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Accident Research Centre

**PSYCHOLOGICAL DISORDERS AS CONSEQUENCES OF
INVOLVEMENT IN MOTOR VEHICLE ACCIDENTS:
A DISCUSSION AND RECOMMENDATIONS FOR
A RESEARCH PROGRAM**

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Psychological Disorders as Consequences of Involvement in Motor Vehicle Accidents: A Discussion and Recommendations for a Research Program

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Abstract

The potential consequences of crash involvement in the Psychological domain are discussed, based on the small corpus of relevant literature and additional material concerning psychological disorders thought to occur as a result of exposure to traumatic events. The results of an analysis of Victorian crash data suggest that the lifetime risk of developing psychological disorders resulting from injury in a crash is quite high. For post traumatic stress disorder, for example, this risk is estimated at 13.1%. It is concluded that there is a need to conduct research in this area to investigate the psychological consequences of crash involvement in the Australian context and to develop and evaluate therapeutic interventions which might reduce the impact of crash involvement.

Key Words

Crash, Psychological Disorder, Anxiety, Depression, Post Traumatic Stress Disorder

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EXECUTIVE SUMMARY

This report is the result of concerns about the lack of interest in the likelihood that the psychological consequences of crash involvement may have a significant long-term impact on crash victims. The possibility that there may be substantial social and medical/paramedical costs associated with psychological trauma has not been investigated in the Australian context, and there is relatively little research in this area in the international road-safety literature.

This report presents a general overview of the involvement of psychological processes in the crash event and recovery, and then focuses on the likely development of psychological disorders as a result of crash involvement. Four specific disorders are discussed, and using information drawn from the literature, crash data from Victoria, and the 1996 population census, estimates of the lifetime risk of developing each disorder as a result of injury in a crash were calculated. These are:

Acute Anxiety Disorder	5.7%
Specific (Driving) Phobia	6.6%
Post Traumatic Stress Disorder	13.1%
Major Depressive Disorder	>6.0%

The limitations of data in this area are discussed, and a two-component research program is recommended involving an initial project to collect data concerning the psychological consequences of crash involvement and a series of smaller investigations to compare the use of various therapeutic modalities as treatments for those suffering these consequences.

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INTRODUCTION

This report is the result of a brief review of the literature concerning psychological disorders as consequences of crash involvement, with a particular focus on the development of anxiety disorders. Crash involvement is a stressor, and involvement in a serious crash is likely to have a range of consequences for the individual ranging from minor stress reactions to more severe psychological problems. The costs of these consequences to the broader community are uncertain, and it was considered important to ascertain the likely longer-term consequences to individuals as a starting point for a more-detailed analysis of the community costs associated with the psychological consequences of crash involvement.

While minor psychological problems were considered important for personal well-being following a crash, it was considered more important here to focus on more-serious psychological outcomes. For this reason, the focus of the present discussion is on specific disorders defined in the Diagnostic and Statistical Manual (4th Edition) (American Psychiatric Association, 1994) rather than variations in general coping skills or transient mood changes or emotional reactions to crash involvement. It was thought that this focus would ensure a relatively conservative treatment of a potentially contentious area, and that it would ensure that the psychological consequences discussed would be those with clear social or community costs as well as clear costs for the individual and those around him or her.

While the focus of this work is the consequence of crash involvement for the individual, there is a growing literature concerning the psychological consequences of personal injuries in other domains such as the workplace. Where appropriate, this literature has been used to add information considered to be valuable in the context of crash-related injury.

This report discusses data relating to crashes and injuries in Victoria, the involvement of psychological factors in various stages of the crash event, and the potential psychological consequences of crash involvement. The report ends with recommendations concerning the need for further research in this area. These recommendations are provided as a broad research strategy as there is a need to determine the prevalence and nature of psychological consequences of crash involvement, and to investigate potential, effective, therapeutic techniques which may assist in reducing the impact of these consequences on both the individual and the broader community.

One aim of the present report was to extend work reported by Oxley and Fildes (1993) who investigated the long-term effects of crash involvement from a medical or physical trauma perspective. Their report emphasised the long-term effects of crash-related physical trauma and its costs to both the individual and the community. They collected some data in the context of a small pilot study which also suggested that there were long-term psychological consequences arising from even mild injuries in a crash. Oxley and Fildes reported that a range of cognitive deficits were reported by mildly to severely injured crash victims two years after the event, and that regardless of injury level the same crash victims continued to report emotional and behavioural consequences from the crash including anxiety and avoidance reactions. In addition to their general recommendation that there was a need for ongoing research in this area, they also suggested that the psychological consequences of crash involvement deserved increased attention.

CRASHES AND INJURIES IN VICTORIA

In 1997, a total of 46,543 people survived involvement in a total of 17,447 crashes in which someone was either injured or killed. As a proportion of the population, this amounts to 1.06% of the State's total population of 4,373,520 (Australian Bureau of Statistics, 1998) who survived a crash in that year. If only those injured in crashes are considered, in 1997 a total of 23,911 were injured but survived, equating to 0.55% of the State's population.

While this does not seem a substantial number in percentage terms, it needs to be noted that these data apply to only one year of crash involvement. Assuming that no-one is involved in more than one crash in their lifetime (an unlikely assumption given evidence concerning the relationships between crash involvement and psychological characteristics discussed below) and assuming that the crash risk in 1997 holds into the future, it might be predicted that someone born now (with a life expectancy of 79.6 years (Central Intelligence Agency, 1997) has an 83.8% chance of being involved in and surviving an injury crash, and a 43.8% chance of being injured in and surviving an injury crash.

