Behavioural and Cognitive Psychotherapy, 2005, 33, 459–486
Printed in the United Kingdom doi:10.1017/S1352465805002389

Cognitive Aspects of Posttraumatic Stress Reactions and their Treatment in Children and Adolescents: An Empirical Review and Some Recommendations

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Abstract. This paper reviews empirical research on cognitive factors associated with the experience of trauma and with the development of posttraumatic stress, Acute Stress Disorder (ASD) and Posttraumatic Stress Disorder (PTSD) in children and adolescents. The review covers three main areas: cognitive experimental and neuropsychological studies; large scale studies on representative samples; and, randomized clinical trial data examining cognitive-behaviour therapy (CBT) interventions. Overall, the conclusions are that progress in all three areas lags far behind that in adult work and that, perhaps, the studies to date raise more questions than they provide answers provided by the studies to date. The paper concludes with detailed empirical recommendations for future research in the three chosen domains.

Keywords: Cognitive, trauma, PTSD, children, adolescents, CBT.

William Yule

Each of us got to know Bill in the first place as a research supervisor; and he has subsequently become a collaborator, colleague, and friend to all of us. His supervision style can be a little idiosyncratic. Supervision might not happen regularly, or even at all, if he was carrying out a workshop in a far-away disaster zone. But when it did happen, it was to be savoured. We might not always have stuck to the task at hand, but we were always entertained. When discussing research ideas, Bill could be what Hudson (1967) might have called a "divergent thinker" (although others might have called it something else), and meetings that had Bill saying, "This might sound completely off the wall, but . . ." were usually the most productive. He has been instrumental in encouraging the young field of child traumatic stress to move in an evidence-based direction. If people believed that play/primal scheme/psychodynamic/energy therapy worked with children, then fine, he would say, just show us some data to back up your intuition (though, it has to be added, they very rarely did). Bill's commitment to data-collection

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is not just lip-service – he always seems to have several article reviews on the go. Even in his retirement it is likely that, should you catch him on one of his innumerable trips to meetings or disaster-stricken regions, he will have his nose buried in yet another manuscript, never failing to boldly spot a split infinitive. Bill's enthusiasm is infectious, and has helped to carry dozens of students through long days of writing-up. His sense of eagerness and fun, tempered by a very down to earth attitude to "getting the job done", make him a pleasure to work with. Of course, it has also made for a very productive research career, not least in the field of cognitive approaches to post traumatic stress in younger populations where he has overseen many of the pioneering studies. We hope his influence is evident in the review below.

Introduction

A growing body of research with adult survivors of trauma suggests that a variety of cognitive factors play a significant role in both the evolution and maintenance of posttraumatic stress states as well as in the process of recovery (oftentimes through clinical intervention) from those states. This research programme has embodied all aspects of the cognitive paradigm, including basic experimental work in the laboratory using case-control designs (see McNally, 2003a, 2003b; Thrasher and Dalgleish, 1999, for reviews), larger-scale cross-sectional and longitudinal studies on representative samples (e.g. Dunmore, Clark and Ehlers, 1997, 1999, 2001; Ehlers et al., 1998; Ehlers, Maercker and Boos, 2000; Ehlers, Mayou and Bryant, 1998; Ehlers and Steil, 1995; Hickling, Blanchard, Buckley and Taylor, 1999; Mayou, Ehlers and Bryant, 2002; Shalev, 1992; Shalev, Peri, Canetti and Schreiber, 1996; Soloman, Mikulincer and Avitzur, 1988), complex and innovative theorising (Brewin, Dalgleish and Joseph, 1996; Dalgleish, 2004; Ehlers and Clark, 2000; Foa and Rothbaum, 1998; Foa, Steketee and Rothbaum, 1989; Janoff-Bulman, 1989), and treatment studies examining cognitive interventions (e.g. Ehlers, Clark et al., 2003; Foa et al., 1999; Marks, Lovell, Noshirvani, Livanou and Thrasher, 1998; Tarrier et al., 1999).

Despite this sea change in the way adult posttraumatic stress reactions are conceptualized, it has only been relatively recently that the attentions of the research and clinical communities have turned to the roles played by cognitive factors in the stress responses of children and adolescents. Significant credit for the introduction of this cognitive perspective in younger populations must go to Bill Yule who encouraged and oversaw a number of the pioneering studies in the area. In this article – part of a Festschrift Special Issue in Bill's honour – we chart the development of this emerging research focus, evaluate progress so far, and comment on the challenges that still lay ahead.

The review will cover three main areas of cognitive research involving child and adolescent trauma survivors: cognitive experimental and neuropsychological work using case-control designs; larger-scale studies on representative samples, mainly involving self-report measures; and, finally, cognitive-based treatment studies. First, however, a bit of background about stress reactions in these younger age groups, and about the nature and variety of cognitive processes that may be relevant in this regard.

Posttraumatic stress in children and adolescents: some background

Until the mid-1980s, a common view in the field of psychotraumatology was that stress reactions in children were invariably short-lived (e.g. Masten, Best and Garmezy, 1990), with

no identified need for the purview of psychiatric diagnostic categories such as Posttraumatic Stress Disorder (PTSD) or Acute Stress Disorder (ASD) to be explicitly extended to include younger age groups. The empirical basis for such views, however, consisted mostly of reports from parents and teachers – groups who are known to under-report their children's levels of distress (e.g. (Handford et al., 1986). Against this backdrop, the last 20 years have witnessed a concerted effort to overturn this assessment bias and to ask children and adolescents themselves about their thoughts, feelings, memories and emotions following trauma (see Yule, Perrin and Smith, 1999). These efforts have prompted a very different set of conclusions – that children can and do suffer debilitating and long-lasting posttraumatic stress reactions, not dissimilar to those found in adults.

Nevertheless, there are still relatively few epidemiological data on the prevalence of traumatic stress reactions such as PTSD and ASD in younger populations, unlike in adults (see Schnurr, Friedman and Bernardy, 2002, for a review). The findings, as in the adult work, are extremely varied depending on the type of trauma, degree of exposure, time elapsed, and the measurement tools used (Cohen and the American Academy, 1998). For example, estimates for PTSD prevalence (or its earlier incarnation as Psychic Trauma) range from almost absent (following the Three Mile Island accident; Handford et al., 1986), to fairly low (e.g. around 5% following Hurricane Hugo; Shannon, Lonigan, Finch and Taylor, 1994); to 100% (in the Chowchilla bus-kidnapping; Terr, 1981, 1983). Even for the same class of trauma, estimates have varied widely. For instance, following childhood sexual abuse, PTSD has been reported in 0% (Livingston, 1987) to 90% (Kiser et al., 1988) of children. Data from many of these prevalence studies were summarized in Fletcher's (1996) meta-analysis of 34 traumatized samples ($N = 2697$) which indicated that, on average, 36% of children met criteria for PTSD following trauma (compared to around 25% in adults; Breslau, Davis, Andreski and Peterson, 1991; Green, 1994) and that caseness rates did not differ significantly across developmental periods (39% in under 7s; 33% in 6–12 year olds; 27% in teenagers).

