APPLIED COGNITIVE PSYCHOLOGY
Appl. Cognit. Psychol. **21**: 821–838 (2007)
Published online 26 September 2006 in Wiley InterScience
(www.interscience.wiley.com) DOI: 10.1002/acp.1294

Children's Narrative Memory for Accidents and their Post-traumatic Distress

RICHARD O'KEARNEY [1]*, JOANNE SPEYER[1] and JUSTIN KENARDY[2]

[1]*School of Psychology, The Australian National University, Australia*
[2]*Centre for National Research on Disability and Rehabilitation Medicine, University of Queensland, Australia*

SUMMARY

This study examines how the quality of children's memory for a traumatic event is related to trauma-related distress and adjustment. Four to 7 weeks after an accident requiring hospitalisation, 80 children aged 7–16 were asked to provide a narrative memory of the event. Age and the quality of the memory report based on its lexical and cohesive structure accounted for a significant and sizable proportion of the variability in the children's intrusive symptoms about the event after considering trauma severity and the child's language ability and gender. There was no significant relationship between memory quality and event specific avoidant symptoms. Children who were troubled by intrusive symptoms at 4 to 7 weeks continue to seek personal control and mastery by cognitively making sense of their experiences. The study's implications for understanding the process of children's adaptation to such events and for the development of chronic problematic adjustment are discussed. Copyright © 2006 John Wiley & Sons, Ltd.

Recent evidence about a connection between children's memory for traumatic events and their post-traumatic psychological adjustment is inconclusive. Some studies have found that children's rating of the overall quality of their trauma memory was associated moderately (Ehlers, Mayou, & Bryant, 2003) or weakly (Stallard, 2003) with more severe subsequent post-traumatic stress symptoms following a motor vehicle accident. In particular, Peterson and Biggs (1998), and Merritt, Ornstein and Spicker (1994) reported that the memory narratives of children who were highly distressed after an accident requiring hospitalisation or during a stressful medical procedure were less accurate, detailed and coherent than those of children who were not highly distressed. Other studies, however, have failed to confirm or have moderated this connection. Vandermaas, Hess and Baker-Ward (1993) found a link for older children undergoing a dental operation but not for younger children. The children in Fivush, Hazzard, Sales, Sarfati, and Brown's (2003) study included more information when recalling experiences such as being assaulted, threatened or witnessing violence than for positive experiences. Children who reported more post-traumatic distress after experiencing a hurricane provided less information in their memory of the event than those who reported less distress but there were no significant

*Correspondence to: Dr Richard O'Kearney, School of Psychology, The Australian National University, Canberra, ACT 0200, Australia. E-mail: richard.okearney@anu.edu.au

associations between the quality of their initial memory and their level of distress (Sales, Fivush, Parker, & Bahrick, 2005). Recently, Kenardy et al. (in press) found no relationship between the amount of emotional detail in children's memory of accidents that lead to hospitalisation and post-traumatic reactions but did find a weak association between judges rating of temporal disorganisation of the memory and psychological outcome.

This empirical evidence corresponds to an equally unclear picture of the link between trauma memory and post-traumatic adjustment in adults (O'Kearney & Perrott, 2006) and reflects divergent theoretical views about how traumatic events impact on memory and consequently on post-traumatic adjustment. Broadly, these views are, on the one hand, that enduring post-traumatic distress develops partly because the trauma has disrupted the person's memory for the traumatic experience. Various models of post-traumatic distress (see Brewin & Holmes, 2003; Dalgleish, 2004 for reviews) include propositions about the specific deficits of trauma-associated memory. The most important feature of this disrupted autobiographical trauma memory is predicted to be less conceptual connection or organisation of individual memories of the event (Ehlers & Clark, 2000). Consequentially, trauma memories lack spatial, temporal and causal context, are less detailed and aren't integrated into a coherent autobiographical episode. This is the essence of trauma memory 'fragmentation' which is claimed to be an important feature of trauma memory in post-traumatic stress disorder. These models propose that the trauma memories will be dominated by loosely connected sensory, perceptual and emotional impressions which because they are poorly discriminated are easily and automatically triggered by other similar cues resulting in trauma memories with an *intrusive*, or *involuntary* quality. Van der Kolk (1994) referred to these as 'body memories'. Alternatively, others (Bernsten, 2001; Berntsen, Willert, & Rubin, 2003; McNally, 2003) propose a view of trauma memories as *landmarks*. This view asserts that rather than being fragmented, disconnected or deficient, for people with ongoing poor post-traumatic adjustment traumatic memories form a coherent landmark in the organisation of their autobiographical memory and are often elaborated and integrated as central components of autobiographical memory. As such they serve as reference points for the interpretation of new experiences and the development of expectations for the future.

Despite the complexity of these issues, the conceptualisation and subsequent measurement of trauma memory quality are often overly simplistic. There is a real risk that the downward extension of these conceptualisations and methods to children will result in a repetition of inconclusive findings. For example, Ehlers et al. (2003) tested the applicability of their model's proposition to children by asking them to rate the extent to which they were 'muddled/confused' at the time of the accident on a 3-point Likert scale. Other child studies also use participant ratings of memory quality (Stallard, 2003) or ask judges to provide ratings of the quality of the recounted memory (Kenardy et al., in press). The validity and sensitivity of both of these methods are questionable. Self-reports of memory quality may better reflect meta-memory that may not correspond to actual autobiographical event memory (Kindt & van den Hout, 2003). In addition, obtaining self-ratings of memory quality from participants with putative memory 'deficits' is paradoxical and it is unclear what factors influence their judgements. Similarly, while judges are making their ratings on the basis of certain linguistic features of the written or spoken memory report it is often merely assumed that these features, e.g. repetitions, are valid indices of fragmentation or temporal disorganisation. Such subjective, summary measures are less likely to be sensitive to detecting complex relationships between memory and adjustment, and more likely to be subject to contextual factors that increase the risk of bias.

DOI: 10.1002/acp

In view of the important clinical implications of accurately understanding the link between children's trauma memory and adjustment these shortcomings need to be addressed.

The deficit and landmark views make opposing predictions about the specific nature of the quality of trauma memories in relation to post-traumatic distress. The deficit model predicts that poorer conceptual connection between individual component memories of the event particularly in regards to its spatial, temporal and causal context will be related to poor post-traumatic adjustment. The deficit model also links poor adjustment with a dominance of sensory/perceptual or emotional content in the memory. The landmark view, on the other hand, suggests that poorer adjustment may be related to conceptual coherence of the trauma memory and a dominance of attempts to understand the event particularly in respect of the person's self-knowledge. The main technique of the current study is to examine these predictions using children's trauma narratives as 'memory reports' which provide unique evidence about these features of autobiographical memories for trauma in children. There is good experimental support for such an approach from a range of studies which suggest that the organisation of autobiographical memory is primarily around narrative-like structures and that language, in particular narration of events, is important for the creation and maintenance of autobiographical memories including memory for emotionally troubling experiences (Brown, 2005; Nelson & Fivush, 2004; Robinson & Taylor, 1998). We investigate the relationship between the quality of memories for traumatic events in children who have experienced an accident requiring hospitalisation and their post-traumatic adjustment focusing on linguistic measures of the organisation and lexical structure of the trauma memory.

