

**Predictors of Posttraumatic Stress Symptom Trajectories in Parents of Children Exposed to Motor Vehicle Collisions**

Rachel M Hiller<sup>1\*</sup>, Sarah L Halligan<sup>1</sup>, Rachel Ariyanayagam<sup>2</sup>, Tim Dalgleish<sup>3</sup>, Patrick Smith<sup>4</sup>, William Yule<sup>4</sup>, Ed Glucksman<sup>5</sup>, Peter Watson<sup>3</sup>, Richard Meiser-Stedman<sup>6</sup>

<sup>1</sup> Department of Psychology, University of Bath, Bath, UK

<sup>2</sup> Kent Hospital University Trust, Kent, UK

<sup>3</sup> Medical Research Council Cognition and Brain Sciences Unit, Cambridge, UK

<sup>4</sup> King's College London, Institute of Psychiatry, Psychology, and Neuroscience, London, United Kingdom

<sup>5</sup> Emergency Department, King's College Hospital, London, UK

<sup>6</sup> Department of Clinical Psychology, University of East Anglia, Norwich, UK

\*Corresponding author:

Rachel Hiller  
Department of Psychology  
University of Bath  
Claverton Down  
Bath  
North East Somerset  
BA2 7AY  
United Kingdom  
P. +441225 383794  
E. [R.Hiller@bath.ac.uk](mailto:R.Hiller@bath.ac.uk)

PTSD in parents of children in MVCs

Author Notes

Supported by the Peggy Pollak Research Fellowship in Developmental Psychiatry (Dr Meiser-Stedman) and a grant from the Steel Charitable Trust. T.D was funded by the UK Medical Research Council.

**Abstract**

**Objective:** Following child trauma, parents are at risk of developing PTSD, either due to their direct involvement or from hearing of their child's involvement. Despite the potential impact of a parent's development of PTSD on both the parent and child, little is known about what may place a parent at increased risk.

**Method:** PTSD symptoms were assessed  $\leq$  4 weeks, six months and three years post-trauma, along with a range of potential risk factors, in a sample of parents of 2-10 year old children who were involved in a motor vehicle collision.

**Results and Conclusions:** Two symptom trajectories were identified: Those parents whose symptoms remained low across all time points and those whose symptoms remained elevated at 6 months post-trauma and declined by three years. Subjective threat, thought suppression and maladaptive cognitions about damage to the child were identified as key predictors of poorer outcomes.

## **Introduction**

Following a child's involvement in a traumatic event their parents are at risk of developing posttraumatic stress disorder (PTSD), either as a result of their direct involvement in the event or, as recognised in the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013), from hearing of their child's involvement in the event. The development of PTSD has been associated with numerous negative outcomes for adults, including associations with other psychopathology and an increased risk of substance abuse (Kessler et al., 1995); in the case of parental PTSD there is also the risk of adverse consequences for the child. PTSD in parents is not only moderately associated with the development of PTSD in their children (Morris et al., 2012; Trickey et al., 2012), but may also adversely impact on their parenting, thus potentially hindering the child's longer term adjustment (Cabizuca et al., 2009; Kazak et al., 2004; Leen-Feldner et al., 2013; Trickey et al., 2012). Given the potential consequences for both the parent and the child, exploration of what factors may predict the onset of parental PTSD following an injury or trauma experienced by their child is warranted.

Current estimates suggest that the prevalence of parental PTSD is approximately 20% following their child's trauma, including in the context of the child suffering from a chronic illness (Cabizuca et al., 2009), and the child being admitted to intensive care (Balluffi et al., 2004). Despite evidence of the relatively high prevalence of parental PTSD, we know little about what factors may be responsible for the onset and maintenance of the disorder following trauma to the child. The context brings some unique features, particularly the focus on a threat to another individual, coupled with the centrality to the parenting role of ensuring child wellbeing. Preliminary evidence suggests that subjective fear that the child could have died is a risk factor for poorer psychological adjustment for the parent (Balluffi et al., 2004; Kassam-Adams et al., 2009). This includes evidence from longitudinal research that parent

## PTSD in parents of children in MVCs

ratings of the threat to their child's life is predictive of both acute stress disorder (Kassam-Adams et al., 2009) and PTSD symptom severity (Balluffi et al., 2004). In contrast, objective trauma severity may be less important, with longitudinal research showing no significant association between objective measures of trauma severity (e.g., injury severity) and PTSD severity (Balluffi et al., 2004; Kassam-Adams et al., 2009); although one cross-sectional study found that the size of a child's burn was associated with parental symptom levels (Rizzonne et al., 1994).

The extent of the parent's own involvement in the trauma may also be important. As noted above, a parent may be at risk of developing PTSD either via their own direct involvement in the trauma or from hearing of their child's involvement in the trauma. However, some studies have found higher levels of parental posttraumatic symptomatology when parents are directly involved in the trauma, including amongst parents of children who have suffered a motor vehicle collision (de Vries et al., 1999; Kassam-Adams et al., 2009).

