A RETROSPECTIVE ANALYSIS TO EXPLORE THE APPLICABILITY OF THE EHLERS AND CLARK (2000) COGNITIVE MODEL TO EXPLAIN PTSD IN CHILDREN

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Abstract A retrospective analysis was undertaken to determine whether the Ehlers and Clark (2000) model of posttraumatic stress disorder explained PTSD in children involved in road traffic accidents. Children were assessed 6 weeks after their accident and items related to subjective trauma severity, sequelae appraisal, trauma memory, behavioural avoidance and cognitive strategies were examined. Ten of the 14 items, from four of the five areas, were significantly associated with the onset of PTSD. Data from the remaining area, trauma memory, approached statistical significance. These data provide preliminary support for the applicability of the Ehlers and Clark (2000) model to children.

Keywords: Children, posttraumatic stress disorder, cognitive model.

Introduction

A cognitive model to explain both the onset and maintenance of posttraumatic stress disorder (PTSD) has been described (Ehlers & Clark, 2000). This model has integrated the work of a number of theorists to provide a cognitive explanation as to why some trauma victims develop PTSD and why, for some, symptoms persist over time (Brewin, Dalgleish, & Joseph, 1996; Janoff-Bulman, 1992; Joseph, Williams, & Yule, 1997; Horowitz, 1997; Foa Steketee, & Rothbaum, 1989). The model describes a number of key interrelated elements that contribute to the underlying assumption that PTSD is associated with appraisals of the tauma and/or its sequelae that create a sense of serious current threat. An additional source of current threat can be created by trauma memories that are poorly integrated and elaborated into existing autobiographical memories (Foa, Molnar, & Cashman, 1995; Van der Kolk & Fisler, 1995; Conway, 1997). Changes in the trauma memory are postulated to be prevented by maladaptive behavioural (e.g. avoidance of accident stimuli) and cognitive processing styles (e.g. rumination, distraction, thought suppression). Support for the model has come from retrospective studies (Dunmore, Clark, & Ehlers, 1997, 1999) and more recently from a prospective study of assault victims (Dunmore, Clark, & Ehlers, 2001).

Empirically testable cognitive models developed specifically to explain the onset and development of PTSD in children have not yet been developed (Meiser-Stedman, 2002). The applicability of cognitive models developed from work with adults has recently been

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assessed in a prospective longitudinal study of child road traffic accidents (Ehlers, Mayou, & Bryant, 2003). However, to date, comparatively little research has focused upon the cognitive processing styles of child trauma victims. Thus, whilst children exposed to a variety of traumas will develop PTSD (Vogel & Vernberg, 1993; Yule, 1999), little is known about the specific cognitions and trauma appraisals associated with the development and maintenance of persistent symptoms.

In terms of potentially important cognitions, Udwin, Boyle, Yule, Bolton and O'Ryan (2000) examined the relationship between a series of risk factors and PTSD in a long-term follow-up study of adolescent survivors from the Jupiter cruise ship disaster. Of the cognitive variables assessed, subjective appraisal of the trauma, such as fear of not escaping or death, were significantly associated with the development of PTSD. The relationship between the perception of life threat and posttraumatic reactions has also been found in child road traffic accident survivors and children exposed to genocide (Dyregrov, Gupta, Gjestad, & Mukanoheli, 2000; Stallard, Velleman, & Baldwin, 1998). In terms of causal attributions, Jupiter survivors with more intrusive throughts and depressive symptoms one year post disaster tended to report more internal causal attributions (Joseph, Brewin, Yule, & Williams, 1993). Finally, in terms of cognitive strategies that are associated with the onset of PTSD, the use of thought suppression has been identified as an important factor (Aaron, Zaglul, & Emery, 1999). Similarly, the use of avoidant cognitive coping strategies (i.e. distraction and social withdrawal) has been found to be associated with higher rates of PTSD in children 8 months after a road traffic accident (Stallard, Velleman, Langsford, & Baldwin, 2001).

The most extensive exploration of the role of cognitive factors in predicting chronic PTSD in children has recently been published (Ehlers et al., 2003). The study found factors including negative interpretation of intrusive memories, rumination, thought suppression and persistent dissociation predicted PTSD severity at 3 and 6 months. Although research examining the cognitions of child trauma victims is extremely limited, the emerging data would suggest that, as with adults, appraisals of the trauma and cognitive coping style are important determinants of PTSD.

