Anxiety Disorders Interview Schedule for the DSM-IV: Child Version (ADIS-C).

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 child reports. The ADIS-C has excellent test-retest reliability (Silverman,

Saavedra, & Pina, 2001). The ADIS-C was appropriately amended to assess ASD at 2-4 weeks (see Meiser-Stedman et al., 2007a, for details), as well as being used to assess PTSD at 2-4 weeks (minus the duration criterion – henceforth 'early PTSD') and 6 months. 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.

Revised Impact of Event Scale – Child Version (RIES-C).

The 13 item RIES-C (Dyregrov & Yule, 1995) was used to assess PTSS. The RIES-C contains subscales pertaining to the 3 core DSM-IV symptom clusters of PTSS (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), we previously found (Perrin, Meiser-Stedman, & Smith, 2005) that the RIES-C had good criterion validity against a diagnosis of PTSD derived from structured clinical interview, classifying 83% of children correctly.

Measures at 2-4 weeks

These measures are described in more detail in Meiser-Stedman et al. (2007a).

Trauma-related measures

Subjective severity of threat was assessed using a 3-item measure (e.g., "*I really thought that I was going to die*"). 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. Cronbach's alpha for this measure in the present sample was .70.

Memory quality

Memory quality was examined in the present study using the 11-item Trauma Memory Quality Questionnaire (TMQQ; Meiser-Stedman, Smith, Yule, & Dalgleish, 2007b). 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*").

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). Cronbach's alpha for this measure 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. Cronbach's alpha for this measure in the present sample was .88.

Response Styles Questionnaire- Rumination Subscale, Child Version (CRSQ-RS). The RSQ – Rumination Subscale (Nolen-Hoeksema, 1991) is a unifactorial measure of ruminative responses to negative mood. The RSQ-RS was adapted (CRSQ-RS) to broaden the focus from feelings of depression to also include feelings of fear (see Meiser-Stedman et al., 2007a). 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. Cronbach's alpha for this measure in the present sample was .93.

Meta-Cognitions Questionnaire (MCQ). The 'positive beliefs about worry' (PBW) sub-scale of the MCQ (Cartwright-Hatton & Wells, 1997) was adapted slightly in order to measure positive beliefs about worrying in our younger sample (see Meiser-Stedman et al., 2007a). Children responded either "*do not agree*", "*agree slightly*", "*agree moderately*", or "*agree very much*" (scored 1, 2, 3, or 4 respectively) to the 19 items with higher scores indicative of greater endorsement of worry as a functional strategy. Cronbach's alpha for the MCQ-PBW in the present sample was .90.

Maladaptive appraisals at 6 months

Maladaptive appraisals at 6 months were assessed using the 25 item Post-Traumatic Cognitions Inventory – Child Version (CPTCI; Meiser-Stedman et al., in press). The CPTCI was adapted from the PTCI (Foa, Ehlers, Clark, Tolin, & Orsillo, 1999), a measure of maladaptive trauma-related appraisals in adults. The CPTCI contains two subscales: "permanent and disturbing change" (13 items; e.g. "My life has been destroyed by the frightening event", "My reactions since the frightening event show that I must be going crazy"); and, "fragile person in a scary world" (12 items; e.g. "Bad things always happen", "I

am a coward"). Items are scored 1, 2, 3, or 4, with higher scores representing more maladaptive appraisals. The CPTCI possessed good internal reliability in the present sample (Cronbach's alpha of .88 for both subscales).

Procedure

As described in detail in Meiser-Stedman et al. (2007a), 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 on two separate occasions (2-4 weeks and 6 months) either at the investigator's department or, in the majority of cases, their own home. Families did not receive payment for participating. Both assessments comprised the structured clinical interview (ADIS-C) with the first author, and the completion of the relevant self-report questionnaires as outlined above.

In four cases at the follow up assessment only questionnaire data were collected. In these cases a PTSD diagnosis was derived on the basis of questionnaire scores (see Bryant, Mayou, Wiggs, Ehlers, & Stores, 2004) by using the established cut-offs for the RIES-C (Perrin et al., 2005). The patterns of results remained the same if these 4 participants' data were set aside.