To our knowledge only three studies to date (including one from Bill Yule's research group) have looked at the prevalence of ASD in children and adolescents (Bryant, Mayou, Wiggs, Ehlers and Stores, 2004; Kassam-Adams and Winston, 2004; Meiser-Stedman, Yule, Smith, Glucksman and Dalgleish, 2005), reporting levels of 8–24%. These studies differed widely in terms of assessment procedures and the traumatized populations under investigation, and more research is therefore needed before any firm conclusions can be drawn.

The symptom patterns associated with posttraumatic stress reactions in children bear many similarities to those in adults. In a pioneering study, Bill Yule (Yule, 1992) compared symptom profiles from children following the Jupiter cruise ship disaster with those of adults following similar disasters (such as The Herald of Free Enterprise sinking). He reported broadly comparable rates of intrusion and avoidance symptoms. Similarly, a confirmatory factor analytic study (Anthony, Lonigan and Hecht, 1999) of child and adolescent survivors of Hurricane Hugo ($N = 5664$) generated three broad symptom clusters that map onto similar clusters identified in adult research (e.g. Taylor, Kuch, Koch, Crockett and Passey, 1998): intrusion/active avoidance; numbing/passive avoidance, and arousal.

Notwithstanding these similarities in symptom presentation across children and adults, it seems likely that in certain aspects the PTSD response manifests itself differently in child and adolescent populations, compared to adults, and that there will also be variations in this presentation as a function of stage of development (Cohen et al., 1998; Salmon and Bryant, 2002). For example, Fletcher's (1996) meta-analysis suggested that children under the age of

7 evidence fewer re-experiencing symptoms and little avoidance. Furthermore, Scheeringa, Zeanah, Drell and Larrieu (1995) have emphasized the predominance of behavioural symptoms in younger children, such as play re-enactment and aggression. However, at the present time, any firm conclusions about the effects of development on PTSD presentation are limited by the lack of empirical findings relevant to this issue and by differences in assessment methodology across age (McNally, 1991; Scheeringa et al., 1995).

The nature and variety of cognitive processes associated with trauma in children and adolescents

Cognitive researchers in the domain of trauma are interested in how 'basic' cognitive processes such as perception, attention and memory, as well as 'higher-order' cognitive processes such as thinking styles, judgements, attributions, interpretations, executive capabilities (e.g. planning, goal management), and emotion regulation capabilities, are affected by the experience of trauma, as well as in how these processes drive, maintain and respond to the evolution of posttraumatic stress reactions. These researchers are also interested in the nature of the underlying mental representations that subsume traumatic memories and other cognitive constructs, such as particular sets of beliefs or assumptions.

The broad rationale of the cognitive approach to trauma is that biases or impairments in different aspects of cognitive processing/representation in the context of experienced trauma can have three broad sets of effects: 1) information about the trauma, the self or the world that comes to mind can be distorted such that it is not a valid reflection of reality. For example, a girl who has survived a domestic accident may blame herself for what happened and even remember/believe that the event was caused by her actions, when in fact this was not the case. 2) The way that new information or experiences are interpreted is distorted or biased in some way. For example, a boy involved in a car accident may interpret any feelings of anxiety that arise when he gets in a car again as evidence that another accident will definitely occur. 3) Information is represented in a different way. For example, a girl who has been abused and who has PTSD may re-experience or recall the abuse in the form of unusually sensorily-laden images and flashbacks, reflecting relatively sensory-based memory representations of the trauma (Brewin et al., 1996; Dalgleish, 2004). These cognitive changes associated with the experience of trauma/posttraumatic stress can represent generic shifts in cognitive processing/representation that apply to a wide range of situations; for example, the girl in the domestic accident may have a tendency to blame herself for a wide range of negative events. Alternatively, they may be somewhat specific to the trauma and its immediate sequelae or, more broadly, to situations with a particular emotional content.

Finally, these cognitive presentations may pre-date the trauma or may be a consequence of it, or indeed a combination of these. For example, the boy in the car accident may always have interpreted his anxiety *ex consequentia* as evidence that something bad was about to happen, yet this may only have generalized to cars following his accident.

In the present review, these different features of cognitive processing associated with the experience of trauma/posttraumatic stress will be used to organize the relevant studies as far as possible in the three domains of interest: experimental research, research on representative samples, and treatment studies.

Before we turn to these data, it is worth commenting on how directly or explicitly research studies in these three domains tap the cognitive processes of interest that we have outlined

above. One the whole, experimental and neuropsychological studies tend to use non-self-report methodologies (see below) to provide, arguably, fairly direct measures of key domains of cognition (e.g. memory, interpretation, judgement, attention). In contrast, representative sample studies have almost exclusively used self-report measures of cognition (though they need not have done); for example, questionnaire measures of post-trauma beliefs. Self-report measures clearly have the potential to be influenced by response bias on the part of the participants and are also necessarily restricted to examining cognitive processes available to some form of introspection – they therefore represent a less direct measure of cognitive operations. Finally, cognitive-based clinical interventions take their name from the fact that aspects of the therapy seek to address directly and explicitly maladaptive thoughts, beliefs, interpretations, and cognitive distortions in the aftermath of trauma. Clinical studies of this type are not in the business of actually researching cognitive processes. Rather, they utilise assumptions about what those processes might be in order to construct therapeutic protiocols. One upshot of this is that it is currently unclear whether changes in the key cognitive constructs that are the focus of therapy do actually drive the process of therapeutic change (e.g. see Teasdale et al., 2001).

It is also important to note that the fact that certain therapies (including those reviewed here) explicitly try to change cognitions does not of course rule out the possibility that other therapies (such as exposure therapy) may also work by changing cognitive processes/representations (e.g. Foa and Kozak, 1986). With these thoughts in mind, let us now turn to the data themselves.

Neuropsychological and experimental research on cognitive factors

Preamble

Clinically-oriented research in adult posttraumatic stress has been informed by laboratory-based investigations of the basic psychological, psychophysiological and brain processes that may underpin such reactions (see McNally, 2003, for a discussion). The vast majority of these laboratory studies have used a case-control design in which a trauma-exposed and symptomatic group is compared with a matched trauma-exposed non-symptomatic group and/or with a matched non-exposed group. As noted above, basic experimental research into cognitive factors speaks to two general questions. First, what is the relationship between trauma and the cognitive processing of *any* information? For example, are there generic cognitive impairments across the board (in memory, concentration and so on) on neuropsychological (or similar) tests that are associated with trauma? Second, are there systematic distortions in the way that emotional information (that is, information about events that has the potential to elicit emotion) or, more specifically, information about the trauma, is processed?

