

# Psychological consequences of road traffic accidents for children and their mothers

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## ABSTRACT

**Background.** Little is known about the psychological and behavioural consequences of road traffic accidents for children. The study aimed to determine the outcome of road traffic accidents on children and their mothers.

**Method.** A 1-year cohort study of consecutive child attenders aged 5–16 years at an Accident and Emergency Department. Data were extracted from medical notes and from interview and self-report at baseline, 3 months and 6 months.

**Results.** The children had an excellent physical outcome. Fifteen per cent suffered acute stress disorder; 25% suffered post-traumatic stress disorder at 3 months and 18% at 6 months. Travel anxiety was frequent. Post-traumatic consequences for mothers were common.

**Conclusion.** Psychological outcome was poor for a minority of children and associated with disability, especially for travel. There were significant family consequences. There is a need for changes in clinical care to prevent, identify and treat distressing and disabling problems.

## INTRODUCTION

Road traffic accidents (RTA) are the main cause of death in childhood and a greatly more frequent cause of injury, which is usually of minor severity. Although research with adult populations has shown that psychological and social complications are very frequent and often persistent (Mayou & Bryant, 2001; Mayou *et al.* 2001), rather less is known about the consequences for children. There has been one study of acute stress disorder (ASD) among children who have been admitted to hospital (Winston *et al.* 2000). Several recent reports, mainly from the United Kingdom, have concluded that post-traumatic stress disorder and other psychological and behavioural consequences are frequent (Di Gallo *et al.* 1997; Ellis *et al.* 1998; Mirza *et al.* 1998; Stallard *et al.* 1998, 1999; de Vries *et al.* 1999; McDermott & Cvitanovich, 2000). However, these studies have used varied methods

of assessment of post-traumatic symptoms at different time intervals and have generally lacked a comprehensive view of outcome. There has been no report on acute stress disorder in this population. This study used a range of measures comparable to those used in research with adult road accident victims in order to establish prevalence of acute stress disorder, post-traumatic stress disorder (PTSD) and phobic travel anxiety; examine the effects on behaviour, activities and sleep; investigate factors associated with longer-term psychiatric problems in children; and describe the effects of the child's RTA on the mother.

## METHOD

### The sample

Children resident in Oxfordshire and aged 5–16 years who were passengers, pedestrians or cyclists involved in a road traffic accident (RTA) and who were taken to the emergency department of the John Radcliffe Hospital in July

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1997–July 1998 were recruited into a prospective study. Those who had been unconscious for more than 15 min ( $N=3$ ), could not speak English ( $N=2$ ), were about to move out of the area ( $N=3$ ) or had been driving motor cycles or stolen cars ( $N=14$ ) were excluded. A further group had to be excluded because the hospital notes were missing or not available in time, or the information was inadequate ( $N=13$ ).

### Measures

The assessment of pre-morbid adjustment, the accident and its immediate and later consequences was based on standard measures supplemented by semi-structured questionnaires based on our previous experience with adult accident victims. We identified a measure of pre-morbid vulnerability based on previous consultation with a doctor or psychologist for distress or behavioural problems. The interviews were held jointly with mothers and children, collecting questionnaire information separately. With younger children, the parent attending the interview (usually the mother) complemented the child's answer to the items and also provided information on symptoms of repetitive play and re-enactment. Older children generally preferred to be spoken to separately with their parents sitting to one side or leaving the room.

#### *Severity of injury*

The Injury Severity Score (ISS) of the Abbreviated Injury Scale (AIS) (American Association for Automotive Medicine, 1990) was used to rate information 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 squares of the highest AIS score in each of the three most injured ISS body regions (head or neck, face, chest, abdominal, extremities).

#### *Child's sleep problems*

The Simonds and Parraga Sleep Questionnaire (SPSQ) (Simonds & Parraga, 1982) was chosen as probably the most comprehensive child sleep questionnaire available at the time. This was shortened to questions that would identify the major categories of sleep disorders: difficulty getting off to sleep or staying asleep, problems with excessive sleepiness and events occurring

during sleep (parasomnias), such as sleepwalking or nightmares. The items are scored on a 0–5 scale from 0 'never' to 4 'daily', and refer to the child's sleep over the previous 2 weeks. As a general indication of change since before the accident a global 'change' question was added, rated on a 5-point scale from 'a lot worse' to 'a lot better'.

#### *Child's behaviour*

The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) was chosen as a measure of the child's behaviour because it is appropriate for the age range of the children under study, is widely used in the United Kingdom with norms available and is relatively brief. It also has scores reflecting the types of behaviour likely to be affected: emotional symptoms, conduct problems, hyperactivity and peer relationships. A total deviance score is obtained by summarising these four scores. The SDQ has the added advantages of having a pro-social behaviour scale with positive questions about the child, which is appealing to respondents. The questions on the SDQ refer to the child's behaviour in the previous 2 weeks, and are scored on a 3-point system: 0 'not true', 1 'somewhat true', 2 'certainly true'. Cut-off scores are available which categorize roughly 80% of children in the community as normal, 10% as borderline and 10% as abnormal cases. As a general indicator of change since before the accident a global change question was added for each of the factors, rated on a 5-point scale from 'a lot worse' to 'a lot better'.