RESULTS

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

At 6 months, 9 (15.3%) of the 59 participants met criteria for PTSD. This is comparable to other studies of children and adolescents exposed to similar traumas (e.g. Bryant et al., 2004). Of these 9, 5 had met criteria for ASD and 5 for 'early PTSD' at 2-4

weeks. There was a significant association between 6 month PTSD and both 2-4 week ASD, *Phi* = .40, *P* = .002, and 2-4 week 'early PTSD', *Phi* = .29, *P* = .024. There was a significant decrease in PTSS (RIES-C scores) between the two assessments, *t* (57) =7.37, *P*<.001, with a strong correlation across time, *r* (56) =.79, *P*<.001.

The demographic and trauma-related characteristics of the study sample 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* (57) = 3.59, *P* < .003. Importantly, however, there were no significant differences on the prevalences of posttraumatic stress diagnoses nor PTSS at either time point as a function of trauma type. It was therefore considered appropriate to combine assault and MVA participants for subsequent analyses in line with previous research (cf. Meiser-Stedman et al., 2007a). To this end, mean scores for the key study variables, conflated across trauma type, but differentiated by 6 month PTSD status are displayed in Table 2. As can be seen, the PTSD participants did not differ from those without PTSD on any of the demographic or trauma-related variables (with the exception of sex), largely mirroring our findings with ASD reported in Meiser-Stedman et al. (2007a). However, the PTSD participants scored more highly on the majority of the cognitive variables, with the exception of the peritraumatic subjective threat measure and the MCQ-PBW subscale.

Predictors of 6-month PTSS and PTSD

Table 3 displays the zero-order relationships between the trauma/demographic and psychological variables at 2-4 weeks and 6 months, and self-reported PTSS and PTSD at 6 months, post-trauma. The table also shows the associations between predictors and 6 month PTSD with 2-4 week ASD or 'early PTSD' partialled out; and between predictors and 6 month PTSS with 2-4 week PTSS partialled out.

Regarding the demographic and trauma variables, we found no significant longitudinal zero-order or partial associations with 6 month PTSD or PTSS (with the exception of sex), largely mirroring the null cross-sectional findings reported in Meiser-Stedman et al. (2007a). Curiously, when ASD was accounted for, there was a relationship between being admitted and developing PTSD, where not being admitted was associated with greater likelihood of developing later PTSD.

With regards to the cognitive variables, as can be seen from Table 3, the zero-order correlations between 6 months PTSD/PTSS and the 2-4 week cognitive predictors are significant, with the exception of the correlation between PTSD status and our subjective threat index (which was only approaching significance), and the MCQ-PBW. This longitudinal pattern at 6 months again mirrors our previous cross-sectional finding that cognitive variables were associated with early PTSD, ASD and PTSS (Meiser-Stedman et al., 2007a). However, interestingly, with respect to our first hypothesis, once initial symptom levels/diagnosis were taken into account, none of these variables showed an independent significant relationship with 6 month outcome either individually (see Table 3) or collectively: 6-month RIES-C, controlling for 2 week RIES-C, Multiple $R = 0.28$, $P > .10$; 6-month PTSD controlling for 2-4 week ASD, Nagelkerke $R^2 = .29$, $P > .10$. In contrast, as anticipated (Hypothesis 2), maladaptive appraisals assessed at 6 months on both of the two subscales of the CPTCI were significantly and independently associated with 6 month symptom levels/diagnosis even after controlling for 2-4 week symptom levels/diagnosis.

The same pattern of findings was observed when these analyses were repeated with age as a covariate. Similarly, when trauma type (i.e. assault vs MVA) was controlled for, the same pattern of findings was observed, with the exception that the near-significant zero-order positive relationship between subjective threat and PTSD (r = .24), now just met the conventional level of significance, r (55) =.27, P < .05.

Mediation analyses

A multiple mediation model was derived to examine our third hypothesis that the two subscales of the CPTCI would significantly mediate the relationship between 2-4 week PTSS and 6 month PTSS (Hayes & Preacher, 2006; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Preacher & Hayes, 2004). We used PTSS in line with Meiser-Stedman et al. (2007a), as continuous variables provide more sensitivity and because in the previous analyses of association (see Table 3) the profile of findings for PTSS was exactly mirrored by the analyses involving the dichotomous diagnostic variables. Our mediation approach used the bootstrapping method devised by Hayes and Preacher (2006), which we employed with the 2-4 week data (Meiser-Stedman et al., 2007a). In this analysis we wanted to ensure that any mediational relationship implicating maladaptive appraisals that we found was not a function of trait tendencies to either ruminate or to endorse rumination/worry as a constructive approach to emotional difficulties. Consequently, to control for trait tendencies to ruminate we covaried 2-4 week scores on the Rumination Subscale of the RSQ. To control for trait tendency to endorse rumination and worry as a functional strategy we covaried 2-4 week scores on the MCQ-PBW subscale. We also covaried age at the time of the trauma, sex, and type of trauma (MVA vs Assault).