The narrative organisation of memory reports can be best understood in terms of cohesion (narrative connectedness) and coherence. Cohesion focuses on relationships or connections between sentences or clauses whereas coherence focuses on connections of goals, actions and outcomes, topics or event sequences regardless of their cohesiveness (Sawyer, 2003). Cohesion is a property of the explicit language that makes up the narrative and is a direct linguistic measure, etc of the narrative organisation while coherence is constructed depending on the cohesiveness of the narrative together with the skills and knowledge that the discourse participants bring to the situation (Graesser, McNamara, Louwerse, & Cai, 2004). The current study focuses on the linguistic devices (connectives; deictic references) that establish spatiotemporal and causal context. These conjunctions link sentences and clauses within a narrative via addition (e.g. *and, also*), comparison (e.g. *but, however*), temporality (e.g. *after, before, when, now*), and causality (e.g. *so, because, that is*) and help establish spatial and temporal perspective. Tomasello (2003) has noted that these conjunctive classes (addition, comparison, temporality and causality) may represent a developmental sequence in respect to the acquisition of complex language construction like narratives for negative experiences. With regard to coherence, the focus of the current study is on differences in the 'maturity' of organisation of event in the narrative or event sequence. The coherence of 'fully developed' narratives (Peterson & McCabe, 1983) will: provide character, time and place orientation; describe a sequence of events leading to a climax with a wrap-up or resolution, and; emphasise or evaluate what is important (Peterson & McCabe, 1983). As well as an overall judgement of coherence based on these elements the current study uses assessments of the degree to which each of the elements (orientation, sequence, evaluation) is present in the narrative.

In regard to the narrative structure, this study examines three semantic categories of references (conceptual, emotional and sensory/perceptual) that are relevant to predictions

DOI: 10.1002/acp

from the two models. The conceptual category covers words and expression indicative of cognitive states or conceptual processes, e.g. *remembered, thought, realised*. A lack or negation of these words, e.g. *I don't remember, I didn't know what. . ., I'm not sure*, are often taken to indicate impaired encoding of the event (Kenardy et al., in press; Foa, Molnar, & Cashman, 1995), an inhibition of attempts to make sense of or to contextualize the event, or reduced willingness to participate in the disclosure about the event. The emotion category covers all expressions judged as pragmatically covering an emotional state, e.g. *I was tense*, *I felt abandoned*, *I felt unsure, confused, angry.* The sensory/perceptual category covers all words and expressions for a sensory state or perceptual action e.g. *hurt, smelt, heard, saw.*

This study also includes a number of child and trauma related factors, generally overlooked in previous work, which may moderate any link between children's memory for traumatic events and their post-traumatic adjustment. Even in studies that use more face valid and sensitive language based measures (Fivush et al., 2003; Sales et al., 2005) or where potential moderators are included (Ehlers et al., 2003), there is little statistical consideration for the concurrent effects of child and trauma factors. Developmental differences in the way children integrate events into autobiographical memory are likely to influence the role their trauma memories play in symptom development. The ability to integrate events into autobiographical memory is in general established by the age of 5 (Nelson & Fivush, 2004). This ability continues to develop and change across childhood (Peterson & Biggs, 1998). Despite this, most studies report results aggregated across a broad range of the ages (Fivush et al., 2003, 5–12 years; Ehlers et al., 2003; 5–16 years Stallard, 2003; 5–16 years). As well as improving as a function of age, it has been found that gender and language ability are related to autobiographical remembering (Fivush, 1998; Nelson & Fivush, 2004). In general, older children and children with better language skills have been found to produce more coherent narratives which include more cognitive and emotional reactions than younger children and children with poorer language skills (Fivush, Haden, & Adam, 1995; Fivush et al., 2003; Peterson & Biggs, 1998). In terms of gender, girls seem to narrate more detailed, coherent and temporally connected autobiographical memories than do boys (Fivush et al., 1995; Haden, Haine, & Fivush, 1997; Reese, Haden, & Fivush, 1996). In addition, characteristics of the event such as its severity, predictability and degree of potential threat and shock are considered critical to post-traumatic adjustment and may moderate any relationship between this adjustment and trauma memory.

The aims of this study are to examine the connection between the quality of children's trauma memory in terms of its organisation and structure and their post-traumatic adjustment. The study takes into account the concurrent contribution the child's age, gender, language ability and the nature of the event in considering the role that memory factors play in the severity of children's distress around specific post-traumatic symptoms.

METHOD

Participants

Participants were 80 children aged between 7 and 16 years ($M = 10.14$ years, $SD = 2.28$) who experienced a physical injury requiring hospitalisation. The injuries included broken limbs, burns, dog bites and lacerations. Participating children had been admitted to hospital

DOI: 10.1002/acp

for a minimum of 24 hours (M hours in hospital = 108.77, SD = 148.75). The participants were recruited via accident and emergency centres at three hospitals in South East Queensland. Children with head injuries who obtained a Glasgow Coma Scale rating of 13 or below and those who sustained injuries following familial or adult to child interpersonal violence were not included in the study.

Procedure

Children were recruited for the study within 1 to 3 days after their admission to hospital. Written informed consent was obtained from parents after a complete description of the study was given. At 4 to 7 weeks post-trauma, a home visit was conducted, during which the child was given the appropriate self-report measures to complete. The child was then asked to give a verbal narrative of his or her memory of the accident to the interviewer, which was recorded on audiotape. A standardised introduction was used in this study. The child was asked to describe his/her injury in the first person: 'In a moment I will ask you to tell me all about your accident, how you felt, what you saw, who was there with you, everything. I would like you to describe the accident to me as if it is happening right now. I would like you to tell me as many things that you can remember that happened during the accident. Things like what happened around you, how you were feeling, and what you were thinking during the accident'. Narratives were then transcribed and coded.