Although these data are averaged across the wider community in Victoria, and although they are based on a number of assumptions about ongoing crash rates and life expectancy, they do serve to emphasise the number of people likely to be affected by crash involvement at some stage in their lives.

Figure 1 presents data of this type for each of the major road-user groups for which data are available in the Victorian crash database.

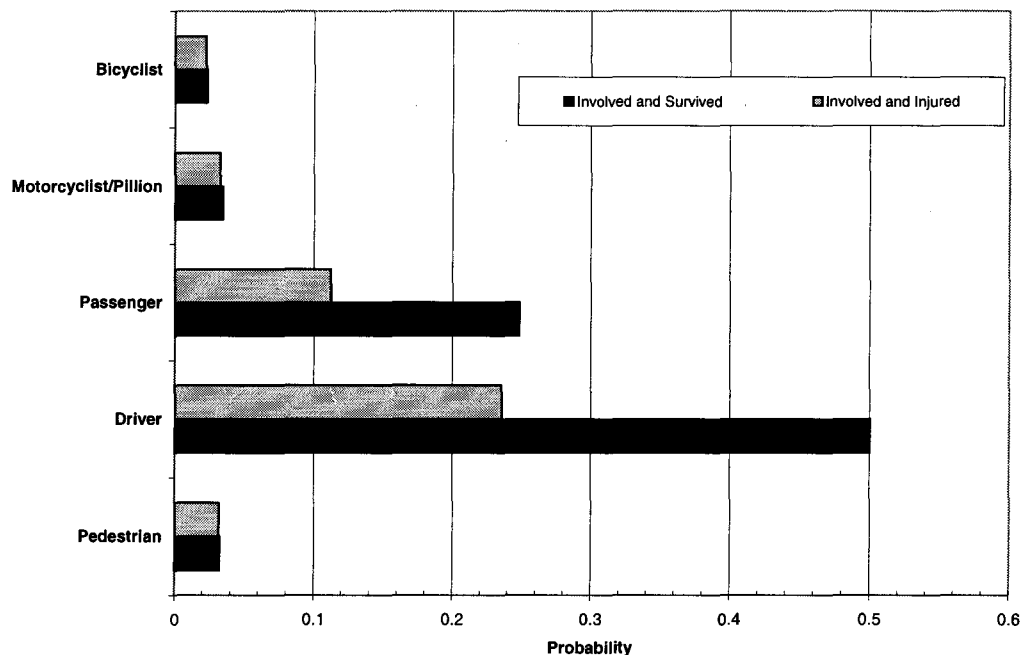


Figure 1: Average Lifetime Probability of Crash Involvement and Survival or Injury in Victoria based on 1997 Crash Data and 1996 Census Data

The data in Figure 1 indicate, for example, that the average probability of involvement and survival in a crash as a driver is 0.5 (or 50%) given the range of assumptions discussed above, and is substantially less for crash involvement as an unprotected road user such as a pedestrian or bicyclist.

These data take on additional importance when the prevalence data reviewed below are considered for serious, long term disorders such as post-traumatic stress disorder (PTSD) where it has been estimated that about 30% of crash victims are likely to suffer PTSD following involvement in a crash in which they were injured. Thus, given the estimate of an average lifetime probability of 43.4% for involvement and injury in a crash, there is a consequent 13.0% lifetime probability of the development of crash-related PTSD averaged across all Victorians. This issue is discussed below.

PSYCHOLOGICAL FACTORS AND CRASH INVOLVEMENT

The involvement of psychological factors or processes in crashes can be viewed from a number of perspectives. It is possible to view the involvement of these factors in terms of the way in which they influence the crash risk of an individual or group of drivers, the way in which they may influence processes within the crash that are related to the severity of crash outcomes, their involvement in recovery from physical injury, or their involvement in the longer-term well-being of the crash victim during and after physical recovery. This view of the involvement of psychological processes is shown in Figure 2.