#### *Child acute stress disorder and post-traumatic stress disorder*

At the time this study was planned there were no reports of ASD in children (Salmon & Bryant, 2002). Although a number of assessments of PTSD in children have been widely used, they are generally unsatisfactory in yielding DSM-IV diagnoses (McNally, 1996). However, we believed that it was important to make standard diagnoses in order to compare findings with those for adult RTA victims and with other trauma populations. We therefore piloted widely-used measures (Impact of Events Scale, children's version (Dyregrov & Yule, 1995) and the Child Post-Traumatic Stress Research Index (Pynoos *et al.* 1987)), consulted the authors

of these measures and other research workers and decided to use a standard instrument supplemented by extra questions.

The principle measure used was the eight-question children version (Dyregrov & Yule, 1995) of the Impact of Events Scale (IES) (Horowitz *et al.* 1979). The IES is a standardized scale of established reliability and validity and has been widely used in trauma studies of children (McNally, 1996). It measures intrusive and avoidance symptoms. It is scored on a four-point scale from 'no' to 'a lot'. A cut-off of 17 is recommended on the IES-8 to identify children with significant post-trauma reactions. DSM-IV symptoms of ASD and PTSD not covered by the IES-8 were therefore assessed using corresponding items from the Post-Traumatic Stress Disorder Reaction Index (RI) (Pynoos *et al.* 1987). If none of the IES or RI items measured a DSM-IV symptom, the authors constructed a new item, for example, symptom C6 was assessed with the question 'Is it difficult for you to have strong feelings? For example, do you find it hard to get really excited or happy, or do you find it hard to cry when you are sad?'. These items were coded on the same four-point scale as the IES items, and all were scored from 0 'no' to 3 'yes, a lot'. To avoid duplication, sleep disturbance was scored from the Simonds & Parraga sleep questionnaire. Some DSM-IV items were represented by two items, for example the IES items 'Do pictures of the accident pop into your mind' and 'Do you think about the accident even if you don't mean to?' both represented symptom B1. The maximum score for these items was used in the overall severity score. For young children, the parent attending the interview (usually the mother) complemented the child's answers to the items and also provided information on symptoms of repetitive play and re-enactment.

Dissociation was assessed by questions based on DSM-IV criteria for a diagnosis of ASD. Significant distress or impairment in social functioning was assessed using questions from the interview rated on a four-point scale from 'none' to 'great'. A cut-off of  $\geq 1$  was used to denote the presence of PTSD and ASD symptoms, similar to previous studies in adults (Bryant & Harvey, 1997; Mayou *et al.* 2001). As Brewin and colleagues (1999) have advocated a stricter cut-off of '2' for the re-experiencing,

avoidance, hyperarousal and social functioning criteria of ASD, we also report the results for this stricter cut-off.

#### *Phobic travel anxiety*

This was assessed from answers to questions based on previous adult studies (Mayou & Bryant, 2001) about four travel situations (going in a car, riding a bicycle, crossing the road, walking along the road). The children rated these as 'OK' or 'I don't like/want to do it'. They were asked to describe their fears in detail, and to say whether these had made it difficult to get on with friends or family, spoilt leisure and fun activities or created problems at school. Phobic travel anxiety was then diagnosed on the basis of DSM-IV, if the accounts gave clear evidence of distress and of change in behaviour.

#### *Mother's acute stress disorder and post-traumatic stress disorder*

These were measured using the Post-traumatic Stress Diagnostic Scale (PDS) (Foa *et al.* 1997), together with additional questions covering dissociative symptoms and social impairment. The cut-offs were the same as those for the children.

#### **Procedure**

Families were contacted in the first week, and interviews were held with a parent and the child at approximately 2 weeks, 3 months and 6 months after the accident. The assessments consisted of semi-structured interviews lasting about an hour to obtain detailed information about the family, the accident and the process of being taken to hospital, and about subsequent effects on the child's behaviour, mood, social life and travel. Some of the questions were for the child to answer and some for the parent. The children also completed the IES-8 and additional questions covering other ASD and PTSD symptoms. The parent completed the SPSQ and the SDQ about the child's sleep and behaviour. The parent also completed the PDS scale measuring his or her own PTSD symptoms. The follow-up assessments at 3 and 6 months after the accident repeated these measures as appropriate. In order to minimize the disruption to busy parents and children 3 and 6 month follow-up assessments were done by telephone and postal questionnaire unless

the child had ASD or scored  $\geq 17$  on the IES-8 at the initial assessment, or there were known family or learning problems which might make completion of postal questionnaires difficult. In order not to miss seeing children who developed symptoms late the IES-8 was used as a telephone screening tool, and those scoring  $\geq 17$  at 3 or 6 months received an interview visit.

## RESULTS

### Participants versus non-participants

A total of 145 children, from 136 families (some accidents involved two or more siblings) were invited to take part in the study. Of these, 86 children (59%) from 80 families agreed to participate. Non-participation was not related to the age or gender of the child, or to the type of accident. Those with less severe injury were less likely to take part. Most of the parents who did not want to take part were willing to speak briefly on the telephone about their reasons and about the child's reaction. On the basis of this information 48 of the 64 non-participant children were categorized into four groups indicating levels of distress: (1) probably no psychological consequences (22 children, 46%), child described as 'fine' etc., the children in this group were significantly older than in the other groups; (2) no evidence of adverse consequences (13 children, 27%), the parent said they wanted to forget about it, not talk about it, not dwell on it, not 'upset the applecart' etc., but not enough evidence to rate 3; (3) probable mild transient distress (6 children, 13%), children described, for example, as upset or had nightmares for a couple of days but all right now; (4) probable acute stress disorder (7 children, 15%), very distressed; three children in this group were in an accident in which a young child was killed.