While we have little knowledge of risk factors for parents developing PTSD there has been much investigation of the risk factors for development of PTSD following an adult's experience of their own trauma. In line with cognitive models of PTSD (Dalgleish, 2004; Ehlers & Clark, 2000) evidence largely supports the stronger predictive power of peri-trauma (features during or immediately after the trauma, such as dissociation) and post-trauma variables, over pre-trauma characteristics (e.g., socio-economic status, gender), for predicting PTSD (Brewin et al., 2000; Ozer et al., 2003). In particular, evidence suggests that post-trauma maladaptive cognitions, such as rumination, thought suppression, negative trauma-related appraisals, as well as general cognitive styles or traits such as positive beliefs about worry (e.g., "worry will help me cope") and anxiety sensitivity, are key predictors of PTSD (e.g., Kleim et al., 2007; Karl et al., 2009; Mayou et al., 2002). However, it is not yet known whether post-trauma variables, and indeed mechanisms implicated by key cognitive models

## PTSD in parents of children in MVCs

of PTSD, will apply to parental PTSD following child trauma exposure. In particular, it is unclear whether the content of post-trauma negative cognitions differs for parental PTSD (e.g., blame, negative appraisals related to damage to the child), given the involvement of the child in the trauma and the lack of direct parental involvement in many cases.

Another potential risk factor for parental development of PTSD is the role of post-trauma family functioning. There is evidence that family functioning can alter in the aftermath of trauma (e.g., increased family conflict; McFarlane, 1987) and that this altered functioning may act as a risk factor for the development of poorer psychological outcomes. In particular, poorer family functioning is considered a strong predictor of children's poorer psychological adjustment post-trauma (Alderfer et al., 2009; Trickey et al., 2012). However, there is no evidence as to whether this may also act as a risk factor for parental PTSD.

### **Aims of study**

The aims of this study were two-fold. First, we explored parental PTSD symptom trajectories over the three-year period. We then examined risk factors for trajectories of elevated parental PTSD symptoms. A key risk factor examined was whether the parent was directly involved in the trauma or was uninvolved but later heard of their child's involvement, since this is arguably a major determinant of the parent's experience of the event. We also examined the predictive ability of pre-trauma variables (e.g., child's age), trait cognitive vulnerability (i.e., positive beliefs about worry and anxiety sensitivity), peri-trauma cognitions (i.e., features that occurred at the time of the trauma; subjective threat to the child and self, dissociation), post-trauma cognitive style (i.e., rumination and thought suppression), post-trauma maladaptive cognitions and post-trauma family functioning. Besides the typical post-trauma maladaptive appraisals commonly associated with adult PTSD (e.g., negative self-appraisals), we also assessed cognitive appraisals concerning impact on the child (i.e., permanent psychological change to their child), to provide a comprehensive exploration of

## PTSD in parents of children in MVCs

post-trauma appraisals that may be unique to the development of parental PTSD following child trauma exposure.

### Method

#### Participants

Participants were parents/carers of 2-10 year old children who were consecutively admitted to a participating emergency departments following the child's involvement in a motor vehicle collision (MVC). Three emergency departments were involved in recruitment, all of which were located in low socioeconomic boroughs of London. A full description of this sample and recruitment process can be found in Meiser-Stedman et al. (2008). Parents were excluded if they did not have sufficient English language skills to complete the measures. A total of 312 children were eligible to participate in the study; the families of 120 (38.5%) could not be contacted, while the families of 114 (36.5%) agreed to participate. There were no differences in the age, gender, or triage level (objective trauma severity) for the children of participants versus non-participants ( $p > .05$ ).

To perform the trajectory analysis, scores on the PTSD measure are required on at least two of the time points (explained in more detail in the Statistical Analysis section). Consequently, of the 114 parents who consented to participate, data from 95 parents were included in the current study. The majority of participants were mothers ( $n = 80$ , 83%), with the remainder comprising fathers ( $n = 7$ , 7%) and other relations (e.g., aunts, adult siblings,  $n = 8$ , 8%). Eighty-eight of the 95 participants completed the assessment at T1 (< 4 weeks post-trauma), 56 completed the T2 assessment (6 months post-trauma), and 52 completed the T3 assessment (3 years post-trauma). There was no difference in the baseline parental PTSD symptom severity ( $t[86] = 1.09$ ,  $p = .28$ ) of those who did and did not complete follow-ups.

#### Procedure

## PTSD in parents of children in MVCs

This study was granted original ethical approval by the institutional review board at the Institute of Psychiatry and South London and Maudsley NHS Trust Research Ethics Committee, with permission for the three year follow up granted by the Bexley & Greenwich Research Ethics Committee. Where possible, research team members, in consultation with clinical staff, approached eligible families on the ward to explain the study. In some instances eligible parents were recruited via letter following attendance at the emergency department. Regarding measures used in this study, the full questionnaire battery was administered to parents at 2-4 weeks post-trauma (T1), while PTSD symptoms were measured again at six months (T2) and three years post-trauma (T3). Parents typically completed the assessments in their home as part of the larger assessment (see Meiser-Stedman et al., 2008). The only exception to this was the three year follow up, when questionnaires were completed online or returned by post.

### Measures

**Demographic variables and objective trauma severity.** Demographic and trauma-related information was obtained from parent interviews and from emergency department (ED) notes at T1 (see Table 1). Objective trauma severity for the child was assessed using triage category (nurse rating of urgency of care), whether the child was admitted to hospital, and presence of physical injury (whether or not they sustained a fracture).

**Trait cognitive vulnerability.** Two measures assessed general trait cognitive vulnerability; The Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) and the Meta-Cognitions Questionnaire-30-Positive Beliefs about Worry Scale (MCQ-30-PB; Wells & Cartwright-Hatton, 2004). The ASI is a 16-item self-report questionnaire that measures negative beliefs about anxiety as recorded on a 0 (very little) to 4 (very much) scale of agreement with statements such as “It scares me when I feel faint”. The measure is considered to be reliable and valid (Peterson & Heilbronner, 1987; Vujanovic et al., 2007),



## PTSD in parents of children in MVCs

with adequate internal consistency also demonstrated in the current study (T1 Cronbach's  $\alpha = .91$ ). The MCQ-30-PB is a 6 item scale where responses are scored on a 4-point (1-4) agreement scale, for statements such as "I need to worry in order to work well" and "worrying helps me cope". The measure has shown good internal consistency (Wells & Cartwright-Hatton, 2004), which was replicated in this study (T1 Cronbach's  $\alpha = .89$ ).