In adult samples, the picture from the experimental literature regarding both of these questions seems increasingly clear. Traumatized adults with PTSD exhibit neuropsychological deficits across a wide range of basic mental functions, compared to their peers without PTSD (see Knight and Taft, 2004). Furthermore, adults with PTSD present with systematic biases in attention and memory in favour of threat-related, and specifically trauma-related, information (e.g. McNally, English and Lipke, 1993; McNally, Kaspi, Riemann and Zeitlin, 1990; McNally, Lasko, Macklin, and Pitman, 1995; McNally, Litz, Prassas, Shin and Weathers, 1994), relative to the way they process neutral information and/or to the way that the same emotional information is processed by control participants. However, as we shall see, in keeping with

much of the research on cognitive factors in children at the present time, attempts to address these same two questions in younger samples have lagged behind similar efforts in adults, with only a handful of published studies to date. This preliminary evidence is mixed and sometimes contradictory and suggests, even at this early stage, that the relationship between basic cognitive processes (such as attention and memory) and trauma in younger populations is more complex than it appears to be in adults.

Neuropsychological investigations in traumatized children and adolescents

The impetus for investigating neuropsychological problems in children and adolescents with PTSD derives not only from the existence of such difficulties in adults with PTSD (Knight & Taft, 2004), but also from early studies suggesting that young trauma survivors with PTSD fare worse at school than their traumatized contemporaries who have not developed the disorder. For example, Saigh, Mroueh and Bremner (1997) reported that, among trauma-exposed Lebanese adolescents, those with PTSD scored lower on a general test of academic functioning than those without PTSD, even when IQ levels were covaried. Studies of this kind not only indicate that we need to pay attention to academic progress in trauma survivors, but suggest that there is something additionally important about the *emotional reactions* to trauma that impact on general cognitive functioning, over and above the experience of trauma per se (see also Hadi and Llabre, 1998).

However, despite these important psychosocial concerns about children with PTSD there have been, to the best of our knowledge, only three studies examining neuropsychological functioning in young populations with the disorder (summarized in Table 1). The first study came from Bill Yule's own research group, where we showed that children with PTSD exhibited impairments in everyday memory (Moradi, Neshat-Doost, Taghavi, Yule and Dalgleish, 1999); in particular, we found difficulties in prospective cognition – remembering things that need to be done in the future – and orientation. The second study (Beers and De Bellis, 2002), showed that children with PTSD compared to non-trauma-exposed controls exhibited difficulties with attention and abstract reasoning/executive functioning, but interestingly *not* in this case with memory, visuo-spatial processing or language. The final study revealed a relative difficulty accessing semantic autobiographical memories in a trauma-exposed group, relative to non-trauma controls (Meesters, Merckelbach, Muris and Wessel, 2000).

It is obviously very difficult to draw any definitive conclusions from such a sparse literature. Instead, these findings collectively raise many important questions. Perhaps the most pressing questions are, firstly, whether a history of trauma alone can lead to neuropsychological (and consequently scholastic) difficulties or whether it is the emotional response to trauma that is key. Note that none of the three studies specified a non-PTSD group with a history of trauma to address this issue. Secondly, what exactly is the neuropsychological profile in the aftermath of trauma? If we take memory as an example, the existing data seem to indicate problems with prospective (Moradi, Neshat-Doost et al., 1999) and autobiographical memory (Meesters et al., 2000), but provide no support for difficulties in straightforward encoding and retrieval of neutral information (Beers and De Bellis, 2002). Exactly which components of memory are impaired? Likewise, what is the nature of any impairments in attention, reasoning, judgement, executive capacity, general intellectual functioning, and so on? Thirdly, are such generic questions even meaningful, given that the existing studies involved different age groups and different types of trauma? What, if any, are the effects of these variables on any

Table 1. Neuropsychological case-control studies of cognitive functioning

Study	Measure(s)	Age and sample size	Groups	Results
Moradi, Neshat-Doost et al. (1999)	British Picture Vocabulary Scale; Rivermead Behavioural Memory Test; Wechsler Objective Reading Dimensions	11–17 yrs; $n = 40$	PTSD after various trauma v. non-trauma control	Trauma group worse than controls on Prospective Memory and Orientation subtests of Rivermead
Beers and De Bellis (2002)	Wechsler Intelligence Scale for Children; Clinical Evaluation of Language Fundamentals, Concepts and Directions; Stroop Color and Word Test; Digit Vigilance Test; Wisconsin Card Sorting Test; Controlled Oral Word Association Test; Trail Making Test; California Verbal Learning Test; Complex Figure Test; Money Road Map; Grooved Pegboard Test	Mean age 11 yrs; $n = 29$	PTSD after maltreatment v. non-trauma control	PTSD group worse on the Stroop, Wisconsin – categories subtest, Digit Vigilance Test – omission errors and Word Association Test – animal naming subtest
Meesters et al. (2000)	Semantic Autobiographical Memory Test	14–19 yrs; $n = 27$	Trauma history (various traumas) versus no trauma history	Trauma history group had more difficulty retrieving semantic autobiographical details

PTSD = Posttraumatic stress disorder.

putative neuropsychological sequelae of traumatic events? Fourthly, what is the direction of causality? Adult meta-analyses indicate that lower scores on intelligence tests are in fact a risk factor for the onset of PTSD (Brewin, Andrews and Valentine, 2000; Ozer, Best, Lipsey and Weiss, 2003). In these neuropsychological investigations in children, does the evidence of impairments merely reflect pre-existing (i.e. pre-trauma) individual differences, or some genuine consequence of the experience of trauma/PTSD? Many of these questions, or ones very similar to these, will be rehearsed for all aspects of cognitive processing in traumatized youth as we visit the various pertinent research domains.

Experimental studies of cognitive bias

Cognitive bias studies, as already noted, seek to examine whether particular profiles of emotional difficulty and/or personal history are associated with systematic differences in the way emotional information (and in this case trauma-related information, also) is processed. The broad finding in the adult literature (again, almost exclusively using case-control designs) is that there are systematic biases evident on various measures of attention and memory for threat-related and trauma-related information in traumatized individuals with PTSD versus those without (see Thrasher and Dalgleish, 1999; McNally, 2003b, for reviews). However, again the picture in children and adolescents is much less clear – a situation exacerbated once more by the relative lack of data in this area.

As far as we are aware, there are only six published studies (summarized in Table 2) investigating cognitive biases in children and adolescents with PTSD/significant posttraumatic stress, versus controls, with only one of these studies examining the effects of trauma history per se. All but two of the six studies have come from Bill Yule's own research group.

Two of these six studies investigated attention processing using the modified Stroop paradigm (Freeman and Beck, 2000; Moradi, Taghavi, Neshat Doost, Yule and Dalgleish, 1999). In the emotional Stroop, participants are required to name (as fast as possible) the ink colours in which emotional words (e.g. danger) are written. The difference in colour-naming times between emotional words and neutral control words is taken as an index of the degree to which the emotional words are differentially recruiting attentional resources away from the primary task of colour-naming. Emotional Stroop performance is therefore generally taken as an index of attentional bias to emotional stimuli, though there is a healthy debate about this (see Algom, Chajut and Lev, 2004; Dalgleish, in press). In the first such study in traumatized younger populations, Moradi, Taghavi et al. (1999) found that children with PTSD were slower to colour-name trauma-related words than neutral words compared to non-traumatized controls. However, in the second study, Freeman and Beck (2000) found no evidence of such a bias on this task in sexually abused girls with PTSD relative to either abused girls with no PTSD, or to a non-traumatized control sample.