One thousand re-samples of the data (with replacement) were executed using Hayes and Preacher's (2006) SPSS macro. The model revealed a significant indirect effect of the mediators considered together, *Bootstrap index* = .15, *S.E.* = .09, *95% bias corrected CI* = .003 to .36 (statistical significance is indicated if the CI does not cross zero; Hayes & Preacher, 2006). Examination of each CPTCI subscale separately revealed that only scores on CPTCI-Permanent Change significantly mediated the relationship between 2-4 week and 6 month symptoms, *Bootstrap index* = .17, *S.E.* = .09, *95% bias corrected CI* = .02 to .39. The

mediation effect of CPTCI-Scary World was non-significant, *Bootstrap index* = -.02, *S.E.* = .05, *95% bias corrected CI* = -.15 to .07.

DISCUSSION

The present data show that maladaptive appraisals about a trauma and its impact in child and adolescent trauma survivors significantly account for post traumatic stress symptomatology (PTSS) and PTSD diagnosis at 6 months post-trauma, even after controlling for the variance accounted for by symptom/diagnostic measures taken at 2-4 weeks post-trauma (cf. Bryant, Salmon, Sinclair, & Davidson, 2007). Furthermore, to our knowledge the present study is the first to show, in any trauma population, that such post-trauma maladaptive appraisals significantly *mediate* the association between initial symptoms and later PTSS as predicted by adult cognitive models (e.g. Ehlers & Clark, 2000) which argue that the way that initial psychological responses to a trauma are later interpreted by survivors can drive the development of PTSD. Thus, the data support the view that maladaptive cognitions are not simply epiphenomenal correlates of symptoms but instead are causally implicated in the unfolding and maintenance of the post traumatic stress response over time.

These data complement our previous finding that changes in maladaptive cognitions in children and adolescents with PTSD mediated the relationship between type of treatment (cognitive-behavior therapy [CBT] vs. wait list) and PTSD outcome in a recent randomized controlled trial (Smith et al., 2007), indicating that successful reduction in maladaptive appraisals is causally implicated in recovery from the disorder following CBT. Taken together, the 2 sets of findings make a strong case for therapeutically targeting maladaptive appraisals in the early aftermath of trauma for those believed to be at elevated risk of later PTSD, as a form of preventive intervention (cf., Ehlers et al., 2003).

The present data also showed that other cognitive-affective variables (preponderance of sensory-based memories, anxiety sensitivity, ruminative style, endorsement of worry,

subjective assessment of threat), that had been shown to be associated with early PTSS and ASD in our previous cross-sectional study (Meiser-Stedman et al., 2007a), were also significantly associated with PTSS/PTSD at 6 months post-trauma. However, once the variance in 6 months PTSS/PTSD accounted for by initial symptoms/diagnosis was controlled for, these relationships were rendered statistically non-significant, failing to support our second hypothesis and suggesting that these other cognitive-affective variables may have limited independent involvement in the later evolution and maintenance of post-traumatic stress over and above their association with the initial symptom response. Our findings involving trauma/demographic factors confirmed our earlier cross-sectional results in showing that these variables generally possessed little predictive power.

It is noteworthy that while both CPTCI sub-scales were correlated with PTSS at 6 months post-trauma (even after controlling for initial PTSS), only the "permanent and disturbing change" sub-scale significantly mediated the relationship between initial and later symptoms. This suggests that the perceived "psychological injury" of being in a trauma and developing significant PTSS should be more of a focus for psychological treatments for youth in this age range with PTSD.

That such relatively abstract meta-cognition should be a key process in this age group is also theoretically significant, suggesting that some children and adolescents can appraise their trauma exposure and PTSS as having a detrimental impact on their current and future identity. Alternatively, and also of relevance to the developmental psychopathology literature, it is possible that those youth who did not develop chronic PTSS were successfully able to normalize any initial symptom reactions.

