The relationship between perceived crash responsibility and post-crash depression

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ABSTRACT

Recent studies have shown that survivors of road traffic crashes experience significant psychological health difficulties. Perception of another party as being responsible for the occurrence of a crash has been associated with on-going distress and lower psychological well-being. This paper extends this research by examining the influence of perceived crash responsibility on depression severity. A total of 57 adults aged 18–58 years injured in a road traffic crash were interviewed prior to hospital discharge and at 2-months post-crash. The results indicate that perceiving oneself as being responsible for the crash is associated with higher levels of later depression compared to those where responsibility is perceived to be shared, and to a lesser extent compared to those perceiving another party as being responsible. Persistent pain and pre-crash psychological health were found to be strongly associated with later depression severity, while trends indicate that length of stay beyond 7 days in hospital is also an important predictor. These findings are discussed in the context of past research.

Recent studies have consistently indicated that approximately 10–20% of motor vehicle crash survivors experience on-going psychological health difficulties. Prominent and debilitating difficulties identified include post-traumatic

stress disorder (PTSD) and major depression, the clinical features of which are shown in Table 1 [Blanchard & Hickling 1997; Bryant & Harvey, 1995; Malt, 1988; Mayou, 2002; Mayou, Bryant, & Duthie, 1993; Mayou, Bryant & Ehlers, 2001]. The World Health Organisation (WHO) [Pedan, Scurfield, Sleet et al., 2004] predicts that by 2020 disability resulting from road traffic crashes will represent the 3rd highest cause of morbidity behind heart disease and depression. It is essential, therefore, to understand the mechanisms of post-crash psychological distress and associated psychosocial outcomes in order to develop effective post-crash intervention programs.

Table 1 – Clinical features of post-traumatic stress disorder and depression

Post traumatic stress disorder (PTSD)	▪ Exposure to an extreme traumatic stressor involving actual or threatened death or serious injury, where intense fear, helplessness or horror is perceived ▪ Intrusive thoughts, recollections and dreams of the event (persistent re-experiencing) ▪ Persistent avoidance of anything associated with the stressor (thoughts, activities, people) ▪ Insomnia and nightmares (increased arousal)
Depression	▪ Somber, flattened mood, feeling sad ▪ Irritability, loss of interest, poor concentration ▪ Sense of worthlessness, hopelessness ▪ Fatigue, insomnia, weight loss or gain

Source: APA 1994

THE ROLE OF PERCEIVED RESPONSIBILITY AND PSYCHOLOGICAL HEALTH - In an early study of the relationship between perceived responsibility and distress in a motor vehicle crash (MVC) sample, Delahunty, Herberman, Craig et al. (1997) asked 130 MVC survivors treated in a hospital emergency department (overall 53% male; 18-65 years) to rate, on a 7-point bipolar scale, 'Who do you think was responsible for the accident' and 'Who do you think police think was responsible for the accident' . Participants were classified as either 'self-responsible' or 'other-responsible' for the MVC based on agreement of responses.

Delahunty et al. (1997) reported that those '…not responsible for their accidents reported more long-term distress and were marginally more likely to be diagnosed with PTSD than MVC survivors who were responsible for their accidents or control participants'. Interestingly, those classified as 'other-responsible' were more likely to suffer on-going pain ($p=0.06$), and at 3-months post crash were significantly more likely to report feeling a higher level of threat in the crash than those in the 'self-responsible' group. This may indicate that pain may be

playing an important role in the presence of PTSD symptoms, rather than the effect of the responsibility judgement alone.

Delahunty et al. (1997) postulated that the perceived loss of control in an event where the individual sustained serious injuries later leads to the perception that the ability to control future driving experiences is diminished, and that the ability to act or respond to avoid future harmful crashes is compromised.

The findings reported by Delahunty et al. were replicated by Hickling, Blanchard, Taylor et al. (1999) in a sample of 158 MVC survivors who had sought medical treatment (68% female) and interviewed 1-4 months and 6-months post-crash. Participants were self-referred based on advertising, or referred by local health professionals. Perceived responsibility was assessed by asking the survivor how much responsibility (0-100%) he/she had for the MVC, and how much responsibility he/she felt someone else had [Hickling et al., 1999]. A threshold value of 80% was used to classify participants as either 'self-responsible' or 'other-responsible', while those outside these categories were dropped from the analysis to enable comparison with the earlier Delahunty et al [1997] study. Individuals attributing responsibility to another party had higher rates of PTSD, slower remittence of PTSD symptoms, and some indicative evidence of higher levels of acute intrusive and avoidant thoughts than those perceiving themselves as responsible for the crash [Hickling et al., 1999].