**Peri-trauma variables.** At T1 ( $\leq 4$  weeks) self-report items were used to assess the presence of parental dissociation and the subjective (from the parent's perspective) threat to the child and self, all during or immediately following the MVC. Parents reported on each statement using a 1 ('don't agree at all') to 4 ('agree a lot') scale. Items were based on previously used measures (Dunmore et al., 2001; Ehlers et al., 1998; Steil and Ehlers 2000). Dissociation was assessed using five statements (e.g., "I didn't feel like I was really there"), while their subjective threat was assessed using four statements (e.g., "I was scared that my child might be badly hurt"). Internal consistency for the dissociation and subjective threat items were Cronbach's  $\alpha = .62$  and  $\alpha = .63$ , respectively.

**Post-trauma variables.** Parents also completed three measures to capture post-trauma cognitive style, maladaptive cognitions and family dysfunction.

***Rumination and thought suppression.*** Parents rated their level of agreement about three rumination statements (e.g., "I keep wishing that I could go back in time and prevent the event from happening"), and one thought suppression statement ("When I have thoughts or memories about what happened, I try hard to push them out of my mind"), with ratings from 1 ('don't agree at all') to 4 ('agree a lot'). Items were created based on the literature on the impact of these cognitive processes on PTSD (e.g., Ehlers et al., 1998; Kleim & Ehlers, 2008). At T1 these items demonstrated adequate internal consistency, Cronbach's  $\alpha = .81$ .

***Maladaptive appraisals.*** Parents' post-trauma negative appraisals were assessed using a modified version of the Post-Traumatic Cognitions Inventory (PTCI; Foa, Ehlers, Clark,

## PTSD in parents of children in MVCs

Tolin, & Orsillo, 1999). This modified version of the PTCI (PTCI-A) measured negative cognitions about oneself (four items, e.g. “I have permanently changed for the worse”), negative cognitions about the world (four items, e.g. “you can never know who will harm you”), self-blame (two items, e.g. “the accident happened because of the way I acted”), and negative appraisals regarding the parent’s perception of damage to their child (two items, e.g., “I think my child was too badly frightened by the accident and won’t get over it”). Agreement with each item was rated using a 1 (‘don’t agree at all’) to 5 (‘agree a lot’) scale. At T1 PTCI-A showed high overall internal consistency ( $\alpha = .85$ ). The first three subscales also each showed good internal consistency (oneself,  $\alpha = .82$ ; the world,  $\alpha = .81$ ; self-blame,  $\alpha = .71$ ), while the damage to child subscale showed adequate internal consistency at T1 ( $\alpha = .64$ ).

**Family functioning.** How the trauma negatively impacted on family functioning was measured using the ‘irritable distress’ subscale of the Family Functioning Questionnaire (FFQ; McFarlane, 1987). Parents reported on six items that assessed the level of family irritability specifically following the trauma (e.g., “Since the frightening event we are more irritable” and “We spend less time together”). Parents rated their responses on a 3-point scale (1 = ‘does not apply’ to 3 = ‘certainly applies’). Internal consistency at T1 for these six items was  $\alpha = .80$ .

**Parental PTSD.** The Posttraumatic Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997) was completed by parents in relation to the event that their child was involved in. The PDS is a widely used 17-item self-report questionnaire for assessing PTSD symptoms, based on DSM-IV criteria for PTSD (possible total scores range from 0 to 51). A score between 1 and 10 is considered mild, a score between 11 and 20 moderate, scores between 21 and 35 moderate to severe, and scores of 36 or greater considered severe (Foa, 1995). T1 data confirmed the measures high internal consistency (Cronbach’s  $\alpha = .92$ ).

### **Statistical Analyses**

Group based trajectory analysis was performed using the TRAJ command (Jones & Nagin, 2013) in STATA (Stata, 2013), adapted from PROC TRAJ (Jones, Nagin and Roeder, 2001). We used the zero-inflated Poisson model. This analysis was used to identify clusters of individuals with similar growth trajectories. PROC TRAJ does not provide any individual level information on the pattern of change over time; subjects are grouped and it is assumed that every subject in the group follows the same trajectory. We followed the lead of D'Unger, Land, McCall and Nagin (1998) and used the Bayesian Information Criterion (BIC) as a basis for selecting the optimal model (see Raftery, 1995). They recommend selection of the model with the maximum BIC. Jones, Nagin and Roeder (2001) suggest criteria for strength of evidence against the null model using the difference in model BICs. Within each group, values of average posterior probability of membership were ascertained; values of greater than 0.7 indicated adequate internal reliability (Niyonkuru, et al., 2013).

As two trajectories, which we discuss later, were identified (having the maximum BIC and with an average posterior group probability  $> 0.70$ ), logistic regressions were then used to explore early predictors (from T1) of trajectory membership. Seven regressions were used to provide a preliminary exploration of predictors of trajectory membership (high trajectory versus low trajectory). Variables were grouped based on the construct measured. That is, each logistic regression assessed the predictive value of a different construct. Regressions were: (1) objective trauma severity, (2) the parent's direct involvement in the collision versus hearing of the collision, (3) trait cognitive style, (4) peri-trauma variables, (5) post-trauma cognitive style (e.g., rumination), (6) post-trauma maladaptive cognitions (e.g., unsafe world, damage to child) and (7) family irritable distress. In all regressions variables were added as a single step. A final logistic regression was then run with all significant predictors to explore what variables would be the sole unique predictor of trajectory membership.