How youth attempt to accommodate cognitively their traumatic and post-traumatic experiences therefore warrants further investigation, particularly in younger children who may not be concerned with abstract issues around their psychological integrity and for whom

the evolution of PTSS in the aftermath of trauma may be quite different (Meiser-Stedman, Smith, Glucksman, Yule, & Dalgleish, 2008). Indeed, the lower age range (7-13 years) of participants in Bryant et al.'s (2007) study may explain why the "permanent and disturbing change" CPTCI sub-scale did not account for any unique variance in 6-month PTSS while the "fragile person in a scary world" sub-scale did, and suggests that the concerns indexed by the former sub-scale may indeed be of less importance in younger participants. The existing literature around childhood anxiety sensitivity (Silverman & Weems, 1999), a construct which similarly involves the appraisal of internal events and processes, may inform research in this area. For example, just as parental reactions to anxious sensations in childhood may encourage the development of anxiety sensitivity in adulthood (e.g. being allowed time off school if displaying anxious symptoms; Watt, Stewart & Cox, 1998), parental behavior may encourage the development of maladaptive beliefs around the experience of PTSS. Unfortunately, a large proportion of missing data for parent-report measures meant that we were unable to explore whether family factors had a role in encouraging maladaptive appraisals in the present study. It may also be pertinent to investigate how features of the trauma itself (e.g. duration, preparedness, interpersonal, legal resolution, persistent injury) and initial PTSS (e.g. reexperiencing vs other symptom clusters) may impact on the types of maladaptive appraisals developed in response.

It is important to consider some possible limitations of the present study. First, the sample size is relatively modest and replication in larger samples is required. That said, the key effect size estimates involving maladaptive appraisals overall were large (M = .52), as were the mediation effects (Cohen, 1988), suggesting that sample size was not a significant problem. Secondly, the types of trauma to which participants 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, these do not have the widespread

consequences of larger-scale events (e.g. natural disasters, war), where support networks and day-to-day life can be disrupted. Finally, the degree of physical injury sustained by participants in this study was relatively mild, and may mean that the study's findings do not extend to more severely injured youth.

In summary, the present follow-up study of child and adolescent trauma survivors showed that levels of maladaptive appraisals about a trauma and its impact significantly and independently account for variance in posttraumatic stress several months after a traumatic event, even after the influence of initial symptoms/diagnosis is accounted for. What is more, the findings are the first to show that levels of such appraisals significantly mediate the association between early symptoms and later post traumatic distress as predicted by cognitive theory (Dalgleish, 2004; Ehlers & Clark, 2000).

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Table 1. Objective/demographic characteristics of the study sample

Characteristic	Frequency		
	Assault (*n*=31)	MVA (*n*=28)	Total (*n*=59)
Age	*M*=14.8 (*SD*=1.4)	*M*=13.2 (*SD*=1.9)	*M*=14.0 (*SD*=1.8)
Female sex	12 (38.7%)	15 (53.6%)	27 (45.8%)
Weekly household income [a]	£595 (SD = £112)	£611 (SD = £85)	£603 (SD = £100)
Injury severity			
Fracture	2 (6.5%)	6 (21.4%)	8 (13.6%)
Admission to hospital	2 (6.5%)	6 (21.4%)	8 (13.6%)
Triage category			
1	1 (3.2%)	4 (14.3%)	5 (8.5%)
2	0 (0.0%)	0 (0.0%)	0 (0.0%)
3	3 (%)	8 (28.6%)	11 (18.6%)
4	24 (%)	15 (53.6%)	39 (66.1%)
Ambulance arrival	3 (9.7%)	1 (3.6%)	4 (6.8%)
Loss of consciousness			
Lost consciousness	0 (0.0%)	4 (14.3%)	4 (6.8%)
Missing data	4 (12.9%)	3 (10.7%)	7 (11.9%)
Ethnicity			
Black African	3 (9.7%)	3 (10.7%)	6 (10.2%)
Black Caribbean	3 (9.7%)	6 (21.4%)	9 (15.3%)
Black Other	7 (22.6%)	3 (10.7%)	10 (16.9%)
Indian	1 (3.2%)	0 (0.0%)	1 (1.7%)
Other	7 (22.6%)	2 (7.1%)	9 (15.3%)
Caucasian	10 (32.3%)	14 (50.0%)	24 (40.7%)
Parent directly exposed to same trauma as child	3 (9.7%)	1 (3.6%)	4 (6.8%)
Prior exposure to trauma			
No prior trauma	16 (51.6%)	18 (64.3%)	34 (57.6%)
Prior trauma	14 (45.2%)	9 (32.1%)	23 (39.0%)
Missing	1 (3.2%)	1 (3.6%)	2 (3.4%)
Prior contact with mental health services			
Some prior contact with mental health services	5 (16.1%)	2 (7.1%)	7 (11.9%)
Missing data	1 (3.2%)	1 (3.6%)	2 (3.4%)
MVA type			
Bicycle rider, hit by motor vehicle	-	3 (10.7%)	-
Motor vehicle passenger	-	5 (17.9%)	-
Fall from bicycle	-	1 (3.6%)	-
Motorbike passenger	-	1 (3.6%)	-
Pedestrian	-	18 (64.3%)	-
Assault type			
Weapon used	11 (35.5%)	-	-
Assailant known to participant	17 (54.8%)	-	-