Despite differences in the measurement of perceived responsibility between the Delahunty et al. (1997) study and Hickling et al. (1999) study, both indicate that attribution of responsibility to another party for the crash is associated with higher levels of PTSD. While the focus of this paper is depression severity, the two studies remain important given that depression and PTSD have been shown to be frequently co-morbid despite being distinct diagnoses with different diagnostic criteria [APA, 1994; Blanchard & Hickling, 1997; Kessler, Sonnega, Hughes et al., 1997; O'Donnell, Creamer & Pattison, 2004], and also due to the methods used to assess perceived responsibility

While Delahunty et al. (1997) and Hickling et al. (1999) examined the influence of perceived responsibility on PTSD, Ho et al. (2000) examined the impact of perceived responsibility and subsequent coping on generalised psychological well-being (PWB) of 321 Australians responding to a newspaper advertisement (72% drivers; 28% passengers). Perceived responsibility was assessed by asking, 'To what extent do you view yourself as responsible for the accident?' with responses of 3, 4, or 5 ('totally') on a 5-point Likert scale being considered self-responsible, and those answering 1 and 2 as 'other-responsible'. The findings of this study showed that the PWB of both drivers and passengers was lower post-crash, and that passengers related to drivers reported a lower PWB than those unrelated to the driver. Importantly, the study also reported that drivers perceiving themselves as responsible for the crash did not

experience the same degree of reduction in PWB as those perceiving others as being responsible for the crash. This finding is consistent with the studies by Delahunty et al. (1997) and Hickling et al. (1999). The impact of blame, as distinct from responsibility, on PWB was assessed separately by asking, 'To what extent do you blame someone else for the accident?' with the finding that blaming others resulted in greater psychological distress and a lower PWB [Ho et al., 2000].

Ho et al. (2000) sought to explain the results by suggesting that accepting responsibility for ones behaviour represents a style of coping aimed at re-establishing control or meaning over the situation and is therefore adaptive. However they note that such a strategy can be maladaptive and lead to heightened distress if self-blame is associated with one's character, and can lead to feelings of guilt associated with the behaviour that caused or was implicated in the crash. Conversely, Ho et al. (1999, p.48) argued that '…by engaging in other-blame as a coping strategy…' results in a loss of control over the accident and later leads to heightened distress mediated through feelings of anger.

Peltzer and Renner (2004) attempted to replicate the findings of Ho et al. (2000) using the same method in South Africa. They reported that while drivers and passengers experienced a significant decline in their well-being post-crash, they could not find any effect of perception of responsibility on PWB. That accepting responsibility was not of benefit was explained in terms of potential fundamental cultural differences in perceived locus of control between African societies and Western societies; the latter it was argued having a greater propensity for an internal locus of control while the former relies more heavily on an external locus of control where the emphasis is on '…environmental responsibility for problems and their solution' (p.373). It is in this sense important to acknowledge that Rotter's (1966) theory of locus of control may play a role in understanding how the attribution of responsibility is made in the first instance.

While the previous studies have examined PTSD and generalised psychological well-being, the impact of perceived responsibility on post-crash depression remains largely unknown. This paper seeks to address this gap by examining the influence of perceived crash responsibility on depression severity following hospitalisation resulting from a road traffic crash. The use of regression models allows for an assessment of factors associated with later depression whilst controlling for potential confounding factors such as pain. The ability to statistically control for the effect of pain is vital given the high degree of co-morbidity between pain and depression [for a review see Bair, Robinson, Katon et al., 2003]. Based on previous studies, it would seem conceivable that those perceiving themselves as being responsible for the crash would experience lower depression symptom

severity compared to those perceiving others as responsible for the crash.

METHOD

PARTICIPANTS - A total of 57 patients admitted to a Major Trauma Centre and two metropolitan teaching hospitals following involvement in a road traffic crash as a vehicle driver or passenger, motorcyclist, cyclist or pedestrian were enrolled in the study. Patients were interviewed on a range of health issues prior to discharge, 6-8 weeks and at 6-months post-crash, although this paper considers only the outcomes up to 2 months post-crash. Potential participants, and those approached, were those meeting the study criteria and admitted in the period March 2004 – end March 2005.