Comparable ambiguity emerges from the results of another attentional task – the dot probe paradigm. Here, participants are required to react as fast as possible to a dot or cross (the probe) that appears on a computer screen. In some trials this neutral probe appears in the spatial screen location previously occupied by an emotion-related stimulus (a word, face, or picture), whereas on other trials this prior stimulus is (presumed to be) unrelated to emotions. The difference in latency to respond to the probe on emotional versus neutral trials is taken to be an indication of attentional bias with respect to emotional material. Dalgleish, Moradi, Taghavi, Neshat-Doost and Yule (2001; see also Dalgleish et al., 2003) found that children

Table 2. Experimental studies of cognitive bias

Study	Cognitive measure(s)	Age and sample size	Groups	Results
Moradi, Taghavi et al. (1999)	Emotional Stroop task with neutral, positive, trauma, threat, and depressive words	9–17 yrs; $n = 46$	PTSD after various trauma v. non-trauma control	PTSD showed selective Stroop interference for trauma words relative to neutral words and to controls
Freeman and Beck (2000)	Emotional Stroop with abuse, development-related, threat, positive and neutral words	11–17 yrs; $n = 53$	PTSD after sexual abuse v. no-PTSD after sexual abuse v. no trauma	PTSD group slower for all word types
Moradi et al. (2000)	Intentional recall task with negative, positive and neutral words	9–17 yrs; $n = 49$	PTSD after various trauma v. non-trauma control	Control group recalled more neutral and positive words than negative words, with no such difference in PTSD group
Dalgleish et al. (2000)	Subjective probability estimation task for hypothetical future physically-threatening and socially threatening events for self versus other	9–17 yrs; $n = 87$	PTSD after various trauma v. children with parents with PTSD after various trauma v. non-trauma control	PTSD group estimated all events as more likely to happen to other than self. This was the case only for physical threat events in the other 2 groups. PTSD group estimated events resembling their own trauma as less likely than dissimilar events.
Dalgleish et al. (2001)	Dot probe task with threat-related (physical and social) and depression-related words	9–17 yrs; $n = 48$	PTSD after various trauma v. non-trauma control control	PTSD showed attentional bias towards social threat words and away from depression-related words, relative to controls
Pine et al. (2005)	Dot probe task with neutral, angry/threatening and happy faces	7–13 yrs; $n = 55$	History of maltreatment v. non-trauma control	PTSD after maltreatment showed bias away from threat. Degree of bias correlated with degree of abuse

PTSD = Posttraumatic stress disorder.

with PTSD did not differ from controls with respect to physical threat-related stimuli, yet showed attentional vigilance towards social threat-related words. In contrast, Pine et al. (2005) found that children with PTSD evidenced an attentional bias on this task *away* from faces with negative emotional expressions (which were designed to be socially threatening), compared to non-maltreated controls, and that the degree of attentional avoidance was positively correlated with reported levels of physical abuse.

The two other studies in this domain showed first that children with PTSD evidence a memory bias in favour of negative material, relative to non-traumatized controls (Moradi, Taghavi, Neshat-Doost, Yule and Dalgleish, 2000). Secondly, however, a similar sample of children with PTSD were more likely to estimate that bad things would happen to others than to themselves – an other-referent bias (Dalgleish et al., 2000). Furthermore, the more similar these hypothetical negative events were to the PTSD children's own trauma, the stronger this other-referent bias became. These latter data, then, are indicative of some form of cognitive avoidance, rather than a bias in favour of trauma-related/emotional information.

It seems that, as with the neuropsychology data on traumatized younger samples, the handful of studies examining cognitive biases raise more questions than they provide answers. There is evidence from two studies that children exhibit an "avoidant" cognitive bias with respect to threat-related stimuli (Dalgleish et al., 2000; Pine et al., 2005), something that is not evident in the adult literature. One other study provides no clear evidence of bias in any direction (Freeman and Beck, 2000), again a different picture to the adult data (see McNally, 2003a). Finally, three studies provide some evidence of a bias in favour of trauma-related, threat-related or negative material (Moradi, Taghavi et al., 1999, 2000; Dalgleish et al., 2001; see also Dalgleish et al., 2003). However, intriguingly, even here the memory bias finding (Moradi, Taghavi et al., 2000) stands in contrast to the adult data where memory biases of this kind have been relatively difficult to establish (see McNally, 2003b).

The questions brought to mind by this mixed bag of findings echo those voiced after our brief review of the neuropsychology data. Essentially, we still have little idea about the extent, range and nature of cognitive biases following trauma in children and adolescents, nor how they relate to trauma history versus trauma symptomatology, nor how they interact with type of trauma, age and other demographic factors. Until we obtain some answers to these questions, there is sufficient discrepancy between the current pattern of findings in children and those in adults to suggest that extreme caution is warranted in making any assumptions that the nature of cognitive biases across these different age groups is at all similar. This is clearly a fertile ground for future empirical investigations and it seems that there is some way to go before we can begin to interpret the data at the level of theory.

Larger scale studies using representative samples

The rationale behind naturalistic or representative sample studies is the attempt to look at relatively large populations of individuals exposed to trauma and to elucidate those factors implicated in the development of significant levels of traumatic stress as well as of ASD and PTSD. Recent advances in this kind of research have led to the development of widely accepted standards for such studies (e.g. Costello and Angold, 2000). For example, in their review of representative sample studies of the effects of trauma in children and adolescents, Pine and Cohen (2002) focused only on those studies that were prospective-longitudinal in design, that

assessed at least 50% of a clearly defined representative sample (though they initially aspired to 80%) and that contained at least 100 participants. Pine and Cohen (2002) also emphasized results from those studies that used standardized interviews.

It is indicative of the current state of research into *cognitive factors* using representative samples that, to the best of our knowledge, none of the existing published studies would have made it into the more widely-focused Pine and Cohen (2002) review. For the present purposes, we shall therefore apply far less stringent criteria than those advocated by Pine and Cohen (2002) or Costello and Angold (2000). However, before we look at the relevant data that have been reported, it is useful to consider briefly the nature of the cognitive variables that have generally been the focus of this kind of research – to do this it is pertinent to return to a consideration of the adult literature.

Within the adult literature on representative samples, as in the experimental literature discussed above, the cognitive variables that have received the most attention can be divided into two broad categories: cognitive processes that focus on the trauma and/or its sequelae (trauma-specific processes) and cognitive processes that are trauma-non-specific. So, as we discussed earlier, appraising the trauma as significantly life-threatening would be a trauma-specific subjective evaluation. In contrast, tending to overestimate the degree of danger from a wide range of events would be a form of cognitive style that was trauma-non-specific. The trauma-specific variables can be further subdivided into those that focus on the experience of the traumatic event itself (as in the above example) versus those that focus on the aftermath of the trauma and/or on the person's posttraumatic stress response (for example, the appraisal "I will never get over this; I am permanently damaged"). The trauma-non-specific cognitive variables can also be sub-categorized into those variables that are assessed post-trauma and may therefore be a *consequence* of the traumatic experience versus those variables that pre-date the trauma.