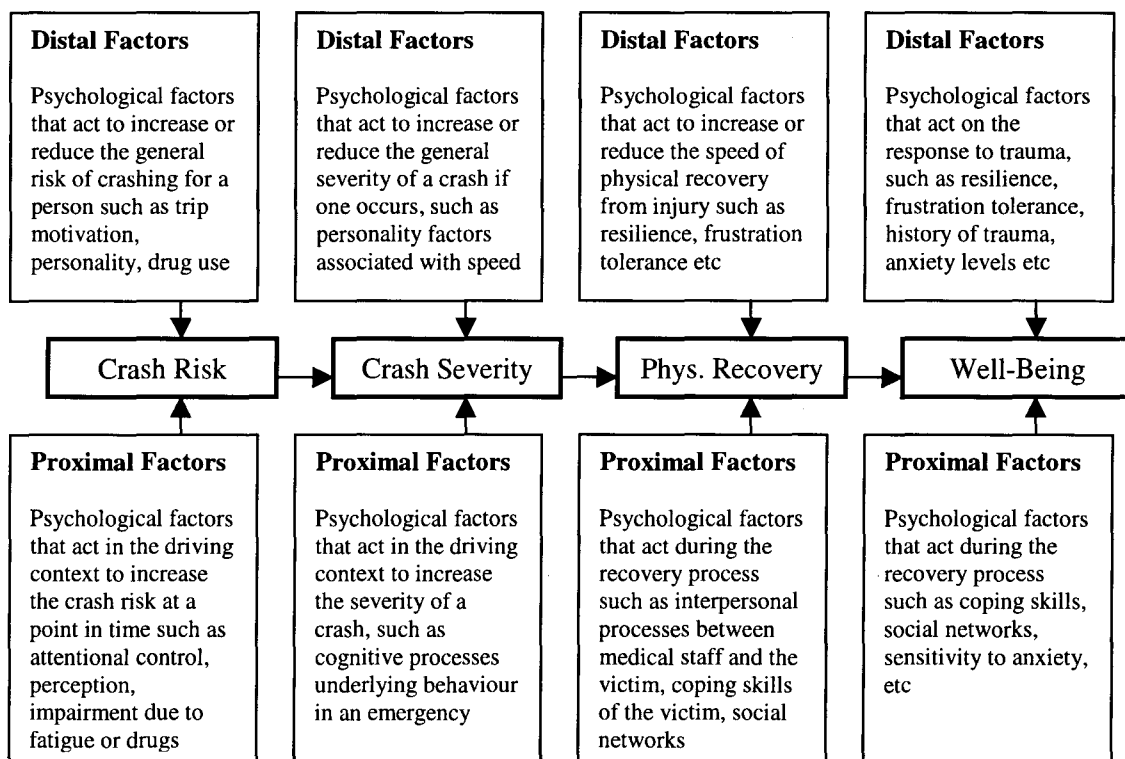


Figure 2: The Role of Psychological Factors in the Crash Process

It is suggested in Figure 2 that there are four potential broad locations for psychological involvement in the sequence of events surrounding crash involvement, and that in each case there are some psychological factors that act at a distance to influence that stage of the crash-involvement process, and some factors that act more immediately within the particular event or stage of the crash involvement process.

The wider road safety literature relevant to psychological factors has focused on the distal and proximal psychological factors related to crash risk. There is a long history of research concerning the relationship between psychological factors and crash involvement (Elander,

West, & French, 1993). It is clear that psychological processes and factors do have an involvement in crash risk, although the large number of causal factors in crashes means that individual psychological processes generally account for only small proportions of the variation in crash-risk.

There is also a growing literature on the involvement of psychological factors in physical recovery from trauma (eg. Blakeny, Robert, & Meyer, 1998; Evans & Hardy, 1995; Watts, 1997). This literature includes material that focuses on the proximal and distal factors considered to be important in recovery from injury with a general conclusion that psychological and social factors can play a significant role in physical recovery.

There has been relatively little work relating to factors that contribute to crash severity, although psychological factors associated with speeding, for example, might be viewed as impacting indirectly on crash severity. There is some potential for investigations of the role that cognitive factors play in the behavioural responses to emergency situations as it is possible that some behavioural responses in an emergency (perhaps resulting from inappropriate automatic responses) may contribute to increases in severity.

There is a small literature concerning the psychological factors associated with well-being following crash involvement, and it is this area of the psychological consequences of crash involvement that is of particular interest here. As was the case for the other stages of the crash process outlined above, it is possible to differentiate between factors that act distally to the crash and those that are more proximal in their action. It is possible, for example, that there are psychological factors which predispose crash victims to more or less adaptive responses to crash involvement (distal factors) as well as psychological factors that act specifically in the context of a particular crash or situation.

This report is concerned with understanding the likely psychological consequences of crash involvement, the factors that influence these outcomes and those with a likely causal role, and the potential for a research program to benefit both crash victims and the broader community.

POTENTIAL PSYCHOLOGICAL DISORDERS AFTER CRASH INVOLVEMENT

Crash involvement, particularly crash involvement in which the victim or others are injured, can be viewed as a stressor. Exposure to stressful events can result either in adaptive behaviours and processes that lead to coping and recovery from the event, or to processes and behaviours that are less adaptive in the circumstances and which impede recovery.

Under the diagnostic system currently in widespread use, the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association, 1994), a number of disorders can follow from exposure to stressful events, apart from pre-existing disorders that might recur as a result of the stressor. These are discussed below.

Acute Stress Disorder

Acute Stress Disorder (ASD) is a relatively new diagnostic category and was included in DSM-IV primarily as a bridge between exposure to a trauma and the development of chronic problems such as Post-Traumatic Stress Disorder (PTSD) which is discussed below. Acute stress disorder involves symptoms which must occur within four weeks of exposure to trauma and is only diagnosed if the disturbance lasts for less than four weeks, after which a diagnosis of PTSD is given. In a sense, then, ASD is similar to PTSD but represents an acute reaction to traumatic events.

ASD requires exposure to a traumatic event in which “the person experienced, witnessed, or was confronted with events that involved actual or threatened death or serious injury, or a threat to the physical integrity” (American Psychiatric Association, 1994) of either the victim or others in the situation. It also requires that the victim’s response involves “intense fear, helplessness, or horror.” (American Psychiatric Association, 1994)

Involvement in a motor vehicle crash, even a relatively minor one, could conceivably meet this requirement. Motor vehicle crashes often involve a threat to physical integrity and more serious crashes generally involve threatened serious injury or death. The reaction of individuals in these situations will clearly vary markedly, but it important to note that there is no reason in this criterion to rule out the possibility that ASD may follow from crash involvement.