Measures

8-item Children's Revised Impact of Event Scale (CRIES-8)
Symptoms of posttraumatic stress were measured using the child version of the Impact of Event Scale (IES, Horowitz, Wilner, & Alvarez, 1979) the CRIES-8 (Yule & Williams, 1990). This 8-item measure consists of two subscales of four items each, measuring specific post-traumatic distress symptoms; intrusion and avoidance. Participants rate the frequency of their symptoms on a 4-point scale consisting of 0 (*Not at all*), 1 (*Rarely*), 3 (*Sometimes*) and 5 (*Often*). The CRIES-8 is a reliable measure of post-traumatic stress disorder symptoms in children ($\alpha = 0.75$, Total score; $\alpha = 0.70$ Intrusion; $\alpha = 0.73$ Avoidance). Using a cut-off of 17, the CRIES-8 has been found to correctly identify more than 80% of children with a diagnosis of PTSD (Perrin, Meiser, & Smith, 2005).

The Injury severity score (ISS). *The Injury Severity Score (ISS)* of the Abbreviated Injury Scale (AIS, American Association for Automotive Medicine, 1990) assessed injury severity. Information was taken from the hospital case notes. On the AIS, each injury is coded on a six-point scale from 1 'minor' to 6 'maximum'. The ISS is the sum of the highest AIS score in each of the three most injured ISS body regions (head or neck, face, chest, abdominal, extremities). AIS scores can range from 3 to 18.

Trauma severity rating. Narratives of the accident were used to obtain an experimenter rating of trauma severity on a 3-point scale from High to Low. High trauma severity was characterised by the unpredictable nature of the event, the potential for severe injury or death, and evidence of horror or terror. At the other end of the scale, low trauma severity was characterised by predictable events, less potential for serious injury and low evidence of threat. Examples of the narratives are provided in the appendix.

DOI: 10.1002/acp

Lexical complexity. Children's narratives were also analysed for percentage of words longer than 6 letters. Pennebaker and Francis (1996) used this as a measure of the child's lexical complexity and an appropriate index of language ability for studies focusing on variability in specific lexical items such as types of words and cohesive markers.

Trauma narrative measures

Narratives were coded in three domains; (1) measures of the distribution of lexical categories (emotional, conceptual and sensory/perceptual); (2) indices of narrative connectedness (cohesion) and (3) indices of narrative organisation (coherence).

Lexical measures. First person references only were considered in each of the three lexical categories (emotional, conceptual and sensory/perceptual) and scores in each category were converted into a percentage of the total word count. The emotion category included any word that described an emotion such as *sad, freaked, annoyed*. Initially emotions were divided into three categories: fear, anger and sadness, but these were later combined due to the small number of references to emotions. Words that described a level of enjoyment such as *fun* were excluded. The conceptual category included words and expressions indicative of cognitive states or processes (e.g. *remembered, thought, knew)*. Conceptual words were divided into two categories: positive references (e.g. *I thought, I can remember*) and negated references (e.g. *I don't know, I forge*t). Words expressing desire or intention such as *want, wished* and so forth were not included as conceptual in this analysis. The sensory/perceptual category included words and expressions denoting sensations based on one of the five senses. Most words consisted of references to physical sensation such as *it hurt, I felt sick*, or perceptual experiences such as *I saw a light, it looked broken*.

Cohesion. The largest class of linguistic devices measuring cohesion is conjunctions, which includes connectives such as *and, but, then, because, so*. The cohesive function of these markers can be classified as additive, comparative, temporal or causal (Tomasello, 2003). Numbers of references in each category were converted into a percentage of the total number of cohesive markers. Some words such as *and* could potentially serve an additive or temporal function. In such cases, the narrative context was used to determine the function.

Coherence. This study used the classification of narrative coherence developed by Peterson and McCabe (1983) which defines 'fully developed' narratives as having clauses or sets of clauses which: (1) provide character, time and place orientation; (2) describe a sequence of events leading to a climax, a wrap-up or resolution and (3) emphasise or evaluate what is important. As well as global ratings of coherence based on these elements, this study used assessments of the degree to which each of three elements (orientation, sequence of events, evaluation) is present in the narrative.

Global coherence ratings were given according to the following scale:

1 = Disoriented pattern—The narrative is too confused or disoriented for the listener to understand.
2 = Impoverished pattern—The narrative consists of too few sentences for any high point pattern to be recognised.
3 = Chronological pattern—The narrative is a simple description of successive events.
4 = Leap-frogging pattern—The narrative jumps from one event to another within an integrated experience, leaving out major events that must be inferred by the listener.

DOI: 10.1002/acp

5 = Ending-at-the-high-point pattern—The narrative builds up to a high point and then ends; there is no resolution.
6 = Classic Pattern—The narrative builds to a high point, evaluatively dwells on it, and then resolves it.

Coherence ratings were also made on 3-point individual scales as follows:

Level of orientation. Certain clauses serve as orientation to the people, place(s), time(s) and ongoing behaviour of the narrative. They set the stage for the narrated events. Narratives were rated in the following way:

0 = The narrative includes no orientation comments or only minimal information such as one statement referring to the setting or context of the events.
1 = The narrative provides enough orientation information to gain a general sense of who, when and where the events took place (or at least two of these pieces of information).
2 = The narrative provides precise information about the time of day, location, people involved, general conditions, etc.

Sequence of events. Narratives were rated according to whether the events were narrated in chronological order or whether there was repetition or disorganisation of the sequence.

0 = The narrative contained no apparent sequence of events or the events appeared so disorganised that the order of events in the narrative was difficult to follow.
1 = The narrative appeared to be structured in chronological order but there was some evidence of disorganisation or repetition of events.
2 = The events of the narrative were organised in chronological order.

Level of evaluation. Evaluation clauses are clauses that give the point of the narrative: why it was told or what to think about a person, place, thing, event or entire experience. Some examples include: explanations, judgements, exaggeration, emotional states, intentions and inferences.

0 = The narrative contained none or very little evaluation and consisted mainly of facts or a series of actions.
1 = The narrative contained some evaluative comments usually in the form of internal emotional states or intentions.
2 = The narrative contained detailed evaluative comments telling the reader what to think about the event being narrated.

Coding reliability. Two judges knowledgeable of the coding system co-rated 25% of the narratives to ensure reliability. There was strong agreement between the raters in the number of words identified in the various lexical categories ($r = 0.95$ (emotional), $r = 0.93$ (sensory/perceptual); $r = 1.0$ (positive conceptual); $r = 0.97$ (negative conceptual)), and also for the cohesive measures ($r = 0.81$ (additive); $r = 0.74$ (comparative); $r = 0.96$ (temporal); $r = 0.97$ (causal)). The percentages of agreement between the judges for the coherence ratings were high for orientation (94%) and sequence (94%), and moderate for the global (75%) and evaluation (69%) rating.