## Results

### Descriptive Statistics

Descriptive statistics for the sample are presented in Table 1. The mean scores and correlations between key predictor variables are presented in Table 2. Sixty-five percent of the parents were directly involved in the MVC, while 35% heard of their child's involvement after the event. The large majority of participants were the mother of the child (89.5%). Regarding PTSD symptom severity, mean scores on the PDS were as follows: T1:  $M = 10.42$ ,  $SD = 9.95$ ; T2:  $M = 7.13$ ,  $SD = 9.05$ ; T3:  $M = 3.39$ ,  $SD = 4.82$ . Initial scores on the PDS are in line with other, large-scale studies of parental PTSD, assessed using this measure (Landolt et al., 2003). Of those parents who completed the PDS at T1 ( $\leq 4$  weeks post-trauma;  $N = 88$ ), 11% ( $n = 10$ ) reported no symptoms, 47% ( $n = 41$ ) reported mild symptoms, 24% ( $n = 21$ ) reported moderate symptoms, 15% ( $n = 13$ ) reported moderate to severe symptoms, and 3% ( $n = 3$ ) reported severe symptoms. Of those parents who completed the PDS at T2 (6 months post-trauma;  $N = 56$ ), 23% ( $n = 13$ ) reported no symptoms, 54% ( $n = 30$ ) reported mild PTSD symptoms, 13% ( $n = 7$ ) reported moderate symptoms, 9% ( $n = 5$ ) reported moderate to severe symptoms, and 2% ( $n = 1$ ) reported severe symptoms. Finally, of the 52 parents who provided PDS scores at T3 (3 years post-trauma), 35% ( $n = 18$ ) reported no symptoms, 58% ( $n = 30$ ) reported mild PTSD symptoms, 6% ( $n = 3$ ) reported moderate symptoms, 2% ( $n = 1$ ) reported moderate to severe symptoms, and no parent reported severe PTSD symptoms.

### Trajectory Analysis

Two distinct symptom trajectories were identified (see Figure 1). Sixty-three percent (63.4%) of participants were allocated to trajectory 1, which was characterised by continuously low symptoms at all time points. Thirty-seven percent (36.6%) were on trajectory 2, which was characterised by high symptoms at the first two time points (2-4 weeks and 6 months post-trauma) and then reduced symptom severity by 3 years post-trauma

PTSD in parents of children in MVCs

(see Figure 1). The two trajectories are subsequently referred to as low symptom trajectory (coded as 0) and high symptom trajectory (coded as 1).

### **Preliminary Investigation of Predictors of Trajectory Membership**

Demographic information about the child (age, gender, prior trauma) failed to predict the trajectory of the parents' symptoms (age:  $\chi^2(1) = 0.12, p = .73$ ; gender:  $\chi^2(1) = 0.004, p = .95$ ; prior trauma:  $\chi^2(1) = .057, p = .45$ )<sup>1</sup>. Objective trauma severity, based on triage rating (i.e., urgency of care when arrived at hospital) also failed to predict symptom trajectory ( $\chi^2(1) = 1.74, p = .19, OR = 0.76 [0.51, 1.14]$ )<sup>2</sup>.

Whether or not the parent was directly involved in the collision or heard of it later also failed to predict symptom trajectory ( $\chi^2(1) = 1.96, p = .16, OR = 0.52 [0.27, 1.30]$ ). When explored as individual regressions, subjective threat at the time of the trauma, thought suppression, maladaptive cognitions about permanent damage to the child and family irritable distress all significantly predicted trajectory membership (see Table 3 for results, as well as the list of variables in each regression). In all cases the presence of more problematic responses (e.g., more maladaptive cognitions, higher reported family irritable distress) were predictive of increased likelihood of being on the high symptom trajectory rather than low symptom trajectory. When all significant variables were added to one model (listed in Table 3) subjective peri-traumatic threat, thought suppression (post-trauma cognitive style) and maladaptive post-trauma cognitions regarding damage to the child remained significant predictors of parental trajectory membership (see Table 4).

### **Discussion**

Following a child's involvement in a trauma the parent is at risk of developing PTSD either due to their involvement in the trauma or from hearing about their child's involvement. While parental PTSD can have significant adverse consequences for the parent and child, we

---

<sup>1</sup> Parent gender was not explored as a predictor, as almost 90% of the sample were female (mothers)

<sup>2</sup> The presence or absence of a fracture and admission to the hospital ward were not included due to their low occurrence.

## PTSD in parents of children in MVCs

know little about risk factors for its development. To address this gap in the literature the current study explored the trajectories of parent PTSD symptoms, as well as risk factors for the development of higher symptoms of PTSD.

Two distinct PTSD symptom trajectories were identified. These were (1) parent's whose symptoms were high within the first month and remained high at six months post-trauma, but had reduced by three years post-trauma (high symptom trajectory), and (2) those whose symptoms remained consistently low at all time points (low symptom trajectory). Results were similar to findings by Le Brocque and colleagues (2010) who also found that acutely elevated parental PTSD symptoms declined to below clinical levels at follow-up. While such findings may suggest that symptom recovery is more likely for parental PTSD, rather than adult PTSD, where there is evidence that high symptoms can remain chronically elevated even years post-trauma (e.g., Wadsworth et al., 2009), we would suggest caution before drawing such conclusions. Our data mapped symptom trajectories over a three-year period. Therefore, it is possible that the reduction in symptom severity at three years post-trauma may be the result of a natural slow reduction in symptom severity that has been documented in both the adult and parent PTSD literature (e.g., McLaughlin et al., 2011; Murphy et al., 2003). Another plausible explanation is that our sample included no children with long-term physical impairments and no child died as a result of the trauma. Different trajectories may be found in samples where the child was involved in a more serious trauma. Thus, further research on parent PTSD symptom trajectories is needed, possibly with a focus on symptoms at other time points (e.g., 1 year post-trauma) and the inclusion of more severe events. If the finding of a decline in symptoms is replicated, exploration of why symptoms may naturally recede in the long term remains an important area for future research, particularly in relation to the child's own adjustment.