Apart from diagnostic criteria relating to the duration of the disturbance (2 days to 4 weeks) and ruling out a range of other diagnostic categories, the remaining diagnostic criteria describe the symptoms required for diagnosis and therefore provide a broad description of the disorder. In summary, the disorder involves (American Psychiatric Association, 1994):

- | | |
|--|--|
| While or after experiencing the event, at least three of | <ul style="list-style-type: none">• A subjective sense of numbing, detachment, or absence of emotional responsiveness• A reduction in awareness of surroundings• Derealization |
|--|--|

- Depersonalization
 - Dissociative amnesia
- The event is persistently reexperienced in at least one of
- Recurrent images
 - Thoughts
 - Dreams
 - Illusions
 - Flashback episodes
 - A sense of reliving the event
 - Distress on exposure to reminders
- Marked avoidance of stimuli that evoke memories of the trauma, such as
- Thoughts
 - Feelings
 - Conversations
 - Activities
 - People
- Marked symptoms of anxiety or arousal, such as
- Insomnia
 - Irritability
 - Poor concentration
 - Hypervigilance
 - Exaggerated startle response

Diagnosis of the disorder also requires that there be significant distress or impairment in social, occupational or other important areas of personal functioning.

The etiology of ASD is uncertain, although it is assumed to arise as a response to the exposure to trauma required for diagnosis. It is also known that the development of ASD can be influenced by factors such as family background, childhood experiences, community supports, and preexisting psychological disorders. It should be noted, however, that the disorder can arise in the absence of preexisting problems.

The similarity between ASD and PTSD suggests that theoretical accounts of the etiology of PTSD (and consequent therapeutic approaches) may appropriately be applied to ASD. The reader is referred to the discussion of PTSD below.

Some issues relating to the diagnostic criteria for ASD were raised by Bryant and Harvey (1997). They suggest that there are some anomalies in the criteria and some inconsistencies between ASD and PTSD which may need to be addressed in the next revision of the Diagnostic and Statistical Manual.

Driving Phobia

Specific Phobia is a diagnostic category in DSM-IV and is viewed as an anxiety disorder (as are ASD and PTSD). Specific phobias are diagnosed under the following criteria (American Psychiatric Association, 1994):

A marked and persistent fear that is excessive or unreasonable and which is cued by either the presence of anticipation of an object or situation

The phobic stimulus evokes an immediate anxiety response, which may involve a panic attack which is characterised by a period of intense fear or discomfort involving four or more of

- palpitations, accelerated heart rate
- Sweating
- Trembling or shaking
- Sense of shortness of breath or smothering
- Feeling of choking
- Chest pain or discomfort
- Nausea or abdominal distress
- Dizziness or fainting
- Derealisation or depersonalisation
- Fear of losing control
- Fear of dying
- Parasthesias
- Chills or hot flushes

The person recognises that the fear is unreasonable

The phobic situation is avoided or else is endured with distress

Diagnosis of the disorder also requires that there be significant distress or impairment in social, occupational or other important areas of personal functioning, and that other disorders do not better account for the symptoms (such as might be the case in PTSD where there is significant avoidance behaviour and distress in the presence of cues associated with the traumatic event).

Specific phobia also has five subtypes depending on the class of cues or events which lead to the phobic response. These are *animal*, *natural environment*, *blood-injection-injury*, *situational*, or *other*. Identification of the specific event(s) involved in the development of the phobia is not necessary for diagnosis and under the usual therapeutic approaches is not considered necessary for treatment, although it is generally considered that phobias often result from exposure to traumatic events (American Psychiatric Association, 1994).

Phobias are generally accounted for in behavioural terms, resulting from learned associations between otherwise neutral cues and fear or panic reactions which ultimately result in those cues taking on the ability to evoke aspects of the emotional response. Consequent avoidance of the newly feared stimulus or context serves to reinforce the fear and anxiety, resulting in a relatively stable phobia.

Lifetime prevalence rates are estimated between 10% and 11% (American Psychiatric Association, 1994; Barlow, Esler, Vitali, 1998).

Driving phobia is a phobia relating to driving and is characterised by phobic reactions as outlined above in response either to driving in general or to driving in specific situations or contexts. In both cases it is a Specific Phobia of the Situational type.

Post-Traumatic Stress Disorder

In one sense, the description of PTSD is similar to that of ASD, with the main exception being the duration of the disorder. PTSD is not normally diagnosed if the duration of the disturbance is less than one month (ASD is used in this case), and if ASD is diagnosed and the symptoms occur for longer than one month, the diagnosis is changed to PTSD. The conditions under which ASD remits or continues to become PTSD are important and are considered later. The other main difference between ASD and PTSD is the intensity of disturbance described in the diagnostic criteria.

PTSD also requires exposure to a traumatic event in which “the person experienced, witnessed, or was confronted with events that involved actual or threatened death or serious injury, or a threat to the physical integrity” (American Psychiatric Association, 1994) of either the victim or others in the situation. It also requires that the victim’s response involves “intense fear, helplessness, or horror.” (American Psychiatric Association, 1994). These requirements are consistent with those for ASD.

As was also the case with ASD, crash involvement could conceivably meet this requirement. Even relatively minor motor vehicle crashes can involve a threat to physical integrity. The development or diagnosis of PTSD will depend (in part) on the way in which the crash and its threat to the victim are perceived, interpreted, or evaluated.

In addition to diagnostic criteria relating to the duration of the disturbance (more than 4 weeks) and ruling out a range of other diagnostic categories, the remaining diagnostic criteria describe the symptoms required for diagnosis and therefore provide a broad description of the disorder. In summary, the disorder involves (American Psychiatric Association, 1994):

The event is persistently reexperienced in at least one of

- Recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions
- Recurrent distressing dreams of the event
- Acting or feeling as if the event is recurring
- Intense psychological distress at exposure to cues (internal or external) that symbolise or resemble an aspect of the traumatic event
- Physiological reactivity to these cues

Persistent avoidance of stimuli that evoke memories of the trauma, and numbing of general responsiveness as indicated by at least three of

- Efforts to avoid thoughts, feelings, or conversations associated with the event
- Avoidance of events, places, people and activity that evoke memories of the event
- Inability to recall important aspect of the event
- Diminished interest in significant activities
- Feelings of detachment and estrangement
- reduced range of emotions
- Sense of foreshortened future

Marked symptoms of increased arousal, indicated by at least two of

- Insomnia
- Irritability
- Poor concentration
- Hypervigilance
- Exaggerated startle response

Diagnosis of the disorder also requires that there be significant distress or impairment in social, occupational or other important areas of personal functioning.