### The interview sample

The remainder of this paper is concerned with the 86 children and 80 parents who agreed to participate. Twenty-nine per cent of the children were alone (mainly cyclists or pedestrians); 26% were with a parent (usually as a vehicle occupant); 15% were with another adult in a vehicle and 30% were with siblings or friends (mainly cyclists or pedestrians). Three month information was obtained for 81 children (94%) and 6 month information for 82 (95%). The main

adult informant was the mother. In ten cases the father was also present, but only one father was the sole informant (for convenience the word 'mother' is used throughout to denote the parent). At the first interview 80 of the 86 children were seen, in six cases the parents did not want the child questioned. At 3 months 48% were seen, 22% were interviewed on the telephone and 30% completed postal questionnaires. At 6 months, the figures were 42, 27 and 32% respectively. Each type of approach covered the same information. At Time 1, 47% of children completed the reaction index alone and 30% with help from a parent or another adult. At Times 2 and 3 the figures were respectively 64 and 30% and 64 and 28%. Questions completed by a parent were 5% at Times 1 and 2 and 8% at Time 3.

The background characteristics of the children and features of the accident and injuries are summarized in Table 1. There were slightly more boys than girls. Just over half were teenagers and only a fifth were aged under 10 years. Two-thirds were living with both natural parents.

Over half the accidents (55%) happened very near the child's home, and a further 13% outside the school. Children in these accidents were mainly pedestrians and cyclists. Of the vehicle occupants 41% were with a parent in the car. The great majority of the children had only minor injuries and were not admitted to hospital.

### Outcome for children

#### *Reactions to the accident*

Half the children rated themselves as having been frightened 'a lot' during the accident, and nearly half (48%) thought they were going to die or be badly hurt. Finding the accident very frightening was not associated with the child's age or gender, or with severity of injury. The process of being taken to hospital could be considered to be a further traumatic experience, and children were asked how scared or frightened they felt in the ambulance or in hospital. Only 10% said they were very scared, and two-thirds were not frightened at all. Indeed, some children commented that they felt safe in hospital. However, two-thirds of the 40 children who were restrained by boards and collars

Table 1. Demographic, accident and injury characteristics of the sample

|   | Participants<br>(N=86)<br>% | Non-participants<br>(N=59)<br>% | P†  |
|---|-----------------------------|---------------------------------|-----|
| Age, mean (s.d.)                                      | 12.27 (2.86)                | 11.98 (3.39)                    | NS‡ |
| Gender  |                             |                                 |     |
| Male  | 55                          | 56                              | NS  |
| Female  | 45                          | 44                              |     |
| Vehicle type  |                             |                                 |     |
| Car   | 43                          | 49                              | NS  |
| Pedal cycle   | 23                          | 22                              |     |
| Pedestrian  | 31                          | 29                              |     |
| Motor cycle pillion                                   | 2                           |                                 |     |
| Injury type   |                             |                                 |     |
| Bony  | 23                          | 3                               | **  |
| Soft tissue only                                      | 73                          | 95                              |     |
| Not injured   | 4                           | 2                               |     |
| Injury severity score, mean (s.d.)<br>range           | 2.40 (1.71)<br>0-9          | 1.73 (0.99)<br>0-5              | **  |
| Admitted to hospital                                  |                             |                                 |     |
| Yes   | 21                          | 13                              | NS  |
| No  | 79                          | 88                              |     |
| Immobilized in ambulance                              |                             |                                 |     |
| Yes   | 46                          | 42                              | NS  |
| No  | 55                          | 58                              |     |
| Not known   |                             | (4)                             |     |
| Not applicable  | (20)                        | (17)                            |     |
| Unconscious   |                             |                                 |     |
| Yes, probably   | 9                           | 12                              | NS  |
| No  | 91                          | 88                              |     |
| Child in previous RTA                                 |                             |                                 |     |
| No  | 79                          | not available                   |     |
| Yes, not injured                                      | 13                          |                                 |     |
| Yes, injured  | 8                           |                                 |     |
| Child has had treatment for stress/behaviour problems |                             |                                 |     |
| No  | 79                          | not available                   |     |
| Yes   | 21                          |                                 |     |
| Mother's employment                                   |                             |                                 |     |
| Full-time   | 52                          | not available                   |     |
| Part-time   | 28                          |                                 |     |
| Does not work   | 20                          |                                 |     |
| Mother's social class                                 |                             |                                 |     |
| Non-manual  | 74                          | not available                   |     |
| Manual  | 26                          |                                 |     |
| Not known/not classifiable                            | (14)                        |                                 |     |
| Child scared/frightened                               |                             |                                 |     |
| No  | 16                          | not available                   |     |
| A little bit  | 35                          |                                 |     |
| A lot   | 50                          |                                 |     |
| Not sure/not known                                    | (2)                         |                                 |     |

† Test of significance chi-square with df 1, except for Injury type (df 2) and Vehicle type (df 3).