There is one other important distinction in this literature, as already hinted at in the discussion of the Pine and Cohen (2002) criteria above. This is between, on the one hand, cross-sectional studies that typically examine associations between some index of posttraumatic stress and a given cognitive measure and, on the other hand, prospective longitudinal studies that assess cognitive variables at one time point and then examine the relationship between these variables and a measure of posttraumatic stress at a later time point. The most powerful analytic approach in such longitudinal studies is to covary out levels of posttraumatic stress as assessed at the first time point when examining the Time 2 data, thus giving an estimate of the unique variance in symptom outcome accounted for by the cognitive variable of interest. We now turn to the data, utilizing the above sets of distinctions.

Trauma-non-specific cognitive processes in representative sample studies

The relevant studies under this banner are summarized in Table 3. We could find only one study (La Greca, Silverman & Wasserstein, 1998) that has been able to examine the role played by trauma-non-specific "cognitive" variables (in this case a measure of academic functioning) that have been assessed *prior* to the trauma. This study used a prospective longitudinal design to assess children who were exposed to Hurricane Andrew. Results revealed that pre-disaster academic functioning was a significant independent predictor of posttraumatic stress at 3 months, but not at 7 months post-disaster.

Table 3. Representative sample studies on trauma-non-specific cognitive variables

Study	Design	Cognitive measure(s)	Age and sample size	Trauma	Results
Schwarzwald et al. (1997)	XS	Cognitive views of the future	10–12 yrs; $n = 492$	Missile attack	Correlation between PTS and negative views of future
La Greca et al. (1998)	XS + PL (15 m pre-trauma; 3 m; 7 m)	Academic functioning; Behavioural inattention	9–11 yrs; $n = 92$	Hurricane	Inattention and academic functioning pre-trauma predicted PTS at 3 m but not at 7 m
La Greca et al. (1996)	PL (3m, 7m, 10m)	Kidcope	8–10 yrs; $n = 442$	Hurricane	Kidcope scales predicted greater PTS
Asarnow et al. (1999)	XS	The Coping Resources Inventory	8–18 yrs; $n = 63$	Earthquake	Greater use of cognitive coping associated with greater PTS
Vernberg et al. (1996)	XS	Kidcope	8–10 yrs; $n = 568$	Hurricane	Kidcope scales correlated with greater PTS
Laor and Wolmer (2000)	XS	Gordon Test of Imagery Control	$n = 39$	Missile attack	Low imagery control related to greater PTS
Qouta et al. (2001)	PL (time of trauma; 36 m)	Saleh Picture IQ Test	10–12 yrs; $n = 86$	Intifada	Mental flexibility at T1 related to lower PTS at T2
Durakovic-Belko et al. (2003)	XS	Cognitive appraisals and coping mechanisms questions designed specifically for the study	15–19 years; $n = 393$	Civil war	Perceived incompetence and appraisal of loss associated with worse PTS, while optimism associated with less severe PTS
Meiser-Stedman et al. (2005)	XS + PL (6 m)	Children's Anxiety Sensitivity Index, and adapted versions of Response Styles Questionnaire (rumination), Meta-Cognitions Questionnaire (positive beliefs about worry), and Thought Control Questionnaire	10–16 yrs; $n = 93$	RTA and violent assault	Anxiety sensitivity, ruminative style, worry beliefs, thought control style correlated with 2–4 week PTS and predicted 6 month PTS

XS = Cross-sectional; PL = Prospective longitudinal; *N*m = No. of months post-trauma; PTS = Posttraumatic stress; RTA = Road traffic accident; T1 = time 1; T2 = time 2.

The majority of the remaining studies in this area have used a cross sectional design, have tended to focus on very specific processes, have measured those processes after the traumatic event thus confounding cause and effect with respect to the trauma, and have, in all but one case, used self-report questionnaires (see Table 3). Taken together, these cross sectional self-report findings indicate significant associations between posttraumatic stress/PTSD and higher self-reported negative views of the future (Schwarzwald, Weisenberg, Solomon and Waysman, 1997), cognitive avoidance (Dempsey, Overstreet and Moely, 2000; Stallard, Velleman and Baldwin, 1998), and use of other cognitive coping strategies (e.g. distraction, thought suppression, rumination; Aaron, Zaglul and Emery, 1999; Asarnow et al., 1999) In Bill Yule's own research group, we have shown also that use of reappraisal as a generic form of coping, anxiety sensitivity (i.e. the fear of anxiety symptoms), the endorsement of worry as a positive strategy, and a ruminative style were associated with greater acute post-traumatic stress (Meiser-Stedman, Dalgleish, Glucksman, Yule and Smith, 2005).

The only deviation from the almost ubiquitous use of self-report instruments in these cross-sectional studies is an elegant study by Laor and Wolmer (2000) who examined terrorized children's ability to manipulate mental images and found that good image control was related to lower levels of posttraumatic stress symptomatology.

As far as we are aware, there are only three further studies (in addition to La Greca et al., 1998, discussed above) that have used a prospective longitudinal design in this domain. Qouta, El Sarraj and Punamaki (2001) focused their research on mental flexibility (i.e. the ability to adapt psychologically to changes in circumstances) with the rationale that greater flexibility should be associated with a better long-term prognosis. Flexibility was measured under the violent conditions of the Intifada in Gaza, Palestine, and posttraumatic stress was assessed 3 years later during relatively more peaceful times. Mental flexibility emerged as a moderating variable such that children were protected from negative long-term consequences of trauma if they possessed good mental flexibility.

La Greca and colleagues showed that stronger endorsement of various ways of coping (i.e. "wishful thinking", "being positive", "blame and anger", and "social withdrawal") in a large sample of children and adolescents exposed to the Hurricane Andrew disaster accounted for significant variance in posttraumatic stress symptoms at the 3 month assessment (Vernberg, La Greca, Silverman and Prinstein, 1996), and to a lesser extent at 7- and 10-month assessments (La Greca, Silverman, Vernberg and Prinstein, 1996).

The final study comes again from Bill Yule's research group (Meiser-Stedman et al., 2005), where we examined assault and road traffic accident survivors. The cognitive style measures found to correlate with acute post-traumatic stress (see above) also predicted PTSD at 6 months. In the case of anxiety sensitivity this relationship remained even when initial PTSD symptoms had been partialled out. Most importantly, as far as we are aware this latter study is the only one to have controlled for initial symptom levels in the key longitudinal analyses.

On the basis of these studies taken together, it seems that a number of trauma-non-specific aspects of cognition can influence levels of posttraumatic stress.