INCLUSION CRITERIA – Eligible patients were road-users admitted for a period greater than 24 hours, being aged 18-65 years, and with a Glasgow Coma Scale (GCS) ≥13. Participants were required to provide informed consent, and Ethics Committee approval for the study was obtained.

EXCLUSION CRITERIA – Patients were excluded if any of the following criteria were met: presence of an AIS 3+ head, spinal, or vertebral column injury; crashes involving a fatality; crashes involving vehicle fires or where individuals sustained burn injuries resulting from a vehicle fire; post-traumatic amnesia (PTA) ≥24 hours; pre-existing cognitive impairment; deliberate self-harm; history of psychosis; illicit drug dependence; occupants of a stolen vehicle; non-English speaker; residing outside of the State of Victoria, and those considered by medical staff to be medically unfit to provide informed consent.

PARTICIPANT INTERVIEWS – Participants were interviewed prior to discharge with the initial interview being approximately 60 minutes duration on average. The inpatient interview (Time 1) focussed on pre-crash health status, details of the crash and perceived level of responsibility for the crash, perceived pain, and questions designed to assess the emotional impact of being involved in the crash. The Time 2 interview was undertaken 6–8 weeks post-crash and focussed on similar health outcomes as the initial interview with temporally specific open-ended items and survey instruments replacing that focussed on 'acute' responses to trauma.

ASSESSMENT INSTRUMENTS - This paper reports on outcomes assessed in order to address the question of perceived responsibility on post-crash depression, and are as follows:

Road-user interview: Perceived responsibility – Questions of perceived responsibility for the crash were: 'Rate on a scale of 0–10 what you feel your level of responsibility was for the accident, where 0 equals 'not at all responsible' and 10 'completely responsible', and, 'Rate on a scale of 0–10 what you feel other person(s) level of responsibility was for the accident,

where 0 equals 'another party not at all responsible' and 10 'other party completely responsible'.

SF-36 [Ware, Snow, & Kosinski, 2000] - The SF-36 is a 36-item measure of general health status and quality of life, providing a physical component summary score (PCS) and mental component summary score (MCS). In-patient administration focused on health in the month prior to the crash. The measure is designed to make reference to the previous four weeks, and has excellent test-retest reliability [Brazier, Harper & Jones, 1992].

Health Assessment Questionnaire [McDowell & Newell, 1996] – Perceived pain at Time 2 (6-8 weeks) was measured using the single Visual Analogue Scale of the Health Assessment Questionnaire. Participants were asked to rate the severity of pain from 0 (No pain) to 100 (Very Severe Pain) in the past week.

Beck Depression Inventory-II – (BDI-II) [Beck, Steer, & Brown, 1996] - The BDI-II is a 21-item self-report survey for measuring the severity of depression by assessing the presence of symptoms, using a 4-point scale (0-3), 'in the past two weeks, including today'. The BDI-II is scored by summing the ratings for each item with the following categories used as per the test manual: minimal (0-13); mild (14-19); moderate (20-28); severe (29-63). The BDI-II was administered at each interview.

INJURY DATA – Injury information was obtained using the inpatient medical history. Injuries were coded according to the Abbreviated Injury Scale (AIS), 1998 revision [AAAM, 1998]. The Injury Severity Score (ISS) was calculated for each participant, and acts as a global index of injury severity [AAAM, 1998]. The Glasgow Coma Scale (GCS) was obtained from paramedic and hospital medical records with the lowest observed value being recorded for this study. The GCS acts as a measure of conscious state and ranges from 3 (non-responsive) – 15 (alert & oriented). The GCS is calculated by summing three components: eye opening response; verbal response, and motor-response to stimuli [Teasdale & Jennett, 1974].

STATISTICAL ANALYSIS - Patient and injury characteristics were examined, and comparisons between the responsibility groups were made using chi-square tests and one-way ANOVAs. To determine predictors of depression multiple regression was used [Tabachnick & Fidell, 2000]. Analysis was conducted using SPSS and statistical significance was set at p-value of ≤ 0.05. Post-hoc power analysis was conducted using Power & Precision to determine the power associated with each independent variable in the multiple regression model [Borenstein, Rothstein, Cohen, 2001].