DOI: 10.1002/acp

Results

Descriptive characteristics of the sample

The sample was made up of 48 boys and 32 girls with mean ages of 10.81 years ($SD = 2.06$) and 9.13 years ($SD = 2.25$), respectively. The mean score on the CRIES-8 was 12.99 ($SD = 10.39$). Twenty-eight children (35% of the sample) were classified as having clinically significant acute post-traumatic symptoms using the cut-off on the CRIES-8 of 17 (Perrin et al., 2005). This mean score and rate of case-ness are almost identical to a previous accident and emergency ward sample (Perrin et al., 2005). It is comparable also to a specific PTSD group with 16% of the current sample scoring at or above the mean for children presenting to a child trauma clinic (Stallard, Velleman, & Baldwin, 1999). Analyses focused on the two CRIES subscales scores, Intrusion and Avoidance. Children's scores on these scales were positively correlated, $r\,(80) = 0.61$, $p < 0.01$ and there was no significant difference found between Intrusion and Avoidance scores ($M = 6.36$, $SD = 5.23$ and $M = 6.63$, $SD = 6.33$ respectively), $t(79) = -0.45$, $p = 0.65$.

Characteristics of the accidents and the narratives

Table 1 presents the frequency of types of accidents experienced by the children and the trauma severity ratings these accidents were given. The children were involved in a wide range of trauma types predominantly falls/tripping over and bike, scooter or skateboard accidents. The majority of accidents were rated as low (67.5%) or moderate (30%) in severity with only two, both burn incidents, considered to be of high severity. The mean injury severity score was 6.59 ($SD = 4.22$) indicating most injuries were of low to moderate severity.

The characteristics of the narratives measures are presented in Table 2 for the three age groups. The narratives were collected on average 5.52 ($SD = 0.84$) weeks after the accident. Narratives ranged in length from 21 to 495 words ($M = 149.36$; $SD = 93.08$). The lexical features (emotional, conceptual and sensory/perceptual) assessed represented very small proportions of the total number of words with sensory and perceptual words relatively most prevalent and emotion words least prevalent. Additive and causal connectives accounted for 86% of all cohesive devices used by the children with temporal connectives at 10.2% and comparatives at 3.7%. Most narratives (74%) were given a global

Table 1. Frequency for various type of trauma broken by Trauma Severity Ratings

	Trauma severity			
Trauma type	High	Moderate	Low	Total
Fall	0	4	17	21
Bike/scooter/skateboard/ rollerblade accident	0	1	12	13
Tripped over	0	1	11	12
Physical contact injury	0	2	7	9
Burn	2	5	0	7
Hit by car	0	5	0	5
Motorbike/go-cart accident	0	1	3	4
Animal injury	0	2	2	4
Cuts/lacerations	0	2	1	3
Hit by projectile	0	0	1	1
Near drowning	0	1	0	1

DOI: 10.1002/acp

Table 2. Characteristics of the narrative measures by age group

	7–9 years ($N = 34$)	10–12 years ($N = 31$)	13–16 years ($N = 15$)
Weeks since trauma event	5.42 (0.88)	5.65 (0.80)	5.51 (0.86)
Narrative length (word count)	134.65 (87.42)	166.13 (96.69)	148.07 (100.55)
Lexical features[a]			
Emotional	0.33 (1.05)	0.30 (0.71)	0.25 (0.56)
Sensory/perceptual	0.91 (0.60)	0.93 (0.70)	0.84 (0.52)
Conceptual	0.82 (1.22	1.31 (1.26)	0.71 (0.73)
Cohesive markers[b]			
Additive	37.85 (16.06)	42.77 (14.75)	44.51 (19.36)
Comparative	2.94 (6.27)	4.83 (6.76)	3.28 (4.54)
Temporal	48.77 (20.46)	43.33 (15.86)	40.13 (14.83)
Causal	10.44 (16.69)	9.06 (10.21)	12.07 (9.44)
Coherence ratings[c]			
Global	5.18 (1.40)	5.42 (1.18)	5.67 (0.82)
Orientation	1.74 (0.75)	1.97 (0.66)	2.27 (0.59)
Sequence	1.56 (0.66)	1.68 (0.48)	1.93 (0.26)
Evaluation	74 (0.79)	1.06 (0.81)	0.93 (0.88)
Lexical complexity[d]	8.91 (2.90)	9.41 (3.31)	9.94 (2.50)

[a]Percentage of total words.
[b]Percentage of total number of cohesive markers.
[c]Mean rating.
[d]Percentage of total words.

coherence rating of 'classic pattern', characterised by the narrative building to a high point, evaluatively dwelling on it, and then resolving it. On average the narratives were considered to be well organised chronologically (Sequence $M = 1.68$; $SD = 0.55$) and in terms of to whom, where and when the events took place (Orientation $M = 1.93$; $SD = 0.71$) but much less so in respect to the children's explanations, judgements and intentions (Evaluation $M = 0.90$; $SD = 0.82$). There were no significant associations between the number of weeks delay between the accident and collection of the narrative and any of the narrative measures (r (range) = 0.01 to 0.18).

Age and gender differences

To explore age and gender differences in posttraumatic symptoms and narrative structure, the child sample was divided into three age groups, 7–9, 10–12 and 13–16 years old. Table 3 presents the means and standard deviations for the Intrusion and Avoidance scores across the age groups, as well as the numbers of children classified with clinical levels of post-traumatic symptoms based on the CRIES-8 clinical cut-off.

Two 2 × 3 (Gender by Age) Analyses of Covariance (ANCOVA) were performed using scores on the Intrusion and Avoidance scores as dependent variables, controlling for lexical complexity. Significant main effects for age were found for both Intrusion and Avoidance scores, F (2,73) = 3.17, $p < 0.05$, and F (2,73) = 3.12, $p < 0.05$, respectively. On average, children in the youngest age group reported the most Intrusion and Avoidance symptoms, whereas children in the oldest group reported the least. There was no significant effect for gender on Intrusion (F (1, 73) = 0.12, $p = 0.74$), or Avoidance (F (1,73) = 1.07, $p = 0.31$) and no significant Gender by Age interaction for Intrusion (F (2,73) = 0.20, $p = 0.82$), or Avoidance (F (2,72) = 30, $p = 0.74$). Chi-square analysis revealed that younger children

DOI: 10.1002/acp

Table 3. CRIES scores and categories by age groups

	7–9 years ($N = 34$)	10–12 years ($N = 31$)	13–16 years ($N = 15$)
Mean Intrusion score (SD)	8.21 (5.89)	5.26 (3.99)	4.47 (4.86)
Mean Avoidance score (SD)	8.56 (6.56)	5.19 (5.34)	5.20 (6.94)
Number with clinical symptoms	19 (8 boys)	6 (5 boys)	3 (3 boys)
Number without clinical symptoms	15 (6 boys)	25 (15 boys)	12 (11 boys)

were significantly more likely then older children to be classified as having clinically significant post-traumatic symptoms ($\chi^2 = 11.34$, $p = 0.003$).