Studies on trauma-specific variables using representative samples

Those studies that have examined trauma-specific variables are summarized in Table 4. Again, the majority of these studies are cross-sectional and all have used exclusively self-report measures. In terms of the cross–sectional studies, the data indicate that higher subjective

Table 4. Representative sample studies on trauma-specific variables

Study	Design	Cognitive measure(s)	Age and sample size	Trauma	Results
La Greca et al. (1996)	PL (3 m, 7 m, 10 m)	Perceived life threat	8–10 yrs; $n = 442$	Hurricane	Perceived life threat predicted PTS at follow up
Vernberg et al. (1996)	XS	Perceived life threat	8–11 yrs; $n = 568$	Hurricane	Perceived life threat correlated with PTS
Greenberg and Keane (2001)	XS + PL (5 m, 9 m)	Attribution of responsibility for trauma	6–17 yrs; $n = 56$	Domestic fire	Attribution of other blame related to PTS at T1 and T2
Kolko et al. (2002)	XS	Children's Attributions and Perceptions Scale; Children's Abuse Specific Perceptions	6–18 yrs; $n = 47$	Childhood abuse	Negative appraisals associated with abuse correlated with PTS
Stallard (2003)	XS	Items assessing: subjective trauma severity, appraisals of trauma sequelae, trauma memory quality, cognitive strategies of suppression, rumination and distraction	5–18 yrs; $n = 119$	RTA	Subjective severity, appraisals of sequelae, and cognitive strategies all predicted PTSD
Ehlers, Mayou and Bryant (2003)	XS + PL (2 weeks, 3 m, 6 m)	Data driven processing during the trauma, negative interpretation of intrusive memories, sense of alienation, rumination, thought suppression, persistent dissociation	5–16 yrs; $n = 86$	RTA	All cognitive variables at 2 weeks predicted PTS at 3 and 6 months
Aaron et al. (1999)	XS	White Bear Suppression Inventory	8–17 yrs; $n = 40$	Acute physical injury	Greater thought suppression associated with increased PTS
Meiser-Stedman et al. (2005)	XS + PL (6 m)	Subjective trauma severity, anger, rumination, and thought suppression items, Memory Quality Questionnaire (qualities of trauma memories), and child version of Post-Traumatic Cognitions Inventory	10–16 yrs; $n = 93$	RTA and violent assault	Subjective trauma severity, anger, qualities of trauma memories correlated with PTS at 2 weeks, and predicted PTS at 6 months. Post-traumatic cognitions, rumination, thought suppression, correlated with PTS at 6 months

XS = Cross-sectional; PL = Prospective longitudinal; Nm = No. of months post-trauma; PTS = Posttraumatic stress; PTSD = Posttraumatic stress disorder; RTA = Road traffic accident; T1 = time 1; T2 = time 2.

appraisal of threat at the time of the trauma (Vernberg et al., 1996, Meiser-Stedman et al., 2005) negative appraisals of the trauma or its consequences (Durakovich-Belko, Kulenovic and Dapic, 2003; Kolko, Brown and Berliner, 2002; Stallard, 2003), a preponderance of sensory-based memories of the trauma (Meiser-Stedman et al., 2005) or "data-driven" processing at the time of the trauma (Ehlers, Mayou & Bryant, 2003), are all associated with higher levels of posttraumatic stress.

As far as we aware only three studies (see Table 4) have approached this issue using a prospective longitudinal methodology (Ehlers, Mayou & Bryant, 2003; La Greca et al., 1996, Meiser-Stedman et al., 2005). These showed that higher subjective appraisal of threat at the time of the trauma, anger (both retrospectively assessed) (Ehlers, Mayou & Bryant, 2003; La Greca et al., 1996; Meiser-Stedman et al., 2005), negative interpretations of intrusive symptoms, rumination, thought suppression (Ehlers, Mayou & Bryant, 2003), and sensory-based memories of the trauma (Meiser-Stedman et al., 2005) (assessed 2–4 weeks after the trauma) predicted PTSD at follow-up assessments. In support of the findings of Ehlers, Mayou & Bryant (2003) (but sadly not exploiting the prospective study design), Meiser-Stedman et al. (2005) found that negative trauma-directed appraisals (e.g. of being permanently damaged by the trauma) and maladaptive coping (e.g. rumination, thought suppression) assessed at a follow-up assessment were correlated with concurrent PTSD. Again, to the best of our knowledge, only one study (Meiser-Stedman et al., 2005) has sought to control for initial symptom levels in the longitudinal analyses.

As can be seen, as with the earlier work on experimental and neuropsychological investigations of cognitive variables in traumatized children and adolescents, there is a paucity of existing research studies using representative samples. Indeed, as we have noted, none of the existing studies would meet the standards laid out for such research by Costello and Angold (2000) and Pine and Cohen (2002). However, unlike for example the studies on cognitive bias reviewed above, the initial tranche of data on cognitive processing from the representative sample studies that we have reviewed seems to indicate broad similarities between children and adults, with a range of cognitive variables (appraisals, cognitive coping techniques, memory quality, and so on) being associated with PTSD/posttraumatic stress in similar ways in the two age groups. This implies that theoretical conceptualizations of PTSD in adults that focus on these variables (e.g. Brewin et al., 1996; Dalgleish, 2004; Ehlers and Clark, 2000) may have some applicability to children, as we have discussed elsewhere (Meiser-Stedman, 2002), though again much more work needs to be done.

Studies investigating cognitive-based treatments

There is now a considerable consensus within the clinical research literature that randomized clinical trials provide the strongest evidence in support of particular psychological treatments for PTSD (e.g. Foa, Keane and Friedman, 2000). For this reason, we shall concentrate here on randomized clinical trial data involving treatments with significant cognitive components, in children and adolescents (though see Cohen, Berliner and March, 2000a; King et al., 1999; Salmon and Bryant, 2002, for reviews of other types of clinical study design). Before we review the randomized clinical trial evidence, it is useful to spend some time reflecting on the main components of cognitive-based treatment approaches (invariably cognitive-behaviour therapy [CBT]) in younger populations.

Components of cognitive-behaviour therapy (CBT) following trauma for children and adolescents

There now exist a number of excellent reviews of CBT methods for younger populations exposed to trauma (Amaya-Jackson et al., 2003; Cohen, 2003, 2004; Cohen, Mannarino and Rogal, 2001; Pine and Cohen, 2002; Vernberg and Johnston, 2001), as well as a complete published treatment manual (Deblinger and Heflin, 1996), and so we will keep this section relatively brief.