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Table 1. Continued…

Characteristic		Frequency		
		Assault (*n*=31)	MVA (*n*=28)	Total (*n*=59)
Post-traumatic stress				
T1	ASD	6 (19.4%)	5 (17.9%)	11 (18.6%)
	Early PTSD	9 (29.0%)	6 (21.4%)	15 (25.4%)
	RIES-C scores	*M*=33.86 (*SD*=17.30)	*M*=28.76 (*SD*=15.26)	*M*=31.39 (*SD*=16.4)
T2	PTSD	6 (19.4%)	3 (10.7%)	9 (15.3%)
	RIES-C scores	*M*=23.60 (*SD*=18.08)	*M*=18.89 (*SD*=15.71)	*M*=21.37 (*SD*=17.02)

Note. MVA = Motor Vehicle Accident. ASD = Acute Stress Disorder. PTSD = Post-Traumatic Stress Disorder. RIES-C = Revised Impact of Event Scale, child version.
[a] Based on estimates from UK Census data 2001 for each local government electoral ward.

Table 2. Comparisons between PTSD and non-PTSD participants on demographic variables, trauma-related variables, peri-traumatic variables, memory quality, trait cognitive style variables, post-traumatic appraisals, and PTSS.

	Mean score (SD) [a]		
Variable	PTSD (*n*=9)	Non-PTSD (*n*=50)	Test statistic [b]
Demographic variables			
Age (years)	14.6 (1.8)	13.9 (1.8)	*t*(57)=.97, ns
Female sex	*n*=7 (77.8%)	*n*=20 (40.0%)	χ^2=4.39, df=1, p<.04
Prior exposure to trauma	*n*=2 (22.2%)	*n*=21 (43.8%)	ns, FET
Prior mental health problem	*n*=2 (22.2%)	*n*=5 (10.4%)	ns, FET
Weekly household income [c]	£638 (£94)	£597 (£101)	t(59) = 1.14, ns
Trauma-related variables			
Triage category	3.56 (1.01)	3.32 (1.10)	*t*(57)=.60, ns
Admitted to hospital	*n*=0 (0.0%)	*n*=8 (16.0%)	ns, FET
Fracture	*n*=1 (11.1%)	*n*=7 (14.0%)	ns, FET
Loss of consciousness	*n*=0 (0.0%)	*n*=4 (8.5%)	ns, FET
Parent directly exposed to same trauma as child	*n*=0 (0.0%)	*n*=4 (8.0%)	ns, FET
Peritraumatic processes (T1)			
Subjective threat	9.22 (2.17)	7.55 (2.52)	*t*(56)=1.87, p=.067
Memory quality (T1)			
TMQQ	30.17 (9.36)	24.20 (7.18)	*t*(55)=2.18, p<.04
Trait cognitive style measures (T1)			
CRSQ	45.37 (13.06)	35.98 (10.61)	*t*(54)=4.12, p<.03
CASI	34.51 (7.22)	28.92 (6.74)	*t*(54)=2.26, p<.03
MCQ-PBW	33.78 (12.50)	34.76 (11.65)	*t*(54)=.23, ns
Post-traumatic appraisals (T2)			
CPTCI-PC	28.40 (6.33)	17.59 (5.45)	*t*(57)=5.35, *p*<.0001
CPTCI-SW	32.89 (7.06)	21.66 (7.19)	*t*(57)=4.32, *p*<.0001
PTSS (T2)			
RIES-C	42.00 (12.00)	17.65 (15.07)	*t*(57)=4.58, *p*<.0001