This study aims to contribute to this emerging literature by undertaking a limited, retrospective analysis to determine whether selected variables of the Ehlers and Clark (2000) model are related to the presence of PTSD in children involved in road traffic accidents. Data will be examined to determine whether subjective trauma severity (appraisal of life threat), sequelae appraisals (enormously affected, physically and emotionally unrecovered), trauma memory (confusion, incomplete memory), behavioural avoidance (accident stimuli, reduced social life) and cognitive strategies (suppression, distraction, rumination) are related to PTSD.

Method

Design

A retrospective analysis of the Bath Road Traffic Accident database was undertaken in order to identify items that related to the key elements of the model suggested by Ehlers and Clark (2000). Children who fulfilled the diagnostic criteria for PTSD approximately 6 weeks after their road traffic accident were compared on the identified cognitive and behavioural variables with those who did not suffer from PTSD.

Participants

All children attending the accident and emergency department of a local hospital over a one-year period were invited to participate in a study examining the psychological effects of road traffic accidents upon children. A total of 119 children, aged 5–18 years, agreed to participate, representing 43% of eligible participants. The study cohort, process of recruitment and extent of PTSD in the children has previously been reported (Stallard et al., 1998). There were no significant differences between those who participated in the study and those who did not in terms of age, gender, type of accident or nature and severity of injuries (Stallard et al., 1998). A subset of 97 children aged 7–18 years of age was examined in this study.

Measures

A range of diagnostic and standardized assessments was undertaken, and for this study information was extracted from the following.

Clinician Administered PTSD Scale for Children (CAPS-C: Nader, Kriegler, Blake, & Pynoos, 1994). CAPS-C was used systematically to assess the diagnostic criteria for PTSD. The scale was administered by a researcher in an interview format and assessed the frequency and intensity of each of the diagnostic criteria for posttraumatic stress disorder as detailed in DSM-IV (American Psychiatric Association, 1994). Fulfilment of the criteria requires the presentation of specific symptoms indicating that the traumatic event is regularly re-experienced, trauma related stimuli are avoided, and that the individual has experienced a significant increase in arousal. The resulting disturbance causes clinically significant distress or impairment in social or other areas of functioning and persists for longer than one month.

Kidcope (Spirito, Stark, & Williams, 1988). A 15-item checklist that assesses whether the child has used each of the specified strategies to cope with their trauma. The items were conceptually selected after reviewing the coping literature. Kidcope is moderately to highly correlated with the Coping Strategies Inventory and Adolescent Coping Orientation for Problem Experiences (Spirito et al., 1988). Reliability, determined by assessing coping strategies across two similar situations, found moderate correlations (.56–.72) with test-retest correlations assessed over 3–7 days demonstrating acceptable levels of reliability (correlations .41–.83).

Semi-structured interview. A semi-structured interview was developed for the project. The interview started by inviting the child to describe in detail their accident, both the actual events and the emotions and thoughts they experienced before, during and immediately after the accident. The interview explored whether the child had any regular or persistent thoughts and memories about the accident and assessed a range of emotional changes, including the presence of severe anxiety, sleeping and eating disturbance, and significant alterations in mood state such as extreme unhappiness/depression, irritability and anger. The effect of the accident upon the child's everyday life was discussed and any avoidance, extreme panic or hypervigilance noted. Any changes following the accident in the child's social life, schoolwork, friendships and relationships with family members were assessed. Finally, the way in

which the child coped with the psychological consequences arising from the accident were identified.

The interview was revised and restructured during the piloting stage when 19 children who had been involved in road traffic accidents were assessed. Data from these children were not included in the final analysis. Inter-rater reliability of the interview was determined by randomly selecting eight interviews, which were rated blind by a second researcher. Agreement between the two raters on their coding of responses to the 101 questions that formed the semi-structured interview was 93.1%.

Item selection

The data set was examined and the following 14 items identified as cognitive and behavioural variables related to the Ehlers and Clark (2000) cognitive model of PTSD. *Subjective trauma severity*: as life threatening (''did you think you might die during the accident''). *Appraisals of trauma sequelae*: perception of enormous effect (''how do you think this accident has affected you'', rated on a 4-point Likert scale, not at all, only a little, quite a lot, enormously); emotionally unrecovered (''are you emotionally back to normal yet'', rated on a 3-point Likert scale, not yet, nearly, back to normal); physically unrecovered (''are you physically back to normal yet'', rated on the previous 3-point Likert scale). *Trauma memory*: confusion during trauma (''did you feel confused during the accident''); incomplete memory of the accident (''are there parts of the accident you can not remember''). *Behavioural avoidance*: avoid accident stimuli (''do you avoid places, people, events associated with your accident''); stopped going to places (''are there any places you used to go before the accident that you haven't been to since''); stopped activities (''are there any things you did before the accident that you don't do anymore''); less sociable (''do you feel as sociable as you used to be''); socially withdrawn (Kidcope item – ''have you coped with the accident by staying on your own''). *Maintaining cognitive strategies*: suppression (Kidcope – ''have you coped with the accident by trying to forget it''; distraction (Kidcope – ''have you coped by doing something else to forget about it''); rumination (Kidcope – ''have you coped by wishing that you could make things different'').