Broadly, the majority of the CBT protocols that have been used contain elements of the following: psychoeducation and normalization; cognitive restructuring; exposure-based work; and some form of stress inoculation or anxiety management training (see Pine and Cohen, 2002). Psychoeducation and normalization refer to efforts to familiarize the child with information about different psychological responses to trauma with the aim of showing, invariably, that the child's own response is neither unusual nor infrequent. Cognitive restructuring is generally a two-stage intervention aimed first at exploring and recording the child's beliefs about both the trauma and about his/her reaction to it and secondly, helping the child to modify any distorted beliefs in line with data not always available at the time of the trauma. For example, children may be of the view that they caused the trauma (often because of a lack of information), resulting in high levels of distress and avoidance. The therapist gathers information and guides the child towards a more full and accurate account of the event and the positive emotional consequences of holding a more realistic view of the trauma's causes. Exposure refers to the process whereby the child gradually exposes him/herself to either the memory of the trauma (*imaginal exposure*), to physical reminders (e.g. objects, sounds, people) in session (*in vivo exposure*), and sometimes by returning to the place where the trauma occurred (*in situ exposure*). The mechanisms by which exposure works are complex and the subject of some debate. Nevertheless, gradual exposure to traumatic reminders and memories should slowly lessen the affect associated when encountering them (Rachman, 1980). Also the process of exposure facilitates access to distorted cognitions that then become the subject of cognitive restructuring. Therapeutic exposure itself can act as a corrective experience in relation to distorted beliefs about the impact of recalling the event (e.g. I will go crazy/It will happen again if I talk about it.). Finally, exposure across sessions may help facilitate the transformation of the memory into a more coherent, contextually sensitive (e.g. time and place), and verbally elaborated structure, thus lessening the current sense of threat/fear that emerges when accessed. Finally, stress inoculation or anxiety management training refers to the practice and acquisition of techniques designed specifically to alleviate unpleasant emotional experiences (or to lessen the likelihood of their recurrence) via such coping techniques as relaxation training, positive imagery, thought stopping, and positive self-talk.

As well as these child-centred aspects of CBT, many protocols also prescribe either parallel sessions with the parent(s) or involvement of the parent(s) in joint sessions with the child. Parents can be taught how to help with exposure exercises, to reinforce coping, and to help deal with co-morbid behavioural and school-related difficulties. Another benefit of involving parents is helping them to address any PTSD symptoms they might be experiencing and/or potentially distressing or dysfunctional beliefs they might hold about themselves, the trauma, or its impact on the child and the family, and how best to bring about change (e.g. modelling of positive coping behaviours, improved communication).

The randomized clinical trial data

To the best of our knowledge, in the child literature there are nine randomized clinical trials for PTSD or posttraumatic stress that involved at least one explicitly cognitive intervention (in all cases this is CBT). These data are summarized in Table 5. Seven of the nine trials have focused on child victims of sexual abuse. Only two have looked at another type of trauma in the form of either cancer or involvement in/exposure to interpersonal violence (Kazak et al., 2004; Stein et al., 2003). Each of the nine RCTs has employed reasonably rigorous methodology, including the use of treatment manuals, treatment fidelity checks, and the use of recognized outcome measures. Children's ages varied considerably across trials, ranging from 3–17 years, as did the primary outcome measure, from diagnostic status to broader measures of behaviour and mood problems. Finally, some trials were based on individual interventions while others were group-based.

Consideration of the treatment outcomes for the nine studies, collectively, provides strong support for the efficacy of CBT for clinical levels of posttraumatic stress symptoms, when compared to wait list (e.g. Kazak et al., 2004; King et al., 2000; Stein et al., 2003) and active treatment control groups (e.g. Cohen and Mannarino, 1996, 1997, 1998; Cohen, Mannarino, Berliner and Deblinger, 2000; Cohen, Deblinger, Mannarino and Steer, 2004; Deblinger, Lippmann and Steer, 1996; Deblinger, Steer and Lippmann, 1999).

The current take-home message from this nascent literature therefore is that CBT appears to have "well established" efficacy (Chambless and Hollon, 1998) in treating a range of posttraumatic stress responses following sexual abuse, with preliminary evidence in favour of this form of intervention following other types of trauma. Few other conclusions can really be derived at this stage. For example, only one study compared CBT with and without the use of exposure (Berliner and Saunders, 1996), with no significant differences. Only two studies compared CBT with and without family involvement (Deblinger et al., 1996, 1999; King et al., 2000), with little added advantage of family involvement found, except for other depression and behaviour problems. There are no studies examining forms of trauma other than abuse, cancer or violence, or the impact of age on outcome.

At the time of writing, therefore, it is unclear to what extent the clear benefits of CBT in the existing published studies will generalize to other forms of trauma, or to children in the lower age ranges, or which CBT components are necessary for achieving positive outcomes. Reasons for optimism stem from the fact that the CBT techniques used to date are amenable to a range of anxiety-provoking situations and are efficacious in children with mood disorders that involve no significant trauma (e.g. Curry, 2001). There is now a clear need for further research into the viability of cognitive-based interventions for children across the age-range, who have been exposed to traumas other than abuse, which has been the main focus to date.

To this end, Bill Yule and colleagues are currently completing a randomized controlled trial of CBT (versus wait list) for children and adolescents (8 to 18 years old) who have developed PTSD following a variety of traumas such as road traffic accidents, assaults, and domestic violence. The manualized, 10-session treatment programme is based on Ehlers and Clark's (2000) model of PTSD, with treatment adapted for use with young people (see Yule, Smith and Perrin, 2005 for an overview). Treatment targets include modifying misappraisals of the trauma and its sequalae, reducing fragmentation of the trauma memory, altering dysfunctional (avoidant) coping strategies, and modifying maladaptive parental beliefs regarding the trauma and its aftermath. Treatment includes several of the components outlined

Table 5. Randomized clinical trials of cognitive behaviour therapy (CBT)

Study	Design	Age and sample size	Type of trauma	Results
Celano et al. (1996)	CBT v. Supportive Care	8–13 yrs; $n = 32$	CSA	No significant difference for PTSD
Berliner and Saunders (1996)	CBT incl. Exposure v. CBT without exposure	4–13 yrs; $n = 80$	CSA	No significant difference on anxiety measures
Deblinger et al. (1996, 1999)	CBT with parent v. CBT with child v. CBT with parent and child v. Community care control	7–13 yrs; $n = 100$	CSA	CBT with child better than other treatments for PTSD
Cohen and Mannarino (1996)	CBT v. supportive therapy	3–6 yrs; $n = 67$	CSA	CBT better than supportive therapy on various symptom measures
Cohen and Mannarino (1998)	CBT v. supportive therapy	8–14 yrs; $n = 49$	CSA	CBT better than supportive therapy on various symptom measures, including MDD diagnosis
King et al. (2000)	CBT with child v. CBT with family v. WL	5–17 yrs; $n = 36$	CSA	CBT better than WL for PTSD
Stein et al. (2003)	CBT v. WL	10–12 yrs; $n = 126$	Violence	CBT better than WL for PTSD symptoms and psychosocial functioning
Cohen et al. (2004)	CBT v. child-centred therapy	8–14 yrs; $n = 229$	CSA	CBT better than child-centred therapy on PTSD plus other measures of psychopathology
Kazak et al. (2004)	CBT plus family therapy v. WL	11–18 yrs; $n = 150$	Cancer	CBT better than WL for arousal symptoms

CSA = Childhood sexual abuse; PTSD = Posttraumatic stress disorder; MDD = Major depressive disorder; WL = Wait list control condition

above, with an emphasis on the close integration of trauma-focused imaginal exposure and cognitive restructuring of maladaptive trauma-related appraisals (see Grey, Young and Holmes, 2002, for a rationale and description as applied to adult work). Interim results from the trial are highly promising (Smith et al., 2004).

