Attributions of responsibility for motor vehicle accidents and post-injury outcomes

Jason Thompson

Thesis by publication

This thesis is submitted in full satisfaction of the requirements for the degree of Doctor of Philosophy at Deakin University

School of Medicine

December, 2014
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Abstract

Determining the factors associated with post-accident outcomes for people injured in motor vehicle accidents (MVAs) is of particular interest to personal injury compensation schemes attempting to best allocate health care resources and identify clients at risk of poor recovery. Whilst the potential impact of attributions of responsibility on post-injury outcomes has been recognised in previous work, the extent and direction of its effect has remained uncertain. Few studies have specifically aimed to assess the association of attributions of responsibility with outcomes among people injured in MVAs, especially in relation to demographic or accident-related variables likely to be known at the initiation of an injury compensation claim process.

Aims

This body of work sought to test the association between attributions of responsibility for MVAs and four areas of recovery; mental health outcomes, physical health outcomes, return to work, and satisfaction with personal injury compensation services. In particular, it sought to understand the impact of attributions of responsibility for accidents on recovery and health outcomes in relation to other demographic and accident circumstance characteristics routinely controlled for in compensation outcomes research and likely to be known or accessible to personal injury compensation schemes at the initiation of a personal injury claims process.
Methods

All participants (n=1173) had been injured in an MVA and were current or previous clients of the Victorian Transport Accident Commission (TAC) – a personal injury compensation scheme that provides both no-fault and limited common-law compensation benefits. In this sense, the TAC may be regarded as a ‘hybrid’ scheme. Participants were invited via letter to take part in a telephone survey and were subsequently contacted by an independent research organisation.

Three studies utilising data from a series of two cross-sectional structured interviews were conducted; (1) a test of the relative association between attributions of responsibility for accidents and mental and physical health outcomes controlling for demographic and claim-related variables such as age, education, gender, time since the accident, injury severity, and role in the accident (e.g., driver, passenger, pedestrian) using structural equation modeling (SEM); (2) an investigation of the potential mediating or moderating role of depressive symptoms on the relationship between attributions of responsibility for accidents and return to work using a series of binary logistic regression analyses, and; (3) an investigation of the relationship between attributions of responsibility for accidents and satisfaction with compensation services, controlling for demographic variables and physical and mental health outcomes using a multivariate analysis of covariance (MANOVA).

Major results

The association between attributions of responsibility for accidents and health outcomes
The hypothesised model was well-fitted to the data demonstrating that attributions of responsibility for accidents were significantly associated with post-accident mental and physical health outcomes. People who did not attribute responsibility for their accident to themselves reported significantly poorer mental and physical health outcomes at follow-up. Analysis of direct effects by observed exogenous variables also demonstrated that longer claim duration, being unemployed at the time of accident, non-vulnerable road user status (e.g., driver / passenger), female gender, and lower levels of education were significantly associated with poorer post-accident mental health outcomes. Most noteworthy, however, was that the largest effect was reserved for attributions of responsibility for the accident \( (r^2 = .35, p<.001) \).

Variables that had a significant direct effect on positive physical health outcomes were higher levels of education, female gender, and younger age. Analysis of parameter pathways showed that attribution of responsibility’s indirect effect on physical health \( (r^2 = -.19) \) was mediated by mental health. Direction of effects among demographic and claim-related variables showed that positive physical health outcomes were associated with younger age, female gender, and higher levels of education. More positive mental health outcomes were associated with vulnerable road user status (e.g., pedestrian, cyclists, motorcyclist), being employed at the time of accident, male gender, shorter claim duration, and higher levels of education.

*The association between attributions of responsibility for MVAs, depressive symptoms and return to work*

Results of this study showed that attributions of responsibility for accidents were strongly associated with the presence of depressive symptoms among road trauma survivors. People who did not attribute any responsibility for their accident to
themselves were around 3 times more likely to exhibit symptoms of depression than those who reported being ‘totally responsible’ for their accident. Further, the findings showed that despite attributions of responsibility being associated with the likelihood of returning to work, the presence of depressive symptoms mediated the relationship between attributions of responsibility for accidents and return to work status; people who reported depressive symptoms were over 3.5 times less likely to have returned to work at follow-up than those who were asymptomatic.