Statistical analysis

Between group (PTSD v no PTSD) comparisons for categorical data were undertaken using Chi Square with Fisher Exact probability being used for small cells. A logistic regression analysis was undertaken in order to determine the predictive relationship between the dependent variable (PTSD) and those categorical variables identified as significant. Finally, each categorical variable was individually entered into the regression analysis with demographic variables related to PTSD in order to determine whether the behavioural and cognitive variables had an additional significant relationship with the onset of PTSD.

Results

Demographic and accident characteristics

Assessments were undertaken approximately 6 weeks post accident (x = 40.76 days, SD = 16.96). Table 1 summarizes demographic, accident and injury variables of the study cohort.

Table 1. Demographic, accident, and injury variables

Detail	$N = 97$
Age	
Mean age (yrs)	14.62 ($SD = 3.16$)
Gender	
Boys	52 (53.6%)
Girls	45 (46.4%)
Type of Accident	
Pedestrian	21 (21.6%)
In car that crashed	58 (59.8%)
On cycle/motorcycle that crashed	18 (18.6%)
Accident factors	
Parents involved in the accident	14 (14.6%)
Others injured in the accident	31 (32.3%)
Triage	
Mean triage rating	2.75 ($SD = 0.97$)
Priority 1 or 2 (treatment within 10 minutes)	29 (36.3%)
Injury and investigations	
Fractured bones	20 (20.6%)
Blow to head recorded	43 (44.3%)
Mean number of X ray pictures	1.32
Outcome	
Admitted to hospital	22 (22.7%)

A total of 36 (37.1%) children fulfilled DSM criteria for PTSD, 26 girls, 10 boys, a gender difference that was statistically significant ($\chi^2 = 15.356$, $df = 1$, $p < .000$). None of the remaining demographic, accident or injury factors assessed were significantly related to PTSD.

Relationship between cognitive and behavioural variables and PTSD

Ten of the 14 selected items from four of the five areas assessed had a significant relationship with PTSD. Although there was no statistically significant relationship between PTSD and trauma memory, both of the factors assessed were approaching significance as correlates of PTSD (confusion during the accident $\chi^2 = 3.722$, $df = 1$, $p = .054$; unable to remember parts of the accident $\chi^2 = 3.624$, $df = 1$, $p = .057$). The remaining two items, avoidance of accident related stimuli and thought suppression, did not have a significant relationship with PTSD.

Logistic regression analysis of PTSD, cognitive and behavioural variables

A logistic regression analysis was undertaken to identify which factors were predictive of PTSD at 6 weeks. Gender, the only demographic, accident or injury factor that was signific-

Table 2. Differences between PTSD and no PTSD groups on cognitive and behavioural variables

Variable	PTSD	No PTSD	Significance
Subjective trauma severity			
Appraisal of life threat during accident	19/34	12/57	$\chi^2 = 11.50$, $df = 1$, $p = .001$
Appraisal of trauma sequelae			
Perceive ''enormous'' negative effect	18/36	3/61	$\chi^2 = 27.125$, $df = 1$, $p < .000$
Perceive self as emotionally unrecovered	17/36	1/61	$\chi^2 = 31.125$, $df = 1$, $p < .000$
Perceive self as physically unrecovered	16/36	7/61	$\chi^2 = 13.604$, $df = 1$, $p < .000$
Trauma memory			
Felt confused during the accident	22/33	26/57	NS
Unable to remember parts of the accident	16/34	15/55	NS
Behavioural avoidance			
Avoid accident stimuli	7/36	6/59	NS
Stopped pre-accident activites	27/35	11/60	$\chi^2 = 31.855$, $df = 1$, $p < .000$
Stopped going to places used to go before accident	24/35	9/60	$\chi^2 = 27.984$, $df = 1$, $p < .000$
Less sociable since the accident	15/35	8/60	$\chi^2 = 10.501$, $df = 1$, $p = .000$
Social withdrawal – coped with the accident by staying on own	12/35	9/57	$\chi^2 = 4.211$, $df = 1$, $p = .000$
Maintaining cognitive strategies			
Thought suppression – coped by trying to forget about it (Kidcope)	25/35	31/59	NS
Distraction – coped by doing something else to forget about it (Kidcope)	27/35	21/58	$\chi^2 = 14.647$, $df = 1$, $p = .000$
Rumination – coped by wishing that the accident could have been different (Kidcope)	32/35	36/59	$\chi^2 = 10.154$, $df = 1$, $p = .000$