Keane (1998) notes that there are estimates that 8-12% of the American population develops PTSD at some stage in their lives resulting from exposure to trauma, while Yehuda, Marshall, & Giller (1998) note estimates of between 1% and 14%. The American Psychiatric Association (1994) concurs with Yehuda et al., while noting that the lifetime prevalence rate for at-risk people has been estimated between 3% and 58%. About 50% of cases remit after 3 months (American Psychiatric Association, 1994), but many others continue to suffer long after the trauma. The nature of exposure to the trauma and its severity are recognised as the most important factors in the likelihood of developing the disorder.

The etiology of PTSD is uncertain, and there are a number of models that may account for the disorder and suggest appropriate therapeutic interventions. Foa, Steketee, & Rothbaum (1989) review conditioning and cognitive theories of PTSD and propose an alternative model that incorporates elements of both. Under a conditioning theory, the processes thought to underlie the development of phobias are thought to drive the development of PTSD. Thus PTSD arises as a result of the dual action of Pavlovian learning about the relationship between otherwise neutral cues and the traumatic event such that the previously neutral cues become able to evoke aspects of the fear, anxiety, and horror associated with the traumatic event. Subsequent avoidance of these cues results in the development of self-reinforcing avoidance behaviours. While this view is consistent with the learning literature and is widely accepted, Foa et al. (1989) argue that there are some aspects of PTSD which it cannot easily account for.

Foa et al. (1989) also discuss cognitive accounts of PTSD based on Seligman's learned helplessness theory of depression. They note that the numbing and passivity associated with PTSD in some cases, and the unpredictability and uncontrollability of the traumatic event are consistent with this view which would argue that PTSD symptoms are the result of an experience of a surprising aversive event over which the person has no control.

Foa et al. (1989) extend these accounts of PTSD, wanting to incorporate the notion of meaning into the development of PTSD and wanting to develop the notion that the memories and emotional responses related to the traumatic event are linked into an internal fear structure that is the basis for PTSD (similar in approach to the fear structure's underlying Lang's (1985) information processing theory of fear and anxiety). They argue that one of the key issues for the victim of a traumatic event is that it violates preexisting beliefs about safety in a situation previously believed to be safe, and that the conditioning and cognitive processes that lead to a fear structure incorporating internal representations of the cues and events also allow for the incorporation of aspects of the meaning of the event for the person. They note that PTSD is more likely to occur in situations considered safe by the individual prior to the event. They suggest that the cognitive fear structure underlying PTSD is larger, more diffuse, and more easily evoked than is the case for fear structures underlying phobias as a result of the highly aversive nature of the initial event or events and the ongoing higher-order learning as avoidance behaviour and fear responses continue to occur.

Lutz and Keane (1989), writing at about the same time as Foa et al. (1989), similarly view the fear structure account of PTSD as worthwhile, but expand this view by taking an information processing view of anxiety and applying it to PTSD. They suggest that PTSD involves the inappropriate and persistent activation of survival responses that are more appropriate in the original traumatic situation. Thus the intense exposure to trauma results in the creation of a single cognitive structure that includes information about the event, responses, and their meaning in such breadth that many environmental cues are able to activate the fear structure and so produce the emotional response originally appropriate at the time of the trauma but inappropriate subsequently. The threat-related arousal is present much of the time for the PTSD victim, resulting in an increased likelihood that they will focus on threat-relevant cues in the environment, thus continuing the symptom cycle.

More-recent discussions of PTSD (eg. Keane, 1998; Yehuda, Marshall, & Giller, 1998) do not suggest any alternatives to the earlier views of PTSD discussed above.

The relationship between PTSD and ASD is of some interest. It is generally accepted that PTSD often starts its development as ASD. This was demonstrated by Harvey and Bryant (1998) in the context of crash-related PTSD, and has been demonstrated more generally by Classen, Koopman, Hales, and Spiegel (1998). Foa et al. (1989) have attempted to account for differences in whether individuals go on to develop PTSD after suffering from ASD in terms of the tendency of the person to engage in avoidance behaviour. They view the remission of ASD as a result of continued exposure to the stimuli that activate memories of the traumatic event such that the emotional responses habituate. Those people that go on to develop PTSD, according to this view, are more likely to engage in successful avoidance behaviour with ASD and so do not allow an habituation process to occur.

Mood Disorders

Mood disorder encompasses a wide variety of psychiatric and psychological disturbance. In the context of crash involvement it was considered important to discuss depressive mood episodes as they have been associated with crash involvement (see below). It should be noted, however, that the range of potential depressive mood disorders is large and for the present circumstances it was considered important to restrict discussion to Major Depressive Disorder (MDD).