Further 2×3 (Gender by Age) ANCOVA were performed using the narrative measures as dependent variables with lexical complexity as the covariate. No significant main effects were found for either age or gender on any of the narrative measures except for orientation. A significant Gender by Age interaction was found for orientation, $F\ (2,73) = 3.57$, $p < 0.05$. Girl's level of orientation increased across the younger age groups and then decreased markedly in the oldest group. Boy's level of orientation remained stable across the younger age groups and then increased in the oldest group. This finding is possibly attributable to the fact that there is only one girl in the oldest group and it is unlikely that her use of orientation comments is representative of all girls aged 13 to 16.

Relationship between child, accident and narrative variables and post-traumatic symptoms

Correlations between accident and narrative variables and level of post-traumatic symptoms are presented in Table 4. Neither injury severity nor the severity rating of the trauma was associated with intrusive or avoidance symptoms. Consistent with the notion trauma memory quality is related to intrusive symptoms, there were significant correlations between some of the narrative memory measures and intrusion scores but no association with avoidance scores. Specifically, there was a significant moderate association between higher Sensory/perceptual references (e.g. *saw, looked, felt*) and lower levels of intrusion symptoms ($r\ (80) = -0.24$, $p < 0.05$) not evident for avoidance ($r\ (80) = -0.02$, *n.s.*), and between a higher incidence of negated conceptual references (e.g. *I don't know, I forget*) and lower levels of intrusion symptoms, $r\ (80) = -0.27$, $p < 0.05$. Children's use of more causal cohesive markers (e.g. *because, so, therefore*) in their memory narrative was also associated with higher levels of intrusion symptoms, $r\ (80) = 0.29$, $p < 0.01$ but was not related to avoidance $r\ (80) = 0.12$, $p < 0.05$.

Hierarchical multiple regression analyses were used to test whether the narrative measures could predict severity of post-traumatic symptoms over and above what can be predicted on the basis of child (gender, age, lexical complexity) and accident factors (trauma severity, injury severity). Separate models were investigated for intrusion and avoidance. Table 5 presents the outcomes for the regression analyses. Due to the multicollinearity of additive cohesive markers, this variable was excluded from the regression analysis. In the first step, accident factors (injury severity and trauma severity rating) were entered into the regression model. In the second step, the child factors (age, gender and lexical complexity) were entered. For intrusion scores together these variables failed to predict a significant proportion of the variance, $R^2 = 0.08$, $F\ (5,73) = 1.28$, $p = 0.28$. In the third step, the narrative measures consisting of the lexical categories, cohesive markers and coherence ratings were entered into the equation. The accuracy of

DOI: 10.1002/acp

Table 4. Correlation matrix of accident, child, and narrative factors with children's post-traumatic symptoms

	Intrusion score	Avoid score	Total score	Injury sevrty	Truma sevrty	Gender	Age	Lexi complexity	Emotn	Sensry perceptual	Positive conceptual	Negated conceptual	Additvr	Comparative	Temporal	Causal	Orientation	Sequence	Evaluation
Intrusion score	1																		
Avoidance score	0.61*	1																	
Total score	0.88*	0.92*	1																
Injury severity	−0.02	0.06	0.03	1															
Trauma severity	0.06	0.14	0.12	0.09	1														
Gender	0.05	0.02	0.04	−0.20	−0.16	1													
Age	−0.27*	−0.22	−0.27*	0.08	0.08	−0.37*	1												
Lexical complexity	−0.06	−0.09	−0.08	0.14	−0.01	−0.16	0.11	1											
Emotion	0.05	−0.06	−0.02	−0.12	0.07	−0.01	−0.10	0.17	1										
Sensory/perceptual	−0.24*	−0.02	−0.13	0.02	−0.09	−0.09	−0.04	0.08	−0.09	1									
Positive conceptual	0.13	0.06	0.10	−0.04	0.22	0.01	−0.04	0.13	0.08	0.12	1								
Negated conceptual	−0.27*	−0.20	−0.25*	0.21	0.02	0.04	0.03	0.20	0.03	0.25*	0.14	1							
Additive	−0.10	−0.03	−0.07	0.14	−0.10	−0.05	0.11	0.21	0.02	0.10	−0.13	−0.03	1						
Comparative	−0.04	−0.13	−0.10	−0.04	0.13	0.17	0.04	0.06	0.13	−0.23*	−0.01	−0.03	−0.17	1					
Temporal	−0.11	−0.02	−0.07	−0.10	0.02	−0.16	−0.13	−00.15	0.01	−0.02	0.05	−0.08	−0.68*	−0.10	1				
Causal	0.29*	0.12	0.22*	−0.02	0.03	0.21	0.04	−0.09	−0.09	0.01	0.11	0.17	−0.23*	−0.14	−0.48*	1			
Orientation	−0.01	−0.06	−0.03	0.23*	−0.15	−0.08	0.23*	0.34*	0.05	−0.10	−0.08	0.04	0.25*	0.15	−0.19	−0.13	1		
Sequence	−0.03	−0.19	−0.13	0.10	−0.26*	−0.08	0.22	0.08	0.12	−0.26*	0.02	−0.12	−0.15	0.12	0.16	−0.09	0.12	1	
Evaluative	0.11	0.17	0.16	0.20	0.20	−0.06	0.14	0.13	0.15	0.03	0.37*	0.28*	−0.04	0.08	−0.03	0.04	0.15	0.07	1

*$p < 0.05$.

DOI: 10.1002/acp

Table 5. Hierarchical multiple regression analysis for variables predicting intrusive and avoidance symptoms

	Intrusive			Avoidance		
Variable	*SE*	ß	R^2_{change}	*SE*	ß	R^2_{change}
Step 1			0.008[a]			0.023[d]
Trauma severity	1.13	0.09		1.37	0.14	
Injury severity	0.14	−0.03		0.17	0.05	
Step 2			0.073[b]			0.059[e]
Gender	1.33	−0.02		1.62	−0.03	
Age	0.28	−0.27*		0.34	−0.23	
Lexical complexity	0.20	−0.05		0.25	−0.09	
Step 3			0.290[c,**]			0.164[f]
Emotion references	0.67	−0.01		0.89	−0.07	
Sensory/perceptual references	0.63	−0.20		0.84	−0.03	
Positive conceptual references	0.79	0.08		1.06	−0.03	
Negated conceptual references	0.75	−0.34**		1.01	−0.32*	
Comparative markers	0.10	−0.01		0.13	−0.11	
Temporal markers	0.04	−0.02		0.05	0.02	
Causal markers	0.04	0.38**		0.07	0.16	
Orientations	0.91	0.10		1.21	0.02	
Sequence of events	1.16	−0.04		1.56	−0.16	
Evaluative comments	0.75	0.21		1.00	0.29*	

*$p < 0.05$.
**$p < 0.01$.
[a]F (2,76) = 0.30.
[b]F (3,73) = 1.93.
[c]F (10,63) = 2.91.
[d]F (2,76) = 0.91.
[e]F (3,73) = 1.57.
[f]F (10,63) = 1.37.

the prediction increased significantly to 37% variance explained, $R^2_{change} = 0.29$, F_{change} (10,63) = 2.91, $p < 0.01$ (see Table 4). According to the standardised regression coefficients (β), it was apparent that age, and a number of the narrative measures (negated conceptual references and causal cohesive markers) were contributing to the accuracy of the prediction of severity of intrusion symptoms. The analysis was repeated following the same steps using severity of Avoidance symptoms as the dependent variable. This model failed to account for a significant proportion of the variance overall, $R^2 = 0.16$, F (15,63) = 1.37, $p = 0.19$ (see Table 4).