Conclusions and research recommendations

In this review we have considered three domains of empirical work investigating cognitive factors associated with posttraumatic stress reactions in children and adolescents: experimental and neuropsychological studies; large-scale predictor studies on representative samples; and randomized clinical trials. In all three areas, it is fair to say that the research is in its infancy, with the initial waves of findings perhaps raising more questions than they can provide answers. Nevertheless, all of the findings reported provide intriguing and clearly important insights into cognitive aspects of traumatic stress reactions in younger people. The challenge now for the research and clinical communities is to build on this promising start. To this end, in this final section of the article we offer some recommendations concerning future research efforts addressing these very important issues. We begin with some general recommendations, followed by some specific recommendations about each of the three research domains we have reviewed above.

General recommendations

1) In order to elucidate the effects of type of trauma, there is a need for studies either explicitly to recruit and compare survivors of different events or to use more standardized measures across studies to facilitate such comparisons. For example, one might expect different cognitive sequelae following interpersonal traumas that affect the individual alone, versus mass traumas involving no interpersonal element that affect the individual as part of a larger group.
2) To facilitate understanding of the relationship between developmental issues and post-traumatic responding, samples need to be stratified at least with respect to age, and preferably with respect to intellectual/educational attainment, or need to be large enough to facilitate designs that can incorporate these factors as correlates. Where it is anticipated that findings may differ between very young children, adolescents, and adults, explicit comparison across these age ranges is also indicated.
3) To aid the process of comparison across studies, there is a need for standardized assessment protocols that have been widely agreed on, not only in terms of posttraumatic stress symptomatology and caseness, but also in terms of the cognitive factors of interest. Where possible, assessment of symptomatology and caseness should involve structured clinical interview as well as parent and child questionnaires.
4) There is a clear need for the development of cognitive assessment tools in very young traumatized populations (e.g. pre-school) to parallel the promising work involving age-sensitive assessment of posttraumatic stress in preschool children (Scheeringa, 1999; Scheeringa, Peebles, Cook and Zeanah, 2001; Scheeringa and Zeanah, 1995; Scheeringa, Zeanah, Myers and Putnam, 2003).
5) A shift away from an almost exclusive focus on self-report measures of cognitive processes is desirable.
6) Replication of the key findings would be ideal, preferably by independent research groups.

Recommendations concerning experimental research (see also Vasey, Dalgleish, and Silverman, 2003)

1) There is a clear need for studies to possess appropriate statistical power as, at present, it is difficult to interpret null findings (e.g. Freeman and Beck, 2000). The first stage in deciding upon appropriate power is to estimate the effect size for a given experimental finding that translates into meaningful differences in everyday cognitive processing. In practice, this is likely to involve at least medium effect sizes (Cohen, 1988). Subsequent estimations of sample size can then proceed on this basis. There seems little value in recruiting very large samples simply to deliver statistical significance for small effect sizes on measures of cognitive bias, as it is doubtful whether such subtle biases would have much ecological validity in the form of effects on day-to-day cognitive processing.
2) Experimental studies should aspire to at least a three-group design, with a four-group design being ideal. The three core groups are: trauma-exposed participants with significant posttraumatic stress (e.g. PTSD); trauma-exposed participants with minimal posttraumatic stress; and non-exposed-healthy controls. The ideal fourth group would be an "emotional distress control" – that is, participants with significant emotional difficulties (e.g. anxiety or depressive disorders) who have not been exposed to a trauma. Such designs would allow distinctions to be drawn between those cognitive factors that are a function of posttraumatic stress, those that are a function of emotional distress more generally, and those that are a function of trauma exposure.
3) Ideally, at least four types of experimental stimuli would be considered for study: trauma-related stimuli; negative emotional stimuli that are non-trauma related; positive emotional stimuli; and neutral control stimuli. The neutral stimuli should all be drawn from the same category to rule out the possibility that any effects specific to the other stimulus types were not simple reflections of semantic relatedness among the exemplars. As far as possible, stimuli should then be matched on any variable that may interact with the cognitive process of interest. These methodological considerations would allow researchers to delineate effects specific to trauma-related information, to negative information, or to emotional information (Vasey et al., 2003). So, for example, if one wanted to examine potential memory biases in road accident survivors, one could present them with video footage of road accidents, video footage of another negative event (e.g. a violent assault), video footage of a matched positive event, and video footage of a neutral event, and subsequently probe their memory for these videos. To the extent that, say, trauma survivors with PTSD could selectively recall details of the accident videos compared with the other videos and compared with the performance of control groups such as accident survivors without PTSD, one could argue for a memory bias associated with PTSD that was focused on trauma-related material.
4) To rule out the possibility that group effects on a given cognitive task are not specific to that task, some form of cognitive control task should be included for which no group differences are expected, but which is nevertheless matched for difficulty and complexity with the main task of interest. So, for example, in the hypothetical video memory study above, one might also include a measure of memory for semantic facts about cars and transport, which one would not expect the key groups to differ on. This would indicate that the hypothetical effects of memory bias concerned emotionally salient accident footage rather than information about cars per se.

5) Many of the tasks (e.g. the emotional Stroop task) in this literature have received limited psychometric investigation (e.g. reliability, validity). It is therefore recommended that an effect be replicated at least three times, preferably by at least two research groups, before the findings are accepted as reliable.

Recommendations concerning larger-scale representative sample studies (see also Costello and Angold, 2000; Pine and Cohen, 2002)

1) Studies should involve a sample size of at least 100 (Pine and Cohen, 2002)
2) Studies should aspire to capture at least 75% of the initial target population; for example, 75% of children and adolescents who have experienced a road traffic accident and who pass through accident and emergency in a given time period.
3) Assessment should involve measures with well-established psychometric properties.
4) There should be a move away from the almost exclusive use of self-report measures, with more studies involving experimental, diary-based, observational, and behavioural measures.
5) Where possible, prospective-longitudinal designs should be employed, with maximal research effort on retention of participants across time.
6) Analytic techniques should, where possible, control for initial levels of symptomatology when investigating the relationship between predictor variables and later levels of symptomatology within prospective longitudinal designs.

Recommendations concerning treatment studies (see also Cohen, Berliner and March, 2000b; Pine and Cohen, 2002)

1) As far as possible treatments should meet the "gold standards" laid down for treatment trials (e.g. Foa et al., 2000): Clearly defined treatment targets; use of reliable and valid measures; use of blind evaluators; assessor training; manualised and replicable treatment protocols; unbiased assignment to condition; and checks on treatment adherence.
2) There is a clear need for trials focusing on traumas other than childhood sexual abuse.
3) There is a need for trials comparing two or more active treatments, to supplement the data from trials with wait-list or placebo controls.
4) The time is now ripe for more CBT dismantling studies to supplement the one study looking at the need or otherwise for exposure as part of the treatment package (Berliner and Saunders, 1996).
5) More studies explicitly examining different types of parental input are required.

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