Note.
PTSD = Posttraumatic Stress Disorder; TMQQ = Trauma Memory Quality Questionnaire; CRSQ = Response Styles Questionnaire, child version; CASI = Childhood Anxiety Sensitivity Index; MCQ-PBW = Meta-cognitions Questionnaire, positive beliefs about worry sub-scale; CPTCI-PC/SW = Child Post-Traumatic Cognitions Inventory- Permanent Change/Scary World subscales; PTSS = Posttraumatic stress symptomatology; RIES-C = Revised Impact of Event Scale, child version; ns = non-significant; FET = Fisher's exact test.
[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. [c] Based on estimates from UK Census data 2001 for each local government electoral ward.

Table 3. Associations of the objective/demographic and cognitive variables with PTSS and PTSD status at 6 months post-trauma

Measure	PTSS [a] (*n*=59)	PTSS (controlling for 2-4 week PTSS [a]; *n*=56[b])	PTSD status[c] (*n*=59)	PTSD status (controlling for ASD[d]; *n*=59)	PTSD status (controlling for early PTSD[d]; *n*=59)
Demographic variables					
Age	.10	.15	.13	.02	.08
Sex [e]	-.11	-.09	-.27	1.10	2.46
Prior exposure to trauma [e]	-.13	.05	.16	.24	.26
Prior mental health problem [e]	.14	.20	.13	.36	.13
Weekly household income [f]	-.02	.00	.15	.08	.13
Trauma-related variables					
Triage category	.06	.04	.08	.16	.10
Admission to hospital [e]	.14	-.06	.17	4.25*	2.78
Fracture [e]	-.04	-.03	.03	.01	.002
Loss of consciousness [e]	.11	.09	n/a	n/a	n/a
Parent directly exposed to same trauma as child [e]	-.02	-.12	.11	.09	.025
Peritraumatic processes (T1)					
Subjective trauma severity	.48***	.05	.24	.15	.13
Memory quality (T1)					
TMQQ	.54***	-.12	.28*	.10	.16
Trait cognitive style measures (T1)					
CRSQ	.64***	.20	.30*	.15	.20
CASI	.66***	.24	.29*	.16	.16
MCQ-PBW	.38**	.11	-.03	-.16	-.10
Negative post-traumatic appraisals (T2)					
CPTCI–PC	.74***	.56***	.58***	.49***	.52***
CPTCI–SW	.66***	.34*	.50***	.37**	.42***

Note.
PTSS = Posttraumatic stress symptomatology, assessed by the RIES-C (Revised Impact of Events Scale, child version); PTSD = Posttraumatic stress disorder; ASD = Acute stress disorder; TMQQ = Trauma memory quality questionnaire; CRSQ = Response Styles Questionnaire, child version; CASI = Childhood Anxiety Sensitivity Index; MCQ-PBW = Meta-cognitions Questionnaire, positive beliefs about worry sub-scale; CPTCI-PC/SW = Child Post-Traumatic Cognitions Inventory- Permanent Change/Scary World subscales.
[a] Associations between PTSS and other continuous variables are Pearson correlations. Those between PTSS and binary variables are point-biserial correlations. [b] Two to four week PTSS data was missing for three participants. [c] Associations between PTSD status and other binary variables are Phi correlations. Those between PTSD status and continuous variables are point-biserial correlations. [d] Associations between PTSD status and other binary variables controlling for T1 diagnostic status are represented by a χ^2 statistic testing the homogeneity of the odds ratio of a Mantel-Haenszel statistic. Those between PTSD status and continuous variables, controlling for T1 diagnosis, are point-biserial correlations. [e] These variables were dichotomous (binary) variables [f] Based on estimates from UK Census data 2001 for each local government electoral ward. * $p<.05$; ** $p<.01$, *** $p<.001$

[i] 1 - The ED was in a deprived part of South London where low take-up of offers to take part in clinical or academic research is common. Nevertheless, participants and non-participants did not significantly differ on the majority of baseline variables that were available.