MDD can have endogenous or exogenous causes, and it is known that exposure to traumatic events or a series of traumatic events can act to initiate a depressive response. As was the case for ASD and PTSD, involvement in a car crash and the medical consequences in the case of injured victims could act in this way. MDD is prevalent and debilitating. The DSM-IV (American Psychiatric Association, 1994) sets the following criteria for MDD:

The occurrence of a Major Depressive Episode (or 2 or more for MDD - Recurrent Type) which involves at least five of these symptoms in a single two-week period (causing significant distress or impairment in day-to-day functioning)

- Depressed mood most of the day nearly every day
- Markedly less interest or pleasure in almost all activities most of the day nearly every day
- Weight loss (change of 5% in a month)
- Insomnia/hypersomnia nearly every day
- Agitation or retardation nearly every day
- Fatigue or energy loss nearly every day
- Feelings of worthlessness or excessive guilt nearly every day
- Diminished cognitive functioning nearly every day
- Recurrent suicidal ideation or thoughts of death

There has never been a manic episode

Craighead, Craighead, and Ilardi (1998) review prevalence rates and note that lifetime prevalence rate estimates for MDD in the United States are in the range of 20%-25% for women and 9%-12% for men. They also comment on the high cost associated with depression, both economically and privately or socially.

The factors underlying MDD are complex, and there are a number of alternative (or in some cases complimentary) models of the etiology of MDD. The focus here on crash involvement lends itself more readily to an environmental model rather than a biological model, and it is generally held (Beck, 1972) that depressive reactions to situational variables relate to a combination of learned responses and cognitive factors, often in the context of inherited and learned predispositions towards particular styles of thinking.

A cognitive view of MDD focuses on the role of thoughts in the development of depression, with self-critical, future-pessimistic cognitions thought to be critical in the development of MDD. The potential for crash involvement to lead to this type of thinking, and therefore the development of mood disorders, is self-evident. This is particularly so for those who may feel responsible for the crash.

INCIDENCE OF PSYCHOLOGICAL DISORDERS AFTER A CRASH

The preceding section suggested that a number of psychological disorders may result from the interaction between crash involvement and other factors based on a consideration of their etiology and prevalence. There is a growing literature concerning the likelihood of developing a number of disorders following crash involvement and concerning the progression of these disorders after the crash. This section of the report details key results from a number of relevant studies for each disorder.

It needs to be noted at the outset that there are a number of methodological issues that weaken some of the studies in this area. A number of these are discussed by Blaszczyński, Gordon, Silove, Sloane, Hillman, and Panasetis (1998) who conclude that failure to record, control, or take into account factors like the severity of crashes, and the use of biased samples and the failure to use well-justified diagnostic techniques make it difficult to know with certainty the prevalence of serious psychological consequences of crash involvement. Developing and conducting better studies in this area is an important aim.

Acute Stress Disorder

The relative recency of inclusion of this disorder in the DSM-IV (American Psychiatric Association, 1994) means that there is little evidence bearing on its prevalence following crash involvement. Taylor and Koch's (1995) review of anxiety disorders following crash involvement, for example, does not include ASD as a possible problem for this reason.

Barton, Blanchard, and Hickling (1996) reported data from a sample of crash victims who had reported for medical treatment following the crash and focused specifically on the factors involved in the development of ASD. They were particularly concerned with differences between those who had ASD as a precursor to PTSD and those with PTSD without any previous ASD. Barton et al. note that 33% of their PTSD sample had initially developed ASD, and that ASD diagnosis was related to the number of prior traumas, past diagnosis of PTSD or mood disorders other than MDD.

Harvey and Bryant (1998) reported a prospective study of a sample of crash survivors who were assessed one month after the crash. They reported that 13% of the sample met the criteria for diagnosis with ASD and that an additional 21% had subclinical levels of ASD. In a study of PTSD in crash victims, Bryant and Harvey (1995) noted that an avoidant coping style was a key predictor of PTSD in crash victims. Given that avoidance of memory-evoking places, thoughts, and cues is a key criterion in ASD, and given the close relationship between ASD and PTSD, it would not be surprising if most PTSD sufferers also suffered from ASD in the period between the crash and the time at which diagnosis with PTSD could be made.

Apart from a number of studies of ASD in crash victims also suffering traumatic brain injury, there appear to be no other studies published in the refereed literature concerning ASD following crash involvement.

A potential concern here is that ASD may be under-diagnosed and therefore left untreated in car crash victims. ASD, although impairing for the sufferer, may present as an over-emotional

reaction to crash involvement rather than as a disorder (both to the victim and to practitioners and researchers). This possibility is particularly strong for this disorder given the close temporal relationship between the traumatic experience of crash involvement and the development of the disorder. For the victim, an important consequence of this is that the behavioural reactions characteristic of both ASD and PTSD may be more difficult to control if left untreated for a length of time. The development of the fear structure discussed above (Lang, 1985) relies on the self-reinforcement of avoidant behaviour patterns which are likely to increase in strength in the absence of appropriate assistance.

There is a risk that ASD may be masked by the processes involved in physical recovery for seriously injured crash victims and that the practice of focusing on seriously injured victims attending trauma centres may fail to take into account the possible development of ASD amongst less-seriously injured or uninjured crash victims, resulting in under-reporting of the prevalence of ASD as a result of crash involvement. It is important to recall that serious injury is not a criterion for the development of either ASD or PTSD, and that the perceived threat of serious injury is sufficient trauma for both disorders. This issue argues strongly for the use of alternative approaches to studies of this disorder and PTSD.

If Harvey and Bryant's estimate for clinical ASD noted above is taken as a reasonable estimate of the incidence of ASD amongst injured drivers (13%), then around 3,100 Victorian people would have been expected to meet the criteria for ASD in 1997 (using the crash data discussed earlier), and making the assumptions outlined earlier the lifetime risk of meeting these criteria for any one person (as a result of injury in a crash) is 5.7%. Given that the criteria for diagnosis require that the person suffer significant impairment or distress in important areas of functioning, and that the disturbance needs to occur for at least two days and up to four weeks, there is a clear need to develop therapies to assist people with this consequence of crash involvement. This is particularly so given the likelihood that ASD is a precursor for PTSD in many crash victims. These estimates, of course, assume that only those injured suffer from ASD as a consequence of crash involvement and may, therefore, be conservative.