Results supported previous findings from the adult- and child-PTSD literature, that psychological factors are more important than demographic factors or objective trauma severity in the etiology/maintenance of PTSD (Kleim, Ehlers, & Glucksman, 2007; Meiser-Stedman, Dalgleish, Smith, Yule, & Glucksman, 2007; Ozer et al., 2008). Children's demographic information and objective trauma severity both failed to predict whether a parent was on the high symptom- or low symptom-trajectory. When explored individually, peri-trauma cognitions, post-trauma cognitive style, post-trauma maladaptive cognitions and post-trauma family dysfunction were all predictive of trajectory membership. However, when explored together only subjective threat to the child or self, thought suppression and maladaptive cognitions about damage to the child remained unique predictors. Findings suggest that concern with the child, rather than towards the self, is a key predictor of poorer outcomes for parents, potentially reflecting the centrality of the child's safety and wellbeing for a parent. While findings support cognitive models of PTSD (e.g., Ehlers & Clark, 2000) and the role of thought suppression in maintaining elevated symptoms (e.g., Ehlers et al., 1998) they suggest that the themes of maladaptive cognitions are different for parent- versus adult-PTSD.

### **Limitations and Future Direction**

This is one of only a few studies to explore the trajectory of parental PTSD symptoms following a child's involvement in a trauma, and the first to explore the role of post-trauma cognitions and family function as possible predictors of trajectory membership. However, we acknowledge some limitations that may have impacted on the results. First, we have provided a preliminary exploration of risk factors for poorer outcomes for parents; however, replication with a larger sample is needed. In particular, confirmation is required of the role of cognitions regarding threat to the child compared to other maladaptive cognitions that have been identified as predictors of adults PTSD, as well as the role of family functioning, given

## PTSD in parents of children in MVCs

this was the first study to explore these variables as predictors of parent PTSD. Moreover, while trajectory analysis assists in accounting for missing data, because of the relatively high attrition at three years post-trauma the study would benefit from replication using a larger sample, maintained at long term follow up assessments. A greater range of child ages and trauma types would also improve the generalizability of the findings, as would the inclusion of a greater proportion of fathers. Moreover, as only a small proportion of parents had severe PTSD symptoms, particularly at follow-up points, the results are not generalisable to more severe cases.

### **Summary and Clinical Implications**

The identification of risk factors for a parent's PTSD symptom severity, following the child's involvement in a MVC, is of relevance to both the parent and child's psychological adjustment following a trauma. That peri- and post-trauma cognitions were significantly associated with symptom trajectory suggests that PTSD treatments for adults who have suffered traumas, which target trauma-related negative appraisals and post-trauma cognitive style, would also be beneficial for parents/carers of children involved in traumas (e.g., Ehlers et al., 2005). In particular our results suggest that clinicians should be cognisant of cognitions regarding damage and risk to the child, as these appear to be a key features to parent PTSD that may maintain high PTSD symptoms. Finally, as direct parental involvement in the accident versus hearing of the child's accident failed to predict trajectory membership, both groups should be regarded as at-risk groups and offered the same treatment opportunities.



## References

- Alderfer, M. A., Navsaria, N., & Kazak, A. E. (2009). Family functioning and posttraumatic stress disorder in adolescent survivors of childhood cancer. *Journal of Family Psychology, 23*(5), 717.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5)*. Arlington, VA: American Psychiatric Publishing.
- Balluffi, A., Kassam-Adams, N., Kazak, A., Tucker, M., Dominguez, T., & Helfaer, M. (2004). Traumatic stress in parents of children admitted to the pediatric intensive care unit. *Pediatric Critical Care Medicine, 5*(6), 547-553.
- Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of consulting and clinical psychology, 68*(5), 748.
- Cabizuca, M., Marques-Portella, C., Mendlowicz, M. V., Coutinho, E. S., & Figueira, I. (2009). Posttraumatic stress disorder in parents of children with chronic illnesses: a meta-analysis. *Health Psychology, 28*(3), 379-388.
- Dalgleish, T. (2004). Cognitive approaches to posttraumatic stress disorder: the evolution of multirepresentational theorizing. *Psychological Bulletin, 130*(2), 228-260.
- de Vries, A. P., Kassam-Adams, N., Cnaan, A., Sherman-Slate, E., Gallagher, P. R., & Winston, F. K. (1999). Looking beyond the physical injury: posttraumatic stress disorder in children and parents after pediatric traffic injury. *Pediatrics, 104*(6), 1293-1299.
- Dunmore, E., Clark, D. M., & Ehlers, A. (2001). A prospective investigation of the role of cognitive factors in persistent posttraumatic stress disorder (PTSD) after physical or sexual assault. *Behaviour research and therapy, 39*(9), 1063-1084.