*The association between attributions of responsibility for MVAs and satisfaction with personal injury compensation schemes*

Results of this study showed that after controlling for mental and physical health status, age, gender, and duration of claim, people who did not attribute responsibility for their accident to themselves reported significantly lower levels of satisfaction with their personal injury compensation scheme than those who attributed responsibility either partially or completely to themselves. Between-subject effects demonstrated a significant association between attributions of responsibility and all satisfaction-related variables under study, including overall satisfaction with the scheme; rating of how the scheme resolved their issues; rating of how the scheme kept them up to date; rating of whether the patient believed the scheme treated them as an individual; and rating of whether the scheme cared about them.

**Conclusions**

Attributions of responsibility for MVAs are significantly associated with post-injury mental health outcomes, symptoms of depression, and satisfaction with compensation schemes. Attributions of responsibility are also associated with
physical health outcomes and return to work outcomes through the mediating role of mental health variables. The direction of effect is such that people injured in MVAs who did not attribute responsibility for their accident to themselves are more likely to experience poorer outcomes across all domains measured at follow-up than those who attribute responsibility to themselves.

The effect of attributions of responsibility on mental health, physical health, and satisfaction with compensation schemes appears robust, even in the presence of other demographic and health outcome variables included in this series of studies. Personal injury compensation schemes may wish to include assessment of attributions of responsibility for accidents in screening processes to identify clients at risk of both poor recovery and low levels of satisfaction. Future research may wish to control for the effect of attributions of responsibility for accidents when assessing mental and physical health outcomes, return to work, or satisfaction within or between populations injured in MVAs. Safety, compensation and rehabilitation services may wish to consider means by which their services can best negate negative outcomes associated with external attributions of responsibility for accidents among their client base.
Acknowledgements

The process of completing a PhD is obviously long and sometimes arduous. I have to confess, though, I thought that conducting this was almost fun. In what other process are you free to pursue an area of research that you are not only passionate about, but one that exposes you to information and perspective from such broad array of smart, interesting people? This thesis is dedicated to those who recognise that research is challenging, exciting, and beneficial not only to those undertaking it, but to those whose lives it may potentially improve should its findings be useful.

Firstly I would like to thank my principal supervisor, Professor Michael Berk. Michael’s exceptionally pragmatic, inventive, and enthusiastic style has ensured that this work (undertaken while also conducting full time work) was focused and reached set milestones at every point. Pound-for-pound, Michael is easily the most punctual person I have ever met – an unusual trait in academia and especially rare among people of his academic capacity. The importance of this trait in assisting me to complete this body of work should not be underestimated. His almost unerring ability to make every meeting on time also kept me on-track and ensured I felt that the project was a priority for him. Thank you, Michael.

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extolled more pride, or made me feel more embarrassed or uncomfortable by constantly telling other people what I was doing than you. You were absolutely the key to the completion of this work. It may now be your turn to study while I cook dinner / feed the dogs / feed the cat / clean the house / go out / do everything else.
List of Abbreviations

MVA: Motor vehicle accident
AMOS: Analysis of Moment Structures
SPSS: Statistical Package for the Social Sciences
SF-12 V2: Short Form 12 Health Survey, Version 2
MCS: Mental health composite score of the SF-12 V2
PCS: Physical health composite score of the SF-12 V2
TAC: Transport Accident Commission
MDD: Major depressive disorder
PTSD: Posttraumatic stress disorder
DASS-21: Depression, Anxiety and Stress Scale – 21 Items
SEM: Structural equation modelling
MANCOVA: Multivariate analysis of covariance
DEP: Depressive symptoms
ATR: Attributions of responsibility
RTW: Return to work
T1: Time 1
T2: Time 2
FOI: Freedom of Information
ABI: Acquired Brain Injury
Publications arising from this series


Presentations arising from this series


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Chapter 1: Background and aims of the research

1.1.1 The burden of illness associated with MVAs

Around the world each year, motor vehicle accidents (MVAs) kill approximately 1.2 million people and injure up to 50 million more\(^1\). Already the 10\(^{th}\) leading contributor to the global burden of disease, transport-related injury is on track to become the 5\(^{th}\) leading cause by 2030\(^2\).