PTSD subgroup analysis

Twenty-eight children (16 boys) scored above the cut-off for case-ness for acute PTSD using the CRIES-8 total score. The gender ratio for this PTSD group was not significantly different to that of the non-PTSD group, $\chi^2 = 0.15$, $p = 0.44$. Children in the PTSD group had a mean age of 9.21 years ($SD = 2.11$), which was significantly younger than children in the rest of the sample (10.63 years, $SD = 2.23$) controlling for trauma severity, injury severity and gender, F (1,79) = 7.10, $p < 0.01$. There were no significant differences between the group with a clinical level of symptoms and the rest of the sample on lexical complexity, injury severity or trauma severity. One-way ANCOVA were performed to

DOI: 10.1002/acp

compare the PTSD group and rest of the sample on the narrative measures. Age and lexical complexity were controlled for as covariates. In terms of the lexical indices, children in the clinically severe group used significantly fewer negated conceptual references ($M = 0.17$, $SD = 0.35$) than children in the rest of the sample ($M = 0.62$, $SD = 0.91$), $F\,(1, 76) = 5.33$, $p < 0.05$. There were no significant differences between these groups on any of the cohesion or coherence measures.

Within the PTSD group there was a significant gender difference for age. The mean age for boys was 10.06 years ($SD = 2.14$) which was significantly older than for girls ($M = 8.08$, $SD = 1.51$) controlling for injury severity and trauma severity; $F\,(1,28) = 6.00$, $p < 0.05$. There were no gender differences on any of the other child factors, incident factors or narrative measures. It is noteworthy that the relationship between lexical complexity and intrusion was in the opposite direction in the PTSD sub-group ($r = 0.24$) compared to the same relationship in the whole sample ($r = -0.06$). Also, negated conceptual references showed no relationship with Intrusion symptoms in the sub-group, whereas, it had a significant negative relationship in the whole sample ($r = -0.27$).

The same hierarchical regression analyses that had been conducted on the whole sample were carried out with the PTSD subgroup. Due to the small number of children in the PTSD group, the final models, which included all variables, did not significantly predict intrusion symptoms, $F\,(15,12) = 1.52$, $p = 0.23$, or avoidance symptoms, $F\,(15,12) = 0.42$, $p = 0.94$, despite accounting for 43% of the variance for intrusion scores and 30% for avoidance. Lower age, fewer sensory/perceptual references and more causal cohesive markers predicted higher intrusion scores for the high symptomatic subgroup of children.

Discussion

Our results document an important connection between the quality of children's memory for a traumatic event and the concurrent severity of intrusive posttraumatic symptoms. Along with the child's age, the quality of their memory report in terms of lexical structure and cohesion accounted for a sizable proportion of the variability in children's intrusive symptoms after taking into account trauma and injury severity and the child's language ability and gender. As expected younger children reported higher degrees of intrusive symptoms about the accident and age remained an important factor in predicting symptom severity when child, accident and memory factors were considered together. Memory reports characterised by fewer sensory or perceptual words, less use of negated conceptual expressions (*don't know, can't remember*) and more causal cohesive connectives (*because, so, therefore*) were related to higher reporting of intrusive symptoms. Negated conceptual expressions and causal cohesive connectives remain important when considered along side the child and accident factors. The evidence for a connection between the child, accident and quality of trauma memory factors and severity of concurrent avoidant symptoms was, overall, less convincing. The differential findings for intrusions and avoidance support the suggestion that memory quality is related to re-experiencing aspects of post-traumatic distress.

The direction of the observed relationship between children's trauma memory quality and intrusive symptoms, however, goes against deficit accounts which propose that a lack of cohesion in trauma memories and a corresponding dominance of the memories by loosely connected sensory, perceptual and emotional impressions helps account for the intrusive, or involuntary quality of the children's post-traumatic distress experiences (Ehlers et al., 2003). Rather, in the current study high reporting of trauma related intrusive

DOI: 10.1002/acp

experiences at 4 to 7 weeks post event was related to memory quality reflecting a paucity of sensory, and perceptual impressions and a dominance of markers indicating attempts at making the event coherent and causally meaningful. This finding is more consistent with a meaning-making model or landmark view (Berntsen et al., 2003), and is in line with some previous findings supportive of such a model. For instance, Berliner, Hyman, Thomas, and Fitzgerald (2003) found that children's memory for trauma had less sensory detail and more impact/meaning than memory for positive events; and Fivush et al. (2003) found that children's narratives of negative events were more coherent than their narratives of positive events. Our results, however, are the first to identify a relationship between attempts at developing a causally cohesive personal memory of a traumatic event and experiences of intrusive post-traumatic symptoms.

One way of reading the current data is to consider them as reflecting a relationship between the quality of the trauma narrative memory and intrusive symptoms in the process of children's adaptation to such events. Involuntary remembering in flashbacks, intrusive images thoughts and dreams are common for most children in the immediate post-trauma period. These intrusive memories have the capacity to reinstate the experiential aspects of the event and hence provoke considerable distress. They also create dissonance because they are often different from the voluntary memory of the event. We suggest these factors make them instrumental in children's active remembering. This active remembering focuses on conceptual understanding and providing a causal account of the trauma. In addition, external demands immediately following the trauma from parents, medical staff and others to know what happened and why may also prioritise causal accounts. Peterson and Biggs (1998) note that these types of events are big news in the lives of families for weeks following the event, and both children and parents report that they widely discuss the events with relatives, friends, neighbours and classmates. In our sample, the less the children report intrusive symptoms 4 to 7 weeks after the accident the more they are able to provide a narrative memory detailed with sensory, perceptual and emotional content with less need to be explicit about causal or conceptual connections. Children who are troubled by intrusive symptoms at 4 to 7 weeks continue to prioritise making causal sense of the event perhaps in an attempt to find a correspondence between the intrusive memories and their voluntary remembering of the event.