## PTSD in parents of children in MVCs

- D'Unger, A., Land, K., McCall, P., & Nagin, D. (1998). How many latent classes of delinquent/criminal careers? Results from mixed Poisson regression analyses of the London, Philadelphia, and Racine cohorts studies. *American Journal of Sociology*, *103*, 1593-1630.
- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour research and therapy*, *38*(4), 319-345.
- Ehlers, A., Clark, D. M., Hackmann, A., McManus, F., & Fennell, M. (2005). Cognitive therapy for post-traumatic stress disorder: development and evaluation. *Behaviour research and therapy*, *43*(4), 413-431.
- Ehlers, A., Mayou, R. A., & Bryant, B. (1998). Psychological predictors of chronic posttraumatic stress disorder after motor vehicle accidents. *Journal of abnormal psychology*, *107*(3), 508.
- Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological assessment*, *9*(4), 445-451.
- Foa, E. B., Ehlers, A., Clark, D. M., Tolin, D. F., & Orsillo, S. M. (1999). The Posttraumatic Cognitions Inventory (PTCI): Development and validation. *Psychological assessment*, *11*(3), 303.
- Jones, B. L., & Nagin, D. S. (2013). A note on a Stata plugin for estimating group-based trajectory models. *Sociological Methods & Research*, *42*(4), 608-613.
- Jones, B., Nagin, D., & Roeder, K. (2001) A SAS procedure based on mixture models for estimating developmental trajectories. *Sociological Methods & Research*, *29*, 374-393.
- Karl, A., Rabe, S., Zöllner, T., Maercker, A., & Stopa, L. (2009). Negative self-appraisals in

## PTSD in parents of children in MVCs

treatment-seeking survivors of motor vehicle accidents. *Journal of Anxiety Disorders*, 23(6), 775-781.

Kassam-Adams, N., Fleisher, C. L., & Winston, F. K. (2009). Acute stress disorder and posttraumatic stress disorder in parents of injured children. *Journal of traumatic stress*, 22(4), 294-302.

Kazak, A. E., Alderfer, M., Rourke, M. T., Simms, S., Streisand, R., & Grossman, J. R. (2004). Posttraumatic stress disorder (PTSD) and posttraumatic stress symptoms (PTSS) in families of adolescent childhood cancer survivors. *Journal of pediatric psychology*, 29(3), 211-219.

Kessler, R. C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of general psychiatry*, 52(12), 1048-1060.

Kleim, B. & Ehlers, A. (2008). Reduced autobiographical memory specificity predicts depression and posttraumatic stress disorder after recent trauma. *Journal of Consulting and Clinical Psychology*, 76(2), 231-242.

Kleim, B., Ehlers, A., & Glucksman, E. (2007). Early predictors of chronic post-traumatic stress disorder in assault survivors. *Psychological Medicine*, 37(10), 1457-1467.

Landolt, M. A., Vollrath, M., Ribi, K., Gnehm, H. E., & Sennhauser, F. H. (2003). Incidence and associations of parental and child posttraumatic stress symptoms in pediatric patients. *Journal of Child Psychology and Psychiatry*, 44(8), 1199-1207.

Le Brocque, R. M., Hendrikz, J., & Kenardy, J. A. (2010). Parental response to child injury: Examination of parental posttraumatic stress symptom trajectories following child accidental injury. *Journal of pediatric psychology*, 35(6), 646-655.

## PTSD in parents of children in MVCs

- Mayou, R., Ehlers, A., & Bryant, B. (2002). Posttraumatic stress disorder after motor vehicle accidents: 3-year follow-up of a prospective longitudinal study. *Behaviour Research and Therapy*, *40*(6), 665-675.
- McCarthy, S. (2008). Post-traumatic stress diagnostic scale (PDS). *Occupational Medicine*, *58*(5), 379-379.
- McFarlane, A. C. (1987). Family functioning and overprotection following a natural disaster: The longitudinal effects of post-traumatic morbidity. *Australasian Psychiatry*, *21*(2), 210-218.
- McLaughlin, K. A., Berglund, P., Gruber, M. J., Kessler, R. C., Sampson, N. A., & Zaslavsky, A. M. (2011). Recovery from PTSD following hurricane Katrina. *Depression and Anxiety*, *28*(6), 439-446.
- Meiser-Stedman, R., Dalgleish, T., Smith, P., Yule, W., & Glucksman, E. (2007). Diagnostic, demographic, memory quality, and cognitive variables associated with acute stress disorder in children and adolescents. *Journal of abnormal psychology*, *116*(1), 65.
- Meiser-Stedman, R., Smith, P., Glucksman, E., Yule, W., & Dalgleish, T. (2008). The posttraumatic stress disorder diagnosis in preschool- and elementary school-age children exposed to motor vehicle accidents. *The American Journal of Psychiatry*, *165*(10), 1326-1337. doi: 10.1176/appi.ajp.2008.07081282
- Morris, A., Gabert-Quillen, C., & Delahanty, D. (2012). The association between parent PTSD/depression symptoms and child PTSD symptoms: a meta-analysis. *Journal of pediatric psychology*, *37*(10), 1076-1088.
- Murphy, S. A., Johnson, L. C., Chung, I. J., & Beaton, R. D. (2003). The prevalence of PTSD following the violent death of a child and predictors of change 5 years later. *Journal of traumatic stress*, *16*(1), 17-25.
- Niyonkuru, C., Wagner, A. K., Ozawa, H., Amin, K., Goyal, A. and Fabio, A. (2013)