Whilst Australia is often regarded as a road safety success story\(^3,4\), it is not immune from the trauma associated with MVAs or the costs associated with treatment and rehabilitation of injured persons. For example, even in the Australian state of Victoria where the road toll has arguably been most dramatically and successfully reduced\(^5\), the Victorian Transport Accident Commission (TAC) maintains an ‘active’ injured client portfolio of around 40,000 clients and processes around 19,000 new claims for injury compensation each year\(^6\).

In addition to the tragic loss of life and disability incurred through MVAs, the direct financial cost to the Victorian community of medical services and other compensation associated with road trauma is around $1 billion per year with close to $10 billion more in forward liabilities\(^6\). Further to this, MVAs leave many people with significant disability rendering them unable to work or return to other roles within families and communities\(^7,8\). Many more continue to experience poor mental health for a time far beyond the duration of their physical injuries\(^9\). Faster, more complete recovery would therefore be of benefit to MVA survivors and to the Victorian community as a whole. This research will shed light on those factors that contribute to faster, more complete recovery among persons injured in MVAs.

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The broad aim of injury compensation and insurance schemes is to provide benefits to improve injured persons’ recovery and functioning. For example, the Transport Accident Commission (the setting for the current study – see section 1.5.2) was established in 1987 under the Transport Accident Act (1986)\textsuperscript{10} to provide, “suitable and just compensation in respect of persons injured or who die as a result of transport accidents… and to provide suitable systems for the effective rehabilitation of persons injured as a result of transport accidents” (p31). Similarly, the Australian Productivity Commission’s\textsuperscript{11} 2010 report into the establishment of a national injury insurance scheme notes the importance of establishing a nationally consistent compensation scheme that avoids the pitfalls of current state-based arrangements and “improves outcomes for participants”\textsuperscript{11} (p.853).

However, despite the fundamental assumptions surrounding these aims, considerable debate continues as to whether poorer health outcomes exist for persons who receive compensation than for those that do not\textsuperscript{12-23}. Within this debate, there also exists a branch of literature more specifically devoted to the question of whether the design of compensation systems produces conditions that exacerbate ill health or its reporting\textsuperscript{11,21,23-26}. In general, this secondary debate revolves around the relative merits and incentives produced by ‘fault-based’ vs ‘no-fault’ (common-law) compensation scheme structures. The arguments pertaining to this discussion are reviewed, below.

1.1.2 The structure of compensation schemes and potential effects on client health outcomes

Across Australia, differences exist at a sub-national level in relation to the motor vehicle accident injury compensation available to clients\textsuperscript{24}. This lack of a consistent approach between states and territories means that compensation processes and
benefits accessible to injured persons can vary widely between jurisdictions. This is most starkly represented in circumstances where individuals have been injured only short distances apart on the cusp of state or territory boundaries\textsuperscript{11}. It also leads to further debate regarding the relative merits of various ‘no-fault’ or ‘fault-based’ compensation system designs in terms of protection of clients’ rights under law, reduction of overall scheme costs, negative consequences of adversarial interactions, and the effectiveness of schemes in providing adequate resources for client recovery and health outcomes\textsuperscript{11, 24}. Given that compensation schemes exist in order to “provide treatment and benefits in order to help people on their way to recovery and independence”\textsuperscript{6}, this is an issue worthy of significant attention.