This account of the findings fits with approaches to autobiographical memory which emphasise that personal memories are constructed according to the person's active and current goals (e.g. Conway & Pleydell-Pearce, 2000) better than with models which focus solely on deficits or alterations to autobiographical memory structure. When there is low degree of current distress associated with the trauma, the goals activated by an adult's request to remember a personal experience do not conflict with any current goals. The low distressed children's goal is to do their best to 'tell all about your accident, how you felt, what you saw, who was there with you, everything'. For high distressed children, however, the adult's request to remember the accident activates this goal but also other goals around personally controlling and mastering, i.e. cognitively making sense of, the experiences triggered by the request (Dalgleish, 2004; Conway, Meares, & Standart, 2004). The relationship between the quality of the children's trauma memory and their self-report of intrusive symptoms described in the current study, then, reflects differences in the goals activated by the memory request.

While we found a similar pattern of associations between the memory factors and severity of intrusive symptoms for the high distress, acute PTSD children, a number of considerations caution against drawing inferences for these data to the development of

DOI: 10.1002/acp

enduring PTSD. We assessed the children 4 to 7 weeks post-trauma. This duration of symptoms is adequate diagnostically for acute PTSD. It is not clear, however, whether high levels of symptom reporting between 1 and 2 months post-event reflect enduring problems for children. Younger age was moderately related to severity of symptoms particularly for intrusive symptoms. Given the age range of the children in our study we suspect that most were still engaged in the process of recovering both cognitively and emotionally. In addition, the CRIES-8 cut-off may not have the required specificity in detecting PTSD. Although the CRIES-8 has been validated for use with children and adolescents, in one study the measure was found to have a false positive rate of 45% when used with children aged 7–18 (Stallard, Velleman, & Baldwin, 1999). The final caveat concerns the type of traumatic event that these children experienced. While we assessed and controlled for trauma severity, the events that these children experienced may not have had the psychological impact or degree of current threat that disrupts memory in a way suggested by the deficits models. In particular, the exclusion of children who had experienced familial or adult to child interpersonal events resulting in hospitalisation may have significantly reduced the relevance of the results to event types known to be of high risk for the development of chronic post-traumatic distress symptoms.

Besides the limitations related to the type and severity of the trauma, the current study only considered child and event related factors in relationship to memory quality. But children's memory for events may also be influenced by other factors most notably by the quality of parenting. Not only do parents potentially serve an important function in moderating their child's trauma response by giving comfort and nurturance, and providing a sense of physical safety, they also may influence the child trauma memory through discussions about the event. For example, parents who talk in more elaborated and coherent ways about the past with their children, have children who come to recount their own experiences in more elaborated and coherent ways (Fivush, 1998). Future research on the connection between the quality of children's memory and their post-traumatic adjustment needs to take into account differences in the ways in which parents assist children in making sense of their experiences. The parents own adjustment to the trauma and to its physical and emotional impact on the child may be critical to their role in this process. Similarly, future studies need to consider the concurrent influence of other emotional and behavioural problems of the child such as depression on their relationship between post-trauma adjustment and the quality of the trauma memory.

The narratives provided by the children were often very extensive encompassing a range of times and events around the trauma itself. One issue raised by the use of such narrative accounts as memory reports is what sections of a memory narrative are most relevant to predictions about the quality of the trauma memory. For example, it may be important in order to better test predictions from the cognitive models to differentiate between intrusive and voluntary parts of a memory account or to specify pre-event, event and post-event sections. We calculated our lexical and cohesive measures for the whole account and used ratings of coherence based on the total text. Whether a pattern of relationships between memory quality and severity of intrusive symptoms more consistent with a deficit model may have been found for particular sections of the narrative is an interesting empirical question. At the same time, the finding here that language measures based on the whole narrative show a consistent moderate relationship to severity of post-traumatic symptoms which is conceptually understandable argues for the continued use of non-transparent linguistic indices of memory quality. In the current study lexical markers for word categories (sensory/perceptual, emotional, conceptual) and for cohesion (causal

DOI: 10.1002/acp

conjunctions) provided direct, sensitive and theoretically useful measures of memory organisation and quality.

Overall, the present results show that the quality of the trauma memory produced by 7 to 16 year olds 4 to 7 weeks after an accident requiring hospitalisation continues to have a moderate relationship to the severity of concurrent intrusive symptoms. The direction of the relationship indicates that high reporting of intrusive symptoms is related to a memory quality dominated by conceptual understanding of the event rather than by the sensory or emotional aspects of the trauma experience. Children who experience trauma of the type and severity of those experienced by our participants may be continuing to make sense of the event for a number of months post trauma. Our results imply that for younger children in particular, promoting activities that facilitate their understanding and conceptual memory of the trauma event may reduce prolonged distress associated with intrusive symptoms.

REFERENCES

American Association for Automotive Medicine. (1990). *The abbreviated injury scale*. Des Plaines, IL: American Association for Automotive Medicine.

Berliner, L., Hyman, I., Thomas, A., & Fitzgerald, M. (2003). Children's memory for trauma and positive experiences. *Journal of Traumatic Stress, 16*, 229–236.

Bernsten, D. (2001). Involuntary memories of emotional events: Do memories of trauma and extremely happy events differ? *Applied Cognitive Psychology, 15*, 135–158.

Berntsen, D., Willert, M., & Rubin, D. (2003). Splintered memories or vivid landmarks? Qualities and organization of traumatic memories with and without PTSD. *Applied Cognitive Psychology, 17*, 675–693.

Brewin, C. R., & Holmes, E. A. (2003). Psychological theories of posttraumatic stress disorder. *Clinical Psychology Review, 23*, 339–376.

Brown, N. R. (2005). On the prevalence of event clusters in autobiographical memory. *Social Cognition, 23*, 35–69.

Conway, M., & Pleydell-Pearce, C. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107*, 261–288.

Conway, M. A., Meares, K., & Standart, S. (2004). Images and goals. *Memory, 12*, 525–531.

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

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

Ehlers, A., Mayou, R. A., & Bryant, B. (2003). Cognitive predictors of posttraumatic stress disorder in children: results of a prospective longitudinal study. *Behavior Research and Therapy, 41*, 1–10.

Graesser, A., McNamara, D., Louwerse, M., & Cai, Z. (2004). Coh-Metrix: Analysis of text on cohesion and langauge. *Behabior Research Methods, Instruments & Computers, 36*(3), 193–202.

Fivush, R. (1998). The stories we tell: How language shapes autobiography. *Applied Cognitive Psychology, 12*, 483–487.

Fivush, R., Haden, C., & Adam, S. (1995). Structure and coherence of preschoolers' personal narratives over time: Implications for childhood amnesia. *Journal of Experimental Child Psychology, 60*, 32–56.