## PTSD in parents of children in MVCs

- Group-based trajectory analysis applications for prognostic biomarker model development in severe TBI: A practical example. *Journal of Neurotrauma*, 30, 938-945.
- Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2008). *Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. Psychological Bulletin*, 129(1), 52-73.
- Peterson, R. A., & Heilbronner, R. L. (1987). The anxiety sensitivity index: Construct validity and factor analytic structure. *Journal of Anxiety Disorders*, 1(2), 117-121.
- Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological Methodology*, 25, 111-164.
- Reiss, S., Peterson, R. A., Gursky, D. M., & McNally, R. J. (1986). Anxiety sensitivity, anxiety frequency and the prediction of fearfulness. *Behaviour research and therapy*, 24(1), 1-8.
- Rizzone, L. P., Stoddard, F. J., Murphy, J. M., & Kruger, L. J. (1994). Posttraumatic stress disorder in mothers of children and adolescents with burns. *Journal of Burn Care & Research*, 15(2), 158-163.
- StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP.
- Steil, R., & Ehlers, A. (2000). Dysfunctional meaning of posttraumatic intrusions in chronic PTSD. *Behaviour research and therapy*, 38(6), 537-558.
- Trickey, D., Siddaway, A. P., Meiser-Stedman, R., Serpell, L., & Field, A. P. (2012). A meta-analysis of risk factors for post-traumatic stress disorder in children and adolescents. *Clinical psychology review*, 32(2), 122-138.
- Vujanovic, A. A., Arrindell, W. A., Bernstein, A., Norton, P. J., & Zvolensky, M. J. (2007). Sixteen-Item Anxiety Sensitivity Index Confirmatory Factor Analytic Evidence,

## PTSD in parents of children in MVCs

Internal Consistency, and Construct Validity in a Young Adult Sample From the Netherlands. *Assessment*, 14(2), 129-143.

Wadsworth, M. E., Santiago, C. D., Einhorn, L. (2009). Coping with displacement from Hurricane Katrina: Predictors of one-year post-traumatic stress and depression symptom trajectories. *Anxiety, Stress, and Coping*, 22, 413-432.

Wells, A., & Cartwright-Hatton, S. (2004). A short form of the metacognitions questionnaire: properties of the MCQ-30. *Behaviour Research and Therapy*, 42(4), 385-396.

Table 1. Descriptive statistics of demographic and trauma-related variables for the sample who completed assessments at Time 1

Demographic Characteristics	Frequency (%) (N = 95)
<i>Parent Characteristics</i>	
Female	85 (89.5%)
Marital status	
Single/ divorced	38 (40.0%)
Relationship (married or cohabiting)	57 (60.0%)
<i>Child Characteristics</i>	
Age, years ( <i>M [SD]</i> )	6.81 (2.75)
Female	51 (53.1%)
Ethnicity	
Caucasian/white	36 (37.5%)
Minority ethnicity	59 (62.1%)
History of previous trauma exposure <sup>a</sup>	21 (22.3%)
<i>Trauma-related variables</i>	
Child admitted to hospital	14 (14.7%)
# category <sup>a</sup>	
1	9 (9.6%)
2	12 (12.7%)
3	18 (19.1%)
4	55 (58.5%)
Fracture	6 (6.3%)
Parent present at trauma	62 (65.3%)

Note. Triage (i.e. nurse rating of need for treatment) categories: 1 = immediate, 2 = very urgent, 3 = urgent, 4 = standard.

<sup>a</sup> Missing data for one case.





PTSD in parents of children in MVCs

Table 2. *Time 1 Mean Scores with Standard Deviations for Each Predictor Variable Along with Correlations between Variables*

Variables	<i>M</i> ( <i>SD</i> )	Correlations Between Predictor Variables <i>r</i> ( <i>p</i> )										
		Dissociation	Subjective Threat	Thought Suppression	Rumination	Anxiety Sensitivity	Positive Beliefs, Worry	Change to Self	Dangerous World	Blame	Damage to Child	Family Irritable Distress
T1 PDS	10.42 (9.95)	.40 ( $<.001$ )	.38 ( $<.001$ )	.44 ( $<.001$ )	.42 ( $<.001$ )	.35 ( $<.001$ )	.17 (.11)	.50 ( $<.001$ )	.45 ( $<.001$ )	.23 (.03)	.51 ( $<.001$ )	.36 (.001)
Dissociation	12.77 (3.56)		.47 ( $<.001$ )	.31 (.004)	.37 ( $<.001$ )	.23 (.04)	.11 (.33)	.41 ( $<.001$ )	.29 (.01)	.18 (.11)	.19 (.09)	.34 (.002)
Subjective Threat	10.37 (3.18)			.20 (.09)	.42 ( $<.001$ )	.11 (.33)	.17 (.15)	.39 ( $<.001$ )	.40 ( $<.001$ )	-.20 (.08)	.15 (.18)	.26 (.03)
Thought Suppression	2.48 (1.12)				.43 ( $<.001$ )	.25 (.03)	.14 (.21)	.35 (.001)	.29 (.01)	.23 (.04)	.22 (.04)	.24 (.03)
Rumination	5.66 (2.20)					.41 ( $<.001$ )	.02 (.83)	.25 (.02)	.59 ( $<.001$ )	.06 (.58)	.11 (.58)	.09 (.41)
Anxiety Sensitivity	38.92 (13.85)						-.004 (.97)	.31 (.004)	.50 ( $<.001$ )	.13 (.24)	.40 ( $<.001$ )	.28 (.01)
Positive Beliefs, Worry	9.88 (4.43)							.28 (.01)	.10 (.39)	.32 (.003)	.23 (.03)	.28 (.01)
Change to Self	5.94 (3.03)								.31 (.004)	.16 (.15)	.40 ( $<.001$ )	.53 ( $<.001$ )

PTSD in parents of children in MVCs

Dangerous World	13.35 (5.00)		.14 (.22)	.32 (.003)	.26 (.01)
Blame	2.53 (1.63)			.19 (.10)	.26 (.02)
Damage to Child	5.89 (2.65)				.46 (<.001)
Family Irritable Distress	1.16 (1.99)				

---

*Note.* Information on the possible range of scores for each variable measure can be found in the Method section of the paper.