RESULTS

SAMPLE DEMOGRAPHICS – Table 1 shows that of the 57 participants, 22 were drivers (38.6%), 5 were passengers (8.8%), 12 were motorcyclists (21.1%), 13 were cyclists (21.8%) and 5 were pedestrians (8.8%). While males represented 59.6% of the sample (n=34) overall, there were more female drivers, passengers and pedestrians than males; notably, all but one of the motorcyclists and cyclists were male. The mean age of males and females was 34.3 years and 38.5 years respectively (p=0.2), with the age of participants ranging from 19–58.8 years at the time of the crash. The age distribution by gender did not differ (p=0.6).

Table 1 – Sample demographic and injury characteristics

Characteristic (N=57)			
Road-user type			
	Driver	22 (38.6%)	36% male (n=8)
	Passenger	5 (8.8%)	40% male (n=2)
	Motorcyclist	12 (21.1%)	92% male (n=11)
	Pedal cyclist	13 (21.8%)	84% male (n=11)
	Pedestrian	5 (8.8%)	40% male (n=2)
Gender	Male	34	59.6%
	Female	23	40.4%
Age (years)			
	Total sample (Mean, SD)	36.0 (12.6) yrs	19–58.8 years
	18-29 yrs	25	44%
	30-39 yrs	8	14%
	40-49 yrs	12	21%
	50-59 yrs	12	21%
	Males (Mean, SD)	34.3 (12.3) yrs	19–55 years
	Female (Mean, SD)	38.5 (12.5) yrs	19-58.8 years
Glasgow Coma Scale (GCS)			
	GCS 15	41	71.9%
	GCS 14	13	22.8%
	GCS 13	3	5.3%
Length of Stay (days)			
	(Mean, SD)	5.6 (3.2)	Range: 2-17
Injury Severity Score (ISS)			
	Mean ISS (SD)	8.3 (5.0)	Range: 1–22
	% Major Trauma: ISS>15	9.1% (n=5)	
Injuries sustained		Num. Persons	Percent persons[1]
	Head AIS2	14	24.5%
	Face AIS2+	3	5.3%
	Neck AIS 2+	0	0.0%
	Chest AIS 2+	8	14.0%
	Abdomen AIS 2+	1	1.8%
	Spine AIS2+	2	3.5%
	Upper Extremity AIS 2+	19	33.3%
	Lower Extremity AIS2+	28	49.1%

[1] Injuries to multiple body regions permitted

GCS scores for 16 participants (28%) indicated a compromised state of consciousness (GCS<15), with the period of time at that level not specified. The mean length of stay was 5.6 days (SD=3.2) with the range being 2–17 days. The mean ISS of the sample was 8.3 (SD=5.0, Range: 1–22) with 8.7% of the sample being classified as major trauma, indexed by an ISS greater than 15. The most common non-minor injuries were AIS2+ lower extremity injuries (49.1% of the sample), AIS2 upper extremity injuries (34.5% of the sample), AIS 2+ head injuries (24.5% of the sample) and AIS2+ chest injuries (14% of the sample). A smaller number of participants sustained AIS2+ spine, face, and abdominal injuries.

ANALYSIS OF PERCEIVED RESPONSIBILITY - To assess the relationship between perceived crash responsibility, participants were categorised into one of three responsibility groups on the basis of their responses to the questions asking them to rate their level of responsibility and that of another party as described earlier. Following Hickling et al. (1999), participants indicating 80% or higher to their own level of responsibility were classified as 'Self-Responsible' while those attributing greater than 80% to another party were classified as 'Other-Responsible'. The remaining participants were allocated to 'mixed' or shared responsibility, as were those with greater than or equal to 80% attribution on both questions. This classification resulted in 11 participants (19.3%) being considered 'self-responsible', 26 as 'other-responsible' (45.6%), and 20 participants (35.1%) as having 'mixed' or shared attribution of responsibility.

Table 2 shows that the crash responsibility groups are well matched on demographics, injury severity, perceived pain at Time 2 and length of stay in hospital. Univariate analysis indicated no statistically reliable differences in the characteristics shown in Table 2 between the three responsibility groups.

Depression severity was assessed at two months post-discharge (Time 2) using the BDI-II, with the time reference for the questions being 'the last two weeks including today'. The mean depression severity score for the 'self-responsible' group at Time 2 was 11.7, for the 'mixed-responsible' group 9.7, and 11.4 for the 'other-responsible' group, $p \geq 0.05$. A slightly higher proportion of those in the 'self-responsible' group were classified as experiencing moderate-severe depression symptom severity (27.3%) compared to the 'other-responsible' (19.2%) and the 'mixed-responsibility' group (15%), $p \geq 0.05$.