Fivush, R., Hazzard, A., Sales, J., Sarfati, D., & Brown, T. (2003). Creating coherence out of chaos? Children's narratives of emotionally positive and negative events. *Applied Cognitive Psychology, 17*, 1–19.

Foa, E. B., Molnar, C., & Cashman, L. (1995). Change in rape narratives during exposure therapy for posttraumatic stress disorder. *Journal of Traumatic Stress, 8*, 675–690.

Haden, C. A., Haine, R., & Fivush, R. (1997). Developing narrative structure in parent-child conversations about the past. *Developmental Psychology, 33*, 295–307.

Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of event scale: A measure of subjective stress. *Psychosomatic Medicine, 41*, 209–218.

DOI: 10.1002/acp

Kenardy, J., Smith, A., Spence, S., H., Lilley, P., Newcombe, P., & Robinson, S. (in press). Dissociation in children's trauma narratives: An exploratory investigation. *Journal of Anxiety Disorders.*
Kindt, M., & van den Hout, M. (2003). Dissociation and memory fragmentation: Experimental effects on meta-memory but not on actual memory performance. *Behavior Research and Therapy, 41*, 167–178.
McNally, R. J. (2003). *Remembering trauma*. Cambridge, MA: Belknap Press/Harvard University Press.
Merritt, K. A., Ornstein, P. A., & Spicker, B. (1994). Children's memory for a salient medical procedure: Implications for testimony. *Pediatrics, 94*, 17–23.
Nelson, K., & Fivush, R. (2004). The emergence of autobiographical memory: A social cultural development theory. *Psychological Review, 111*, 486–511.
O'Kearney, R., & Perrott, K. (2006). Trauma narratives in posttraumatic stress disorder: A review. *Journal of Traumatic Stress, 19*(1), 81–93.
Pennebaker, J. W., & Francis, M. (1996). Cognitive, emotional, and language processes in disclosure. *Cognition and Emotion, 10*, 601–626.
Perrin, S., Meiser, R., & Smith, P. (2005). The children's revised impact of event scale (CRIES): Validity as a screening instrument for PTSD. *Behavioral and Cognitive Psychotherapy, 33*, 487–498.
Peterson, C., & Biggs, M. (1998). Stitches and casts: Emotionality and narrative coherence. *Narrative Inquiry, 8*, 51–76.
Peterson, C., & McCabe, A. (1983). *Developmental psycholinguistics: Three ways of looking at a narrative*. New York: Plenum.
Robinson, J. A., & Taylor, L. R. (1998). Autobiographical memory and self-narratives: A tale of two stories. In C. P. Thompson & D. J. Hermman (Eds.), *Autobiographical memory: Theoretical and applied perspectives* (pp. 125–143). Mahwah, NJ: Erlbaum.
Reese, E., Haden, C. A., & Fivush, R. (1996). Mothers, fathers, daughters, and sons: Gender differences in reminiscing. *Research of Language and Social Interaction, 29*, 27–56.
Sales, J., Fivush, R., Parker, J., & Bahrick, L. (2005). Stressing memory: Long-term relations among children's stress, recall and psychological outcome following hurricane Andrew. *Journal of Cognition and Development, 6*, 529–545.
Sawyer, K. (2003). Coherence in discourse: Suggestions for future work. *Human Development, 46*, 189–193.
Stallard, P. (2003). A retrospective analysis to explore the applicability of the Ehlers and Clark (2000) cognitive model to explain PTSD in children. *Behavioral & Cognitive Psychotherapy, 31*, 337–345.
Stallard, P., Velleman, R., & Baldwin, S. (1999). Psychological screening of children for post-traumatic stress disorder. *Journal of Child Psychology and Psychiatry, 40*, 1075–1082.
Tomasello, M. (2003). *Constructing a language- a usage-based theory of language acquisition*. England: Harvard University Press.
van der Kolk, B. (1994). The body keeps the score: Memory and the evolving psychobiology of posttraumatic stress. *Harvard Reviews in Psychiatry, 1*, 253–265
Vandermaas, M. O., Hess, T. M., & Baker-Ward, L. (1993). Does anxiety affect children's reports of memory for a stressful event? *Applied Cognitive Psychology, 7*, 109–127.
Yule, W., & Williams, R.M. (1990). Posttraumatic stress reactions in children. *Journal of Traumatic Stress, 3*, 279–295.

APPENDIX

SAMPLE 1. LOW TRAUMA SEVERITY (11 YEAR OLD GIRL)

I got hit in the eye by a rock, this grade 8 guy was throwing rocks and I was going to a friend's house. I was really, really angry because it hurt really, really badly. The hospital was very, very fun, I met a girl and I got some stuff and a wheelchair.

DOI: 10.1002/acp

SAMPLE 2. MODERATE TRAUMA SEVERITY (7 YEAR OLD GIRL)

My friend was carrying one first and I was carrying the other one and it split and I dropped I and it landed on my foot and I had a slipper on so I took that off and there was a tap nearby so my Dad came and rescued and put me under the tap for 50 seconds and called the ambulance so we kept going on the road and then we saw a light and that was them and we had to go in the hospital when I carried the billy and she took one first and then I took one and I took off my sock and slipper and then some people and a lady came because they heard me scream. They called the ambulance and a friend, we met, went over to their house and we used their car when we saw them in front and then I went in the ambulance with Dad and Mum and when I got there I had to take my foot out the water. And when I got onto the bed it started paining so they gave me a medicine.

SAMPLE 3. HIGH TRAUMA SEVERITY (14 YEAR OLD BOY)

Well, I went to my friend S's place and slept there the night and then someone named L came down with a firecracker, that was before it actually happened and then he went before he was gonna ride it down the back he held it up to my head and threatened to light it and then he went down to the back and 'cause where S lives a drain goes there under his yard and then in the corner there's this storm drain inlet and he puts bricks all there and when he lit it, when L lit it down there it split the brick in half and then he tried to light another one but that didn't work. Then he decided to make a metho bomb and then he saw the metho up on top of the cupboard and then got a glass bottle out of my friend S's room and then he made, got a rag and put the metho on it and stuck the rag in and lit it and tried throwing it at a rock but he missed the rock then tried throwing it from S's yard, where S lives there's a house next door to it and then there's a road, and so he threw it, he tried throwing it over his next door neighbour's yard and onto the road, so he threw it over but it only landed halfway in the middle and then L threw it back over and it hit me there, on the fence and then I was yelling and screaming, 'I'm on fire' but I don't, I think they thought I was joking 'cause you can't see metho burn. I was in a lot of shock. He said, 'Shut up or the next door neighbours would call the cops'. I don't remember where the bottle hit me, I don't remember rolling around on the ground but I know I did it because I was panicking.

DOI: 10.1002/acp