Table 3. Results of Exploratory Logistic Regressions for Predictors of Trajectory Membership

Regression Model (bolded) and Variables	$\chi^2(1)$	<i>p</i>	OR [95% CI]
<b>Peri-Trauma Variables</b>			
Dissociation	2.87	.050	1.20 [1.00, 1.44]
Subjective threat*	6.56	.01	1.29 [1.06, 1.57]
<b>Trait Cognitive Vulnerability</b>			
Anxiety sensitivity	1.01	.32	1.02 [0.98, 1.05]
Positive beliefs about worry	3.39	.07	1.10 [0.99, 1.22]
<b>Cognitive Style</b>			
Thought suppression*	4.68	.03	1.69 [1.05, 2.72]
Rumination	2.45	.12	1.22 [0.95, 1.57]
<b>Maladaptive Cognitions</b>			
Change to self	2.52	.11	1.16 [0.97, 1.38]
Dangerous world	1.07	.30	1.06 [0.95, 1.19]
Blame	0.04	.83	1.03 [0.77, 1.39]
Damage to child*	4.39	.04	1.24 [1.01, 1.52]
<b>Family Functioning</b>			
Irritable distress*	4.16	.04	1.32 [1.01, 1.71]

Note. OR = Odds ratio; Variables added as single step in each regression model.

\**p* < .05

PTSD in parents of children in MVCs

Table 4. *Final Logistic Regression Model for All Significant Predictors of Trajectory Membership*

Variables	$\chi^2$ (1)	<i>p</i>	OR [95% CI]
Subjective threat	6.88	.01	1.32 [1.07, 1.61]
Thought suppression	4.32	.04	1.96 [1.04, 3.71]
Maladaptive cognitions, damage to child	4.34	.04	1.30 [1.10, 1.66]
Family irritable distress	0.53	.47	1.19 [0.74, 1.91]

*Note.* OR = Odds ratio. *Nagelkerke R*<sup>2</sup> for this model = .45.

## PTSD in parents of children in MVCs

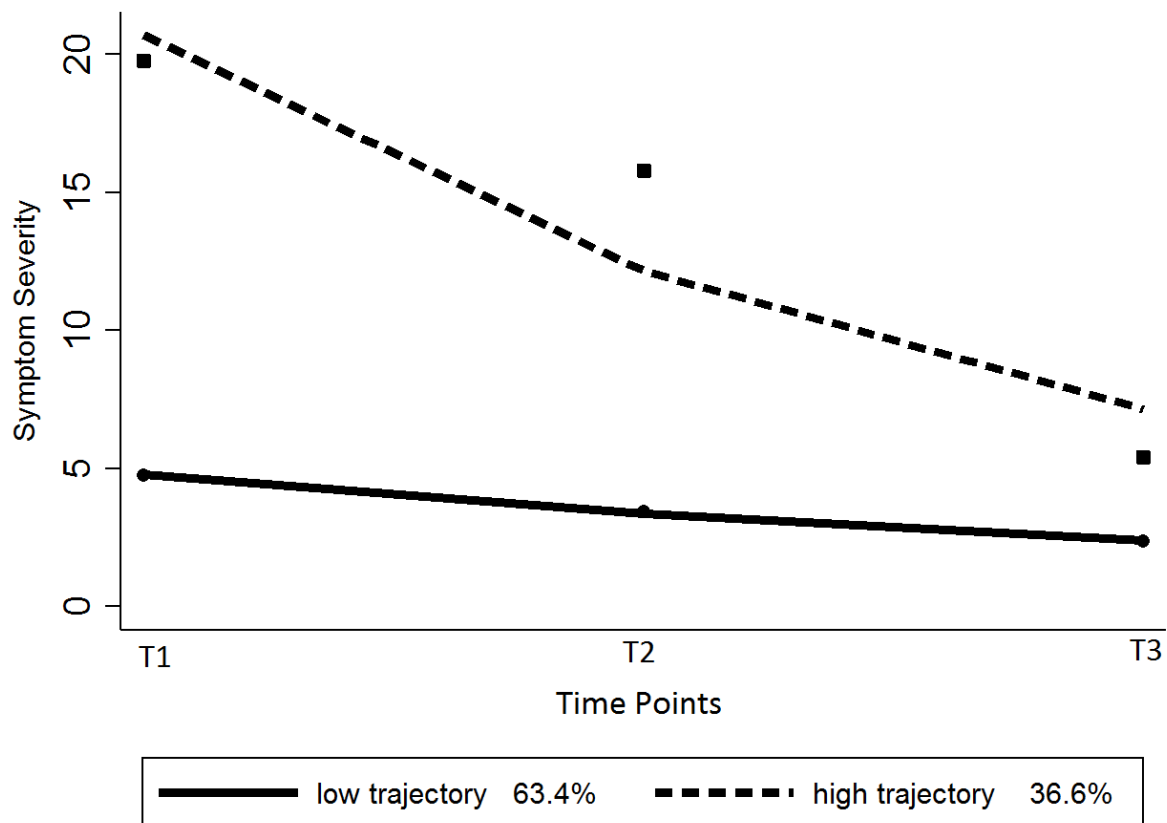


Figure 1. Trajectories for PTSD symptom severity over a three-year period ( $N = 95$ ).

Note. x-axis not to scale.