Driving Phobia

There is a more substantial body of literature concerning driving or accident phobia and its relationship with crash involvement than was the case for ASD. Taylor and Koch (1995) reviewed literature relating to the psychological consequences of crash involvement and concluded that the prevalence rate of driving phobia in crash victims is about 15%-18%.

Driving phobia is a broader condition than a simple response to crash involvement, and factors leading to the development of this phobia are quite varied. Ehlers, Hofmann, Herda, and Roth (1994) used a sample of patients presenting with driving phobia in a study of this phenomenon and reported that only 15% of this group reported that their phobia was the result of crash involvement. A larger group (53%) identified a panic attack in a car as the primary cause of their disorder.

The relationship between Specific Phobia and PTSD in the DSM-IV (American Psychiatric Association, 1994) system presents some particular difficulties for prevalence studies in this area. The diagnostic criteria for PTSD include the avoidance of situations, stimuli, people, thoughts, and conversations associated with the traumatic event, and the criteria for specific phobia specifically rule out the diagnosis of phobia if the symptoms can be accounted for in terms of PTSD (amongst other disorders).

The consequence of this is that some studies have reported quite low levels of specific (driving) phobia in crash victims. Blanchard, Hickling, Taylor, Loos, and Gerardi (1994), for example, reported that only 2% of their sample of crash victims met the criteria for driving phobia, although 46% met the criteria for PTSD and presumably were avoidant or distressed in relation to crash-related stimuli. In another study, Hickling and Blanchard (1992) showed that around 90% of PTSD sufferers (resulting from crash involvement - 50% of the sample met these criteria) also met criteria for driving phobia (amounting to 45% of crash victims).

The high level of reliance on road transport in Victoria (and Australia) emphasises the problems that are likely to arise for people suffering driving phobia as a result of a crash. If the Taylor and Koch (1995) estimate is used (say 15%), this means that about 3,500 Victorians may have developed (or will develop) a driving phobia as a result of crash involvement in 1997. This equates to a lifetime risk of developing driving phobia as a result of crash involvement of 6.6%, and is likely again to be a conservative effort as it assumes that only injured people will develop this type of disorder. It will be recalled that phobias involve intense distress or avoidance of the phobic situation. The development of a phobia as a result of involvement in a crash, therefore, is likely to be significant in a number of ways both to the individual and to the community. It needs to be noted, however, that many phobic responses to crash involvement may occur in the context of developing the more-severe PTSD.

Post Traumatic Stress Disorder

There is a substantial body of evidence concerning the incidence of PTSD following crash involvement. Taylor and Koch's (1995) review of crash involvement and anxiety disorders suggests that the incidence of PTSD in crash victims is likely to be around 30%, with an additional 10%-15% suffering a partial form of PTSD with more narrowly defined (but still distressing or impairing) symptoms. They note that some studies have estimated as many as 50% of victims may meet the PTSD criteria.

Blanchard et al. (1994) reported that 46% of their sample of injured victims met these criteria, and that 20% met the criteria for partial PTSD. They also reported that PTSD in their crash victims was associated with prior experiences of trauma and PTSD, and prior experiences of major depressive episodes.

Blanchard and colleagues (Blanchard et al., 1995, 1995, 1996, 1996, 1998) reported a series of studies using a single sample of 158 crash victims who sought medical attention following crash involvement. They reported that 39% of their sample met the diagnostic criteria for PTSD and that 28% met the requirements for partial PTSD (about 2-3 months after crash involvement). They also reported follow-up data on the same sample and reported that 66% of the PTSD sufferers underwent remission at some stage in the twelve months following their crash, but that 26% of those who had not been diagnosed with PTSD 2-3 months after the crash then went on to develop this disorder in the twelve months following the crash.

Blanchard, Hickling, Vollmer, Loos, Buckley, & Jaccard (1996) investigated the characteristics associated with the development of PTSD in crash victims. They reported (using multivariate techniques) that PTSD was associated with being involved in post-crash litigation, fear of dying in the crash, prior major depressive episodes, and injury severity in the crash. Amongst those who met the PTSD diagnostic criteria, the strength of symptoms

was predicted by the same variables and ethnicity, blaming external factors for the crash, whiplash injury, and prior experience of PTSD.

In a similar vein, Delahunty, Heberman, Craig, Hatward, Fullerton, Ursano, & Baum (1997) investigated the relationship between responsibility for a crash and the development of PTSD using drivers involved in crashes in which the driver and Police reports were in agreement on the responsibility for the crash. They divided their sample of 173 drivers into responsible and not-responsible groups and assessed them over a twelve-month period. About 30% of the not-responsible group met the criteria for PTSD, compared to 25% of the responsible group.

Blanchard, Hickling, Mitnick, Taylor, Loos, & Buckley (1995) (using a different sample of crash victims) reported that injury severity and perceptions of the risk of the crash to the life of the victim were both related to the diagnosis of PTSD, although they note that the PTSD victims may have reinvented or given new meaning to their crash as a result of the PTSD itself.

Mayou, Bryant, and Duthie (1993) collected data from consecutive trauma patients and reported that 25% of those involved in a crash 12 months prior to the interview still reported ongoing and often disabling PTSD problems.

Goldberg and Gara (1990) reported a cluster analysis of crash victims in which they found that Major Depressive Disorder was the most common problem, and that there was a smaller group (14% of the sample) whose problems could best be described as PTSD or driving phobia.