An important issue in the examination of the effect of perceived responsibility on later depression severity is the measurement of pre-crash mental health. The SF-36 provided data on participants' pre-crash mental health status, with reference made to the four weeks prior to the crash. Mental health was assessed using the Mental Component Summary (MCS) Score of the SF-36, and the mean pre-crash MCS scores (refer Table 2) indicates 'average' level of health functioning,

respectively, for each of the responsibility groups relative to the Australian population [ABS, 1995]. The SF-36 MCS will be used in the multiple regression analysis to adjust for pre-crash psychological health in assessing the role of perceived responsibility on later depression symptom severity.

Table 2 - Participant profile by crash responsibility group

	Self-responsible (n=11)	Mixed responsible (n=20)	Other responsible (N=26)
Demographics & Injury severity			
% Male	54.5%	60%	61.5%
Age (mean, SD)	35.8 (12.7)	32.6 (13.6)	38.6 (11.6)
ISS (mean, SD)	7.8 (3.8)	8.8 (6.5)	8.1 (4.3)
Perceived Pain: 6-8 wks post-crash			
Mean (SD)	23.5 (22.9)	29.2 (21.8)	33.1 (22.7)
Length of stay			
Days (mean, SD)	6.3 (2.2)	5.6 (3.2)	5.2 (3.7)
% > 7 days	27%	25%	15%
SF-36: Pre-crash Mental Component Score			
Mean (SD)	52.3 (7.6)	47.8 (11.7)	51.8 (9.1)
Depression severity: 6-8 wks post-crash			
Mean (SD)	11.7 (11.0)	9.7 (8.7)	11.4 (9.8)
% Minimal	63.6%	65%	61.5%
% Mild	9.1%	20%	19.2%
% Moderate	18.2%	15%	11.5%
% Severe	9.1%	Nil	7.7%

PERCEIVED RESPONSIBILITY ON LATER DEPRESSION SEVERITY – A standard multiple regression was used to assess the role of perceived responsibility, rated whilst an in-patient, on later depression severity. To control for potential effects of pre-crash psychological health and well-being on later depression symptom severity and the responsibility judgement itself, the pre-crash Mental Health Summary Scale of the SF-36 was entered into the model. Self-rated pain at Time 2 and length of stay were also entered. Preliminary analyses indicated that age, gender, and ISS were not related to depression symptom severity and were therefore not included in the regression model.

Evaluation of multiple regression assumptions indicated that square root transformations of depression severity at Time 2 (dependent variable), perceived pain at Time 2, and pre-crash SF-36 mental health component scores were required in order to ensure homoscedasticity of residuals. One case, from the 'other-responsible' group was removed from the analysis due to an excessively large (>+2.5) studentized residual, leaving 56 cases in the model. In the final model there was no evidence of multicollinearity (Mean VIF: 1.41) and there were no multivariate outliers using a $p<0.001$ criteria for Mahalanobis distance.

Table 3 shows that the entered predictors accounted for 56% of the variance in depression severity measured at Time 2, and the overall model was statistically significant, $F(5,50)=14.8$, $p\leq0.001$, $R^2_{adj}=56\%$.

Three of the independent variables contributed significantly to the prediction of the model: (the square root of) self-rated pain at Time 2 ($p\leq0.001$; $sr_i^2=0.44$, power 100%); (the square root of) pre-crash psychological health indexed by the SF-36 ($p=0.02$; $sr_i^2=0.05$, power 75%), and the 'mixed-responsibility group' ($p=0.04$; $sr_i^2=0.04$), in combination accounting for 53% of variance (i.e., R^2) in depression severity at Time 2, with the remaining 6.7% being shared amongst all independent variables. A strong trend of higher later depression severity for those admitted longer than 7 days relative to those discharged earlier was evident ($p=0.06$; power: 86.7%).