‡ Test of significance for Age was *t* test (df 148).

\*\* *P* < 0.01; NS, not significant.

described this as horrible or very uncomfortable, and one became so panicky that he had to have the restraints removed.

Table 2. Children: psychological outcomes at first assessment, 3-month and 6-month follow-up (%); post-traumatic symptom assessment (%); and Impact of Events Scale (mean, s.d.)

|                                   | First<br>assessment<br>(N=86)<br>% | 3 months<br>(N=81)<br>% | 6 months<br>(N=81)<br>% |      |      |      |            |          |
|-----------------------------------|------------------------------------|-------------------------|-------------------------|------|------|------|------------|----------|
| Post-traumatic symptom assessment |                                    |                         |                         |      |      |      |            |          |
| ASD                               | 15                                 | —                       | —                       |      |      |      |            |          |
| PTSD                              | —                                  | 25                      | 18                      |      |      |      |            |          |
| ASD/PTSD symptom areas            |                                    |                         |                         |      |      |      |            |          |
| Dissociation                      | 19                                 | —                       | —                       |      |      |      |            |          |
| Re-experiencing                   | 88                                 | 78                      | 62                      |      |      |      |            |          |
| Avoidance                         | 74                                 | 36                      | 32                      |      |      |      |            |          |
| Arousal                           | 94                                 | 76                      | 58                      |      |      |      |            |          |
| Social impairment                 | 67                                 | 54                      | 44                      |      |      |      |            |          |
| Phobic travel anxiety             | —                                  | 37                      | 34                      |      |      |      |            |          |
| IES-8 score ≥ 17                  | 34                                 | 18                      | 18                      |      |      |      |            |          |
| Impact of Events Scale            | Mean                               | s.d.                    | Mean                    | s.d. | Mean | s.d. | <i>F</i> † | df       |
| Total score                       | 12.42                              | 9.89                    | 9.03                    | 8.05 | 7.73 | 8.78 | 10.86      | 122.2*** |
| Intrusions score                  | 6.32                               | 5.40                    | 3.44                    | 3.78 | 2.74 | 3.46 | 23.85      | 122.2*** |
| Avoidance score                   | 6.10                               | 7.00                    | 5.60                    | 6.30 | 4.98 | 6.60 | 1.10       | 122.2    |

† Test of significance: analysis of variance for repeated measures.  
\*\*\* *P* < 0.001.

As a measure of the child's early distress mothers were asked to rate changes in the child's behaviour and mood in the 2 weeks following the accident. Extreme adverse effects were rare, but a third of the children were felt to be more anxious and 28% more upset or worried.

*Physical outcome*

Most of the children made a good physical recovery. At 3 months 83% were receiving no further treatment, and this had increased to 92% by 6 months. Seven per cent were still having physiotherapy at 6 months, and 2% were still attending out-patient clinics. Three-quarters of the children said they had no pain or physical problems from their injuries at 3 months, and four-fifths at 6 months.

**How many children develop ASD, PTSD and travel anxiety?**

Table 2 shows the proportions of children with ASD and PTSD and phobic travel anxiety. The

IES-8 scores are also shown. One-third of the children scored at or above the recommended cut-off for PTSD of  $\geq 17$  at the first assessment, and about one-fifth at 3 and 6 months. The intrusion scores showed significant improvement over time, but the avoidance scores did not improve.

#### *Acute stress disorder*

Symptoms of acute distress were common, particularly those of re-experiencing, avoidance and arousal. However, only 15% met the criteria for a DSM-IV diagnosis of ASD, largely due to the small proportion with three or more dissociative symptoms. There was a trend for more girls than boys to have ASD (19% compared with 5% of boys;  $\chi^2$  with Yates' correction = 2.875,  $df = 1$ ,  $P < 0.1$ ). Age, injury severity and admission to hospital were not associated with ASD. If the stricter cut-off for scoring symptoms (Brewin *et al.* 1999) was used, only 11% of the children met criteria for ASD.

#### *Post-traumatic stress disorder*

Twenty-nine per cent of the children had PTSD at some stage, 25% at 3 months and 18% at 6 months. Of the 19 children with PTSD at 3 months, 58% still had PTSD at 6 months. Four children had a late onset of PTSD between 3 and 6 months, one of whom had been in a further road accident.

#### *Travel anxiety*

Phobic distress about travel was common, and about half the children had difficulty in at least one travel situation (Table 3). This distress was closely associated with the type of accident, with, for example, pedestrians and cyclists reporting more anxiety about using or crossing the road or cycling, while more of the car occupants said they did not like going in cars. This distress often meant that children could not see their friends, travel with them to and from school or join in their leisure activities outside the home.