In one of the few Australian studies in this area, Green, McFarlane, Hunter, & Griggs (1993) collected data from a small sample (24) of consecutive attendees at a trauma centre following a car crash. The sample was biased towards more-seriously injured crash victims. They reported that most of those diagnosed as meeting the criteria for partial PTSD four weeks after the crash went on to meet the criteria for full PTSD at 18 months post-crash. They also reported that those with PTSD had weaker emotional and social skills, but this may have been a consequence rather than a cause of PTSD.

If the Taylor and Koch estimate for the incidence of PTSD noted above is taken as a reasonable estimate amongst injured drivers (30%), then around 7,100 Victorian people would have been expected to meet the criteria for PTSD after being injured in a crash in 1997 (using the crash data discussed earlier), and making the assumptions outlined earlier the lifetime risk of meeting these criteria for any one person (as a result of injury in a crash) is 13.1%. Given that the criteria for diagnosis require that the person suffer significant impairment or distress in important areas of functioning, and that the disturbance needs to occur for at least four weeks, this disorder is likely to represent a serious problem both for the individual and for the broader community. These estimates are likely to be conservative as they assume that only those injured suffer from PTSD as a consequence of crash involvement, and they do not take into account those who meet the criteria for partial PTSD who are also likely to be significantly impaired.

Major Depressive Disorder (MDD)

In their study of PTSD in crash victims, Blanchard et al. (1995) reported that 48% of their PTSD victims also met the criteria for MDD.

In the cluster-analysis reported by Goldberg and Gara (1990), the largest group of crash victims shared symptoms primarily associated with major depression, although the authors did not attempt a formal diagnosis.

The common finding that PTSD and MDD are comorbid in crash victims led Blanchard, Buckley, Hickling, and Taylor (1998) to investigate the relationship between the two disorders. Their particular interest was to investigate the extent to which PTSD and MDD in crash victims might be manifestations of a single response to trauma rather than independent disorders resulting from the trauma. They used multiple measures of PTSD and MDD symptoms and were able to compare a two-factor (PTSD and MDD are separate entities) and a single-factor model. Their results indicated that PTSD and MDD are separate disorders that result independently from crash involvement.

There are no consistent estimates of the prevalence of MDD amongst crash victims, so it is not possible to estimate the extent to which this disorder represents a problem for Victorian road users, although Blanchard et al.'s (1995) estimate that 48% of their PTSD sample also met the criteria for MDD probably serves as a conservative estimate of the lower bound for the prevalence of this problem amongst crash victims and suggests that at least 3,300 Victorians would have suffered MDD in 1997 as a result of a crash, and that the lifetime risk of developing this disorder as a result of injury in a crash is at least 6%.

Summary

The brief review of the literature presented here suggests that the following estimates for each of the four disorders are appropriate (assuming only injured people develop each disorder, suggesting that these estimates are likely to be quite conservative):

	Acute Anxiety Disorder ¹	Specific (Driving) Phobia ¹	Post Traumatic Stress Disorder ¹	Major Depressive Disorder ¹
Estimate of incidence following injury in a crash	13%	15%	30%	>14%
Estimate of number of Victorians injured in 1997 likely to meet diagnostic criteria	3,100	3,500	7,100	>3,300
Estimate of lifetime risk of disorder after crash involvement	5.7%	6.6%	13.1%	>6%

¹ Estimates for the disorders are not additive as these disorders may (and often do) occur together

A RESEARCH PROGRAM

In addition to reviewing material relevant to the issue of the psychological disorders following crash involvement, the purpose of this report was to determine the need for additional research in this area and, if appropriate, to suggest a research program that would lead to improvements in our understanding of the nature of this problem and to the development of effective, efficient therapeutic interventions to lessen the long-term impact of crash involvement.

It is clear that there is a relatively small amount of literature directly relevant to the psychological disorders resulting from crash involvement and that there are a number of problems with the studies published in this area. There are, therefore, a number of reasons for recommending an Australian research program in this area:

- Published studies tend to be biased towards injured and seriously injured crash victims, with a consequential lack of data concerning crash-involved road users with less severe injuries or no injuries.
- Published studies rely on small sample sizes.
- Published studies do not allow estimates of longer-term consequences or prevalence of crash-related problems in the wider community.
- There are very few studies of Australian crash victims, and those that have been published use very small sample sizes biased towards seriously-injured crash victims.
- It is not possible to estimate the cost of crash-related psychological problems, either in terms of personal costs or in terms of the costs to the community.
- There are issues relating to psychological well-being that are not necessarily best assessed using the diagnostic approach of DSM-IV.
- There are very few studies of the application of different treatment approaches to crash victims with psychological problems, so there is little evidence available to direct practitioners in this area.

It is recommended that a research program in this area is necessary given the paucity of relevant data. The research program would best be composed of two specific components:

- A large-sample study (after appropriate pilot studies) of the psychological consequences of crash involvement using a broader sample of Australian crash victims and minimising the bias towards more seriously injured crash victims. This study should incorporate an investigation of the time-course of remission of any psychological problems and should investigate the personal characteristics associated with the development of problems.
- A study (or series of studies) comparing different therapeutic interventions to determine the most effective treatment for the various crash-related psychological problems, with the ultimate aim being the development of a guide-booklet and resources for practitioners who work with people involved in crashes.

Together, these components would provide sufficient data to ensure that there is a detailed understanding of the consequences of crash involvement in the psychological domain, and that there are effective treatment options available that minimise the cost of treatment while minimising the cost to the community of these problems.

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