Table 3 – Predictors of depression severity at Time 2

Depression severity: Time2	*B*	P	B	sr^2 (unique)
Pre-crash SF-36 Mental Health Component score	-0.46	0.02	-0.22	0.05
Overall body pain, T2	0.46	≤0.001	0.69	0.44
Length of stay > 7 days	0.68	0.06	0.18	0.03
'Other-responsible'†	-0.76	0.06	-0.24	0.03
'Mixed-responsible'†	-0.87	0.04	-0.27	0.04
	$R= 0.773^{**}$, $R^2= 0.597$, Adj. $R^2 = 0.557$			

† Relative to 'self-responsible'; ** $p \leq 0.001$

Importantly, the model showed that depression symptom severity at Time 2 was lower in both the 'other-responsible' ($p=0.06$) and 'mixed-responsibility' group ($p=0.04$) relative to the 'self-responsible' group. The depression severity of the 'mixed-responsibility' group appeared lower, though not statistically significant compared to 'other-responsibility' group ($p=0.09$). Model power for perceived responsibility was 50%.

Finally, standardized beta coefficients indicated that persistent pain (0.69) was the most potent predictor of later depression severity, followed by perceived responsibility (-.24, -.27), pre-crash psychological health (-0.22), and length of stay (0.18).

DISCUSSION

The findings of this study demonstrate that perceived responsibility in a hospitalised sample of individuals involved in road traffic crashes was related to the severity of later depression, following adjustment for pre-crash psychological health, post-crash pain and length of stay. Perception of oneself as responsible for the crash was related to higher levels of later depression

compared to those who perceived responsibility to be mixed. The regression model also indicated a trend for higher later depression severity for those rating themselves as responsible for the MVC compared to those rating another party as being responsible for the crash. The regression analysis also revealed that persistent pain was the most potent predictor of later depression severity, and that pre-crash psychological health was an important predictor of later depression severity. Length of stay in hospital demonstrated a marginal association with later depression severity, while factors such as age, gender, ISS, and pre-crash physical health were not found to be related to later depression severity.

The multiple regression model indicated that those in the 'self-responsible' group reported higher levels of depression compared to those in the other two responsibility groups The results of this paper differ from the pattern reported in the previous studies which demonstrated that perceiving others as responsible was related to heightened later distress and PTSD. It must be noted though that there are important differences in the diagnostic criteria of PTSD and depression, as noted in Table 1 in this paper, and they are classified as distinct psychological disorders.

It is possible that the depression symptom severity of the 'self-responsible' group may have been higher than the 'mixed' and 'other' responsible group due to holding a strong degree of guilt for the crash and possibly engaging in maladaptive self-blame behaviour [see Janoff-Bullman, 1992], where the focus is on the perceived intrinsic flaws in themselves, rather than some random aberrant behaviour that led to the MVC.

An important finding of this paper is that while perceived responsibility plays a role in later depression severity, on-going pain proved to be the most potent predictor. That pain is related to depression severity is not surprising, nor was the finding that pre-crash psychological health is also associated with heightened depression symptom severity.

Identification of those susceptible for high pain levels post-discharge based on injury profiling and subsequent implementation of effective pain relief regimes might be useful in countering later depression severity. In doing so, consideration of pre-crash psychological health would further enhance the identification of individuals susceptible to on-going depression difficulties. Improved pain management post-crash and training patients in the use of appropriate adaptive coping strategies by hospital allied health staff and continuing local medical officer support may act to alleviate the persistence and severity of depressive symptoms.

STUDY LIMITATIONS - While the use of multiple regression represents an advance from previous research by allowing for potential explanatory factors to be accounted for in assessing the relationship between crash responsibility with later

depression severity, there were limitations to the study. The sample represents a relatively small number of otherwise healthy crash-involved individuals hospitalised as a consequence of a road traffic crash where there was no fatality. The exclusion of fatalities from the study was deliberate as fatality crashes represent a small proportion of total road accident victims and are an extreme form of trauma. The effect of being self-responsible for a crash where another party was fatally injured may lead to far greater psychopathology, particularly if known to the person injured, and is an important area to be explored in future research. A related issue worth exploring is the effect of the injury severity sustained by other parties to the crash on both the attribution of responsibility and later psychological health.

The effect of the overall small sample size is seen in the relatively small number of participants in the 'self-responsible' category, although this is also a feature of previous studies where the majority regarded others to be responsible for the crash. Power analysis does however indicate that the results are robust. It is important to state that these results do not necessarily apply to those outside of the inclusion criteria, and the representativeness of the sample with respect to demographics and injury severity in the Australian context is yet to be confirmed. Further studies would be well served to examine the influence of road-user groups on the relationship between crash responsibility and later depression severity, drawing the distinction between vulnerable road-users and vehicle occupants.

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