Over a third of children had travel problems which satisfied diagnostic criteria for specific phobia (defined as distress or avoidance, together with evidence of limitation of social activities or relationships as required by DSM-IV; the diagnoses were based on self-report information, together with responses to specific questions about the nature of distress and of

Table 3. *Baseline factors associated with PTSD and travel anxiety*

|                       | Perceived threat of accident |                    | Child more anxious (mother's rating) |               |
|-----------------------|------------------------------|--------------------|--------------------------------------|---------------|
|                       | Not very frightening %       | Very frightening % | No %                                 | Yes %         |
| <b>PTSD</b>           |                              |                    |                                      |               |
| At 3 months           | 18                           | 38* (N = 77)       | 16                                   | 46** (N = 74) |
| At 6 months           | 9                            | 34** (N = 78)      | 12                                   | 32* (N = 78)  |
| <b>Travel anxiety</b> |                              |                    |                                      |               |
| At 3 months           | 29                           | 53* (N = 77)       | 28                                   | 63** (N = 74) |
| At 6 months           | 26                           | 50* (N = 78)       | 26                                   | 56* (N = 75)  |

Test of significance  $\chi^2$ ;  $df = 1$ .

\*  $P < 0.05$  (exact sig. one-sided); \*\*  $P < 0.01$ .

avoidance behaviour). Criteria require 6 months duration. However, we identified 31% of subjects describing symptoms of phobic travel anxiety at 2 months and 37% at 3 months. The DSM-IV could be definitely applied to 34% with similar symptoms at 6 months. Specific problems included distress when in cars or when walking with parents and when trying to cross roads. Avoidance symptoms included unwillingness to cycle, to walk near the site of the accident and unwillingness to cross roads. Several described considerable efforts to avoid being in situations which reminded them of the accident.

#### *Phobic travel anxiety and PTSD at 6 months*

As would be expected, given that they have symptoms in common, there was some overlap between diagnoses of PTSD and phobic travel anxiety. Eighty-seven per cent of the 15 children with PTSD at 6 months also had travel anxiety. However of the 28 children with travel anxiety, only 46% had PTSD.

#### *Baseline factors associated with PTSD and phobic travel anxiety*

Age, gender, accident group, injury severity, unconsciousness and previous psychological vulnerability were not associated with PTSD or phobic travel anxiety at any stage. Perceived threat of the accident and increased anxiety in the 2 weeks after the accident (mother's rating) were associated with both PTSD and phobic travel anxiety at both 3 and 6 months (see Table 3).

## Consultation

Two families were seen by hospital psychologists following exceptional accidents involving the death or major injury of a child.

## Are there consequences for behaviour and sleep?

### Behaviour

Table 4 shows the proportions of children in the categories of 'normal', 'borderline' and 'abnormal' behaviour on the SDQ, as assessed by their mothers. At the first assessment 12% had abnormal scores on the total deviance scale. These children were significantly more likely to have been referred to a doctor or psychologist for stress or behaviour difficulties before the accident (67% of the 'abnormal' group compared with 17% of 'borderline' and 16% of 'normal':  $\chi^2 = 11.54$ ,  $df = 2$ ,  $P < 0.01$ ,  $N = 76$ ).

Associations between behavioural abnormalities and ASD or PTSD were explored. At the first assessment more of the children who were abnormal or borderline cases on the emotional symptoms scale had ASD, 33% compared with 9% of the normal cases ( $N = 75$ ,  $\chi^2 = 4.78$ ,  $df = 1$ ,  $P < 0.05$ ). Emotional symptoms were also associated with PTSD at 3 months but not at 6 months. At 6 months abnormal/borderline conduct cases and pro-social cases were more likely to have PTSD.

### Sleep disturbance

For the group as a whole there was little evidence of major adverse effects on sleep. Only 10% of children were rated by their mothers as sleeping less well in the 2 weeks after the accident than before the accident (Table 2). Scores on the SPSQ subscales showed that sleep anxiety, sleep quality and early waking scores had decreased slightly by 6 months, but there were no significant time effects.

An interesting question is whether sleep disturbance is associated with post-traumatic stress. Since some sleep problems are also symptoms of ASD and PTSD, a score of  $\geq 17$  on the IES-8 (which does not contain questions about sleep) was used as the measure of PTSD symptom distress. The sleep scores were dichotomized into 'less than once a week' or 'once a week or more' to provide a measure of mild sleep disturbance. The results for the assessment 2 weeks after the accident are shown in Table 5. Sleep

Table 4. Child's behaviour rating 'case' (assessed by mother) at first assessment, 3 months and 6 months

| Strengths & Difficulties Questionnaire | First                           | 3 months          | 6 months          |
|--|---------------------------------|-------------------|-------------------|
|  | assessment<br>( $N = 76$ )<br>% | ( $N = 69$ )<br>% | ( $N = 70$ )<br>% |
| Total deviance case                    |                                 |                   |                   |
| Normal                                 | 80                              | 78                | 80                |
| Borderline                             | 8                               | 7                 | 7                 |
| Abnormal                               | 12                              | 15                | 13                |
| NK                                     | (10)                            | (17)              | (17)              |
| Hyperactivity case                     |                                 |                   |                   |
| Normal                                 | 84                              | 75                | 79                |
| Borderline                             | 3                               | 3                 | 4                 |
| Abnormal                               | 13                              | 22                | 17                |
| NK                                     | (10)                            | (17)              | (16)              |
| Emotional symptoms case                |                                 |                   |                   |
| Normal                                 | 76                              | 74                | 77                |
| Borderline                             | 7                               | 12                | 11                |
| Abnormal                               | 17                              | 15                | 11                |
| NK                                     | (10)                            | (17)              | (16)              |
| Conduct problems case                  |                                 |                   |                   |
| Normal                                 | 71                              | 77                | 67                |
| Borderline                             | 16                              | 7                 | 13                |
| Abnormal                               | 13                              | 16                | 20                |
| NK                                     | (17)                            | (16)              | (16)              |
| Peer problems case                     |                                 |                   |                   |
| Normal                                 | 73                              | 76                | 69                |
| Borderline                             | 16                              | 6                 | 11                |
| Abnormal                               | 12                              | 14                | 20                |
| NK                                     | (9)                             | (18)              | (16)              |
| Prosocial case                         |                                 |                   |                   |
| Normal                                 | 86                              | 88                | 80                |
| Borderline                             | 3                               | 5                 | 11                |
| Abnormal                               | 12                              | 7                 | 9                 |
| NK                                     | (10)                            | (17)              | (16)              |