antly associated with PTSD, was entered into the equation as the first block. On its own, gender resulted in 71.3% of children being correctly classified as to whether or not they were diagnosed with PTSD ($\chi^2 = 14.936$, $df = 1$, $p < .000$). The 10 variables identified in Table 2 as significantly associated with PTSD were then entered as a second block. Complete information was available for 80 children, with the final model producing a good fit with 90.00% being correctly classified as whether or not they had PTSD ($\chi^2 = 53.616$, $df = 10$, $p < .000$). The inclusion of the additional variables resulted in a better predictive model with the -2 log likelihood reducing from 91.883 at block 1 to 38.267 after block 2. Similarly, the Cox and Snell R square increased from .170 to .576 and the Nagelkarke R square from .231 to .781 suggesting a better goodness of fit.

Finally, a separate regression analysis was undertaken for each of the 10 variables in order to determine whether they accounted for significant variance in PTSD over and above gender. Each variable was entered with gender into the regression analysis and all had an additional significant relationship with PTSD. Subjective severity of trauma (life threat $p =$

.007), appraisal of trauma sequelae (enormous effect $p < .000$, emotionally unrecovered $p < .000$, physically unrecovered $p = .002$), behavioural avoidance (stopped activities $p < .000$, stopped places $p < .000$, less sociable $p = .017$, social withdrawal $p = .036$) and maintaining cognitive strategies (distraction $p = .002$, rumination $p = .017$).

Discussion

The results of this retrospective analysis provide preliminary support for the applicability of the key elements of the Ehlers and Clark (2000) cognitive model of PTSD to children involved in road traffic accidents. This conclusion needs to be considered in context and two major limitations of this analysis are acknowledged.

First, the analysis was retrospective and thus many of the variables selected to test the key cognitive elements of the model are proxy measures and less than ideal. The items, for example, assessing appraisal of trauma sequelae are neither meta-beliefs concerning PTSD symptoms nor relate to cognitions suggesting permanent change. Similarly, some of the items selected to explore concepts such as rumination and suppression were very general and may not adequately assess these cognitive processes. Rumination, for example, implies a more focused process of repetitively rehearsing specific aspects of the trauma rather than a general wish for things to be different. Suppression also implies a more active process of pushing out intrusive thoughts rather than a general desire to forget about the trauma. Furthermore, information was not available to explore in detail specific elements of the Ehlers and Clark (2000) model, such as important cognitions and appraisals that may be associated with a sense of current threat. It may be useful to explore the importance of other attributions about blame and responsibility that have been found to be important with adult RTA survivors (Hickling, Blanchard, Buckley, & Taylor, 1999). Further work therefore is needed to develop comprehensive, reliable, standardized multi-item scales that assess cognitive processes in children. Extending the work undertaken by Steil and Ehlers (2000) to a child population may be one way of beginning to address this issue.

Secondly, it is not possible to assert with confidence that the significant factors identified in this study are predictive of the onset of PTSD (Dunmore et al., 1999). Assessments were undertaken at one point in time, approximately 6 weeks post-trauma. Items, such as those used to assess behavioural avoidance, may therefore be consequences of PTSD rather than antecedents associated with onset. Although these findings are consistent with the first prospective longitudinal study with children exploring cognitive predictors of PTSD, further studies using repeated measures are required to substantiate these findings (Ehlers et al., 2003).

In terms of behavioural avoidance, although avoidance of trauma stimuli is common among trauma victims, the rates reported here (13 children, 13.7%) would appear low. This probably reflects developmental issues, where children have fewer opportunities to engage in avoidance behaviours. Adults have more control over their decisions and are able to make choices about, for example, changing their route to avoid the accident site or changing their means of transportation, choices that are often unavailable to children.

Although this retrospective analysis has a number of methodological limitations, these results do support the applicability of the key variables of the cognitive model, i.e. subjective severity of trauma, trauma sequelae, behavioural avoidance, and dysfunctional cognitive strategies to the presence of PTSD in children. The 10 significant variables correctly classi-

fied 90% of children as to whether or not they were diagnosed with PTSD. The failure to confirm a significant relationship between the fifth factor assessed, trauma memory and PTSD, was marginal and there was a tendency for more children with PTSD to report confusion during the accident and an inability to recall aspects of the trauma. It is unclear whether this would become statistically significant with a larger cohort or whether there are important developmental factors about the developing nature of children's memories that need to be incorporated into explanatory models with this age group.

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