Test of significance for change in caseness over time: Friedman test,  $df = 2$ ; all comparisons were not significant.

NK, Not known.

anxiety and parasomnias were associated with post-traumatic stress symptoms at the first assessment, but not at the 3 and 6 month follow-ups.

## Effects on mothers

Three-quarters of mothers described themselves as having felt very or moderately frightened and a half feared their child might have been seriously injured or killed, whether or not they had been in the accident themselves or had witnessed it. About half the mothers complained of the long wait to see the doctor and a third felt they should have been informed about the effects of shock and what to expect when the child came home.

Table 5. *Sleep problems by Impact of Events score at first assessment*

| Frequency†       | Impact of Events score |      |               |      | P ( $\chi^2$ , df 1) |
|------------------|------------------------|------|---------------|------|----------------------|
|                  | <17<br>(N=52)          |      | ≥17<br>(N=23) |      |                      |
|                  | N                      | (%)  | N             | (%)  |                      |
| Sleep anxiety    |                        |      |               |      |                      |
| <1/week          | 36                     | (69) | 10            | (43) | *                    |
| ≥1/week          | 16                     | (31) | 13            | (57) |                      |
| Parasomnias      |                        |      |               |      |                      |
| <1/week          | 48                     | (92) | 16            | (70) | *                    |
| ≥1/week          | 4                      | (8)  | 7             | (30) |                      |
| Sleep quality    |                        |      |               |      |                      |
| <1/week          | 27                     | (52) | 10            | (43) | NS                   |
| ≥1/week          | 25                     | (48) | 13            | (57) |                      |
| Sleep resistance |                        |      |               |      |                      |
| <1/week          | 29                     | (56) | 9             | (39) | NS                   |
| ≥1/week          | 23                     | (44) | 14            | (61) |                      |
| Early waking     |                        |      |               |      |                      |
| <1/week          | 49                     | (98) | 20            | (91) | NS                   |
| ≥1/week          | 1                      | (2)  | 2             | (9)  |                      |

† Frequency based on at least one item in each area occurring once a week or more.

\*  $P < 0.05$ ; NS, not significant.

#### *Mothers' ASD and PTSD*

Symptoms of acute stress disorder at the first interview were common among mothers with 84% reporting persistent re-experiencing and 81% increased arousal. However only 16% met all the criteria for a diagnosis of ASD (12% using the stricter cut-off (Brewin *et al.* 1999)). Mothers who had themselves been in or witnessed the accident were significantly more likely to have ASD (38% compared with 7% of those not present,  $N = 78$ ,  $\chi^2 = 11.39$ ,  $df = 1$ ,  $P < 0.01$ ). Neither the child's age nor the severity of the child's injuries was associated with ASD in the mother.

At 3 and 6 month follow-up half the mothers were experiencing symptoms of reliving and increased arousal, but only two (4%) were diagnosed as suffering PTSD. This represents 11% at 3 months and 13% at 6 months of mothers who had been in or witnessed the accident.

#### *Associations between mother's and child's ASD and PTSD*

There was no association between mother's and child's diagnosis of ASD or PTSD, whether or not the mother had also been involved in the accident or witnessed it. In only three cases

did both have ASD. In the 21 cases where both mother and child had been present at the accident eight mothers, but only one child, had ASD.

## DISCUSSION

The majority of children suffered only very minor physical injuries; most others made a rapid physical recovery from more serious injury. The information from all sources enables us to conclude that although most children have a good psychological outcome, others suffer temporary distress and behavioural difficulties and a minority experience persistent problems. Over a quarter described adverse psychological or social consequences at 3 and 6 months of which difficulties about travel were the most conspicuous. The findings are in many ways comparable to those we described for adult road accident victims despite the differences between adult and children in intrusion and avoidance symptoms and despite the lack of control younger children have over activities such as travel. The present findings add to understanding of the immediate and longer-term psychological consequences of road accidents for both children and mothers, using a wide range of outcomes. Some details of methods and results from other studies of children suffering road accidents are shown for ease of comparison in Table 6. There has also been a report of ASD and PTSD in children who were admitted to hospital following injury of all types (Davis *et al.* 2000*a, b*).

The study has a number of limitations. Like other research groups, we had considerable difficulty in recruitment because parents were unwilling to take part in research about an event which had caused them distress and which they feared might exacerbate their children's distress. The children themselves were sometimes unenthusiastic. Nevertheless, the information obtained about initial outcome for the majority of non-participants greatly strengthens the prevalence estimates. The pilot studies led us to concentrate on recruitment and interview procedures which were likely to obtain the maximum participation by children and mothers throughout the study. No doubt the greater attempts to interview young children separately or to try and insist on seeing children

Table 6. Reported prevalences of PTSD in children following a road traffic accident

| Study                          | Age range | ASD/PTSD measure   | N   | Eligible % | Follow-up                 | PTSD diagnosis %/<br>symptom severity  |
|--------------------------------|-----------|--|-----|------------|---------------------------|--|
| Winston <i>et al.</i> (2000)   | 5–17      | CASQ   | 95  | 212        | 1 mth                     | 28 'Broad distress'  |
| Di Gallo <i>et al.</i> (1997)  | 5–18      | PTSD-RI + IES  | 57  | 77         | 3 mths                    | 6 'Severe' on RI<br>8 'Moderate' on RI   |
| Ellis <i>et al.</i> (1998)     | 5–16      | Parent rating of psychological functioning                     | 45  | 58         | 6 mths                    | 11 Rated 'severely affected' by parent   |
| Mirza <i>et al.</i> (1998)     | 8–16      | PTSD-RI +  | 119 | 76         | 6 wks<br>6 mths           | 23 'Severe' on RI<br>6 'Moderate' on RI<br>12 'Severe' on RI<br>2 'Moderate' on RI |
| Stallard <i>et al.</i> (1998)  | 5–18      | CAPS-C   | 119 | 43         | 6 wks                     | 34 PTSD diagnosis  |
| de Vries <i>et al.</i> (1999)  | 3–18      | PCL-C-PR (parent report)                                       | 102 | 52         | 7–12 mths                 | 25 PTSD diagnosis  |
| McDermott & Cvitanovich (2000) | 8–13      | PTSD-RI  | 26  | 34         | 3 mths<br>3 mths          | 8 PTSD diagnosis<br>11 'Severe' on RI<br>11 'Moderate' on RI                       |
| Present study                  | 5–16      | IES + RI & other questions covering ASD & PTSD DSM-IV criteria | 86  | 59         | 2 wks<br>3 mths<br>6 mths | 15 ASD diagnosis<br>25 PTSD diagnosis<br>18 PTSD diagnosis                         |

CASQ, Measure co-opted and extended for the study; PTSD-RI (Post-traumatic Stress Disorder Reaction Index), a structured interview for assessing DSM-III-R diagnosis in children; PCL-C/PR (PTSD Checklist for Children/Parent Report), 17-item questionnaire in which items correspond with DSM-IV criteria for a diagnosis of PTSD; and CAPS-C (Clinician Administered PTSD Scale for Children), administered by a researcher in an interview format and assesses frequency and intensity of each of DSM-IV criteria.

when screening telephone interviews suggested that there were no persistent problems would have been unacceptable to a number of families and would have further limited data collection. There were some limitations in follow-up in that we relied on screening questions and telephone interviews as well as face-to-face interviews. It was not always possible to speak to children as well as parents. While we made very considerable efforts to obtain high quality information about ASD and DSM symptoms the final measure, based on adapting a standard measure and adding extra questions, is a methodological limitation. Although less seriously injured children were under-represented in our sample, severity of injury was not associated with outcome.

### Acute stress disorder

Although only 11% of the children were diagnosed as suffering ASD, symptoms of persistent re-experiencing, avoidance and arousal were reported for between two-thirds and three-quarters. There have been no other studies of children involved in road traffic accidents which have assessed ASD at this early stage, although Di Gallo *et al.* (1997) reported that 14% of

children aged 5–18 years had severe post-traumatic symptom scores on the PTSD-RI at 2–16 days post-accident.

Procedures for assessing post-traumatic symptoms enable us to apply DSM-IV criteria for both ASD and PTSD in a manner that was not possible with rating procedures used in some other studies. The proportion of children diagnosed as having ASD was much lower than might have been expected from their scores on the IES, which raises the possibility that the DSM-IV criteria may not be entirely appropriate for children. In particular, there were very few children who met the requirement for at least three dissociative symptoms for a diagnosis of ASD. The dissociation questions may have been particularly difficult for some children to understand. The emphasis placed on dissociative symptoms in the DSM-IV diagnostic scheme has also been questioned by others in relation to both adults and children (Salmon & Bryant, 2002).

### Post-traumatic stress disorder

The prevalences of PTSD found in the present study, 25% at 3 months and 18% at 6 months represent a significant minority of distressed

children. Comparisons with other studies of children (Table 6) are difficult, due to different methods and different age groups, but these proportions are similar to those reported by some other writers (Ellis *et al.* 1998; Mirza *et al.* 1998). However, other researchers have reported both lower (Di Gallo *et al.* 1997; McDermott & Cvitanovich, 2000) and higher rates (Stallard *et al.* 1998). The prevalences of PTSD reported here are similar to those we have previously reported for adults of 23% at 3 months and 17% at 1 year (Ehlers *et al.* 1998) and comparable with prevalence of children suffering other traumas. Predictors of PTSD have been discussed in a companion paper (Ehlers *et al.* 2003). They include data-driven processing during the accident, negative interpretation of intrusive memories, alienation from other people, anger, rumination, thought suppression and persistent dissociation at initial assessment predicted PTSD symptom severity at 3 and 6 months.

Only a third of the children met the full PTSD avoidance criteria. It was noticeable that avoidance symptoms were much less frequent than the other features of PTSD *i.e.* re-experiencing or arousal. The DSM-IV diagnosis of PTSD requires the presence of three avoidance symptoms and concerns have been raised that this may be inappropriate for children (Salmon & Bryant, 2002). Children often have very little choice over what they do, where they go or how they travel, and therefore have less opportunity than adults to avoid distressing situations.

### Phobic travel anxiety

Phobic travel anxiety was found to be a common problem suffered by over a third of children in this study 3 and 6 months after the accident. Ellis *et al.* (1998) also reported a similar proportion with travel anxiety at 4–7 months. It is an aspect of trauma reaction that has perhaps been given insufficient attention as compared with the interest devoted to PTSD, an interest that has been partly reinforced by legal considerations of compensation. Fears about travel were not only distressing but were also the main factor limiting the children's social activities and relationships with friends.

### Behaviour

There did not appear to be marked adverse effects on the child's conduct at home or in

school as a result of the accident, and there was good agreement between mothers and teachers about the child's behaviour. There was evidence that abnormal behaviour shown by a minority of children largely preceded the accident.

There was evidence that emotionally disturbed behaviour was associated with ASD and PTSD. However, the items comprising this scale (worrying, unhappy/tearful, clingy, fearful, psychosomatic symptoms) are largely behavioural equivalents of some ASD and PTSD symptoms, and thus probably measuring the same thing.

### Sleep

Major sleep disturbance was uncommon among the children in this study. Ellis *et al.* (1998) reported a similar proportion of parents who rated their child's sleep as unchanged (84%). The findings of previous research into sleep and trauma have been contradictory (Pillar *et al.* 2000). The associations reported here between some aspects of sleep disturbance and post-traumatic stress 2 weeks after the accident, but not at 3 or 6 months, would support the theory that short and acute stress, such as a road accident, leads to hypervigilance, sleep avoidance and disrupted sleep (Sadeh, 2001), but suggest that this may be only in the short-term.

### Consequences for mothers

Recognition of how upsetting some parents and children found hospital emergency procedures should have direct practical consequences (Hepinstall, 1996). Relatively simple changes, such as the rapid removal of neck and back restraints on arrival at the hospital, and providing families with better information about trauma and its immediate consequences, could be expected to increase satisfaction, relieve distress and perhaps improve outcome. This is the first study to have collected systematic information about the early impact on mothers of their child's RTA and it is consistent with reports from more mixed trauma groups. It has been shown that it is a traumatic event for some mothers, particularly those who were also involved in the accident or present at the scene, over a third of whom were diagnosed as having ASD. There was also anecdotal evidence in seven cases that siblings or friends who witnessed the accident became very distressed. About half the mothers continued to have

intrusive and arousal symptoms throughout the 6 month follow-up, although relatively few had a diagnosis of PTSD.

There has been conflicting evidence from other studies about the association between the parent's and child's distress and post-traumatic symptoms (de Vries *et al.* 1999). The only other study of acute distress (Winston *et al.* 2000) found no association between 'broad distress' (defined in terms of ASD symptoms) in parents and children. The de Vries study, which found them to be strongly associated, was based on information collected entirely from the parent. In the present study, which used the children as informants about their own symptoms were possible, there was no evidence of any association, even if mother and child were in the same accident. This is in line with previous research showing that objective severity of trauma is not a good predictor of PTSD. The subjective response, e.g. whether or not the individual perceives threat to life, seems to be a much better predictor than objective measures such as injury severity (March & Amaya-Jackson, 1993; Ehlers *et al.* 1998; Salmon & Bryant, 2002). Thus, even if mother and child experienced the same accident, their subjective response may have been completely different, leading to different post-trauma responses.

### Clinical implications

There are obvious clinical implications for prevention, early recognition and treatment of psychological consequences in child victims of road accidents (Hepinstall, 1996; Stallard *et al.* 2001) that are rather similar to those which we have previously described for adults (Mayou & Bryant, 2001; Mayou *et al.* 2001). In particular, it is apparent that psychological issues need to be considered in children who have suffered minor injuries as well as those suffering much more serious injury.

Despite the considerable and continuing distress of many children and mothers, virtually no help was requested or given. This may, in part, be attributable to a failure to recognize that distress is as common after suffering minor injury as it is after severe injury. Moreover, some parents may be ambivalent about seeking help because they also want the child and family to forget about the accident, and are afraid of making things worse.

Good management must, as with adult RTA victims, depend on good, immediate routine care, early recognition of problems and access to extra treatment for those who require it. Emergency departments could make more use of explanatory leaflets now available (Hepinstall, 1996) and could also ensure that general practitioners were informed about particularly distressed children and families who are likely to be at the highest risk of further problems. Early recognition depends on awareness of the commonness of problems by those in hospital follow-up departments and in general practice. It may be that there could be a role for simple screening questions. Specific complications can be expected to benefit from psychological treatment, especially cognitive behavioural treatment similar to that which has shown to be effective in adults (Ehlers *et al.* 2003); it is also apparent that some children and their families might benefit from a wider range of individualized psychiatric and psychological care (Hepinstall, 1996; Yule, 1999).

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