One of the primary advantages of no-fault schemes over fault-based schemes is considered to be the responsibility that no-fault schemes have in providing ‘life-time’ care for an injured person. Rather than attempting to estimate the level of compensation needed early on in the history of a claim in a single lump-sum\textsuperscript{11}, this enables schemes to work with clients whose circumstances or level of functioning may change over time, or deviate from an expected trajectory. This is particularly important for people injured in MVAs as, whilst the extent of physical injuries caused by MVAs varies from the relatively benign to the catastrophic, the recovery and extent of disability individuals face post-accident varies similarly\textsuperscript{27}. Health outcomes and post-accident functioning experienced by individuals are not always commensurate with their initial level of injury\textsuperscript{7}. People with substantial physical injuries often report full recoveries, whereas many less severely injured people report significant acute and chronic debilitation\textsuperscript{28, 29}. 

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The relatively unpredictable nature of individual recovery means it is often difficult to project the patient outcomes and the range and intensity of treatment and services that will be required by MVA survivors post-accident\textsuperscript{27, 29}. This creates uncertainty on the part of personal injury insurance and compensation schemes that must ensure that claims management resources are matched to the medical and service requirements of clients and, furthermore, must ensure that the ongoing financial liabilities arising from treatment and rehabilitation costs can be met\textsuperscript{10}. This not only creates a degree of flexibility within personal injury insurance schemes to deal with unexpected circumstances or recoveries, but provides an incentive for them to direct funding into research and investigations of new treatment, compensation, and management practices that may result in improved health outcomes for clients\textsuperscript{11, 30}. It also ensures that they regularly monitor client health outcomes, functional recoveries, satisfaction with services, and claims liabilities\textsuperscript{6}.

Whilst MVAs are among the most common causes of trauma affecting people in Western countries\textsuperscript{2, 31}, concerns exist that their frequency and predictability have bred complacency among researchers and health systems both for dealing effectively with their causes and treating survivors\textsuperscript{32}. Further, the practical difficulties in researching this population\textsuperscript{22} and the overwhelming reliance that people in many western countries have on the utilisation of motor vehicles for everyday transportation\textsuperscript{33} have resulted in relative neglect regarding the study of MVA survivors as an isolated population.

The aim of this research is, therefore, to add to our knowledge about MVA survivors by understanding how pre-injury and accident circumstance factors affect subsequent recovery from trauma. In particular, this research investigates the association...
between attributions of responsibility for MVAs and physical health outcomes, mental health outcomes, return to work, and levels of satisfaction within the context of a single personal injury compensation scheme.

1.1.3 Areas covered in the literature review

The following sections provide an overview of the literature relevant to the series of three studies contained within the thesis. Whilst the area of injury, accident, compensation, and recovery is extremely broad, this chapter will specifically address the following areas:

- the role of compensation schemes in recovery for MVAs and injury
- the potential impact of compensation system designs on recovery following MVAs
- the monitoring of patient health outcomes following MVAs
- the relationship between models of psychological trauma, experience of injury, and the development or maintenance of illness
- the potential role of attributions of responsibility on outcomes for people injured in MVAs
- the nature of the compensation setting specific to the studies undertaken, and
- a broad description of the study methodology.
1.2 The association between injury compensation and recovery

First termed “railway spine”, the potentially maintaining association between compensation and illness has been noted since the late 19th and early 20th century with the introduction of workers’ compensation laws in industrialised countries. Of a similar nature to other psychosomatic conditions such as “soldier’s heart”, “neurasthenia”, “compensation neurosis”, and “spinal irritation”, it was also highlighted in 1961 by Miller who coined the term “accident neurosis”. Miller described accident neurosis as a situation where injured persons failed to recover under conditions where 1) the accident was someone else's fault, and, 2) payment of financial compensation was potentially involved.

Miller suggested that the severity of accident neurosis was inversely proportional to the physical injuries sustained by individuals and believed it would not continue where hope for financial gain (i.e., compensation) did not exist, had dissipated, or where it had been satisfied. Whilst frequently cited from the date of publication forth, subsequent research and reviews have often failed to support Miller's findings, particularly in relation to the dissipation of symptoms with the absence of opportunity for financial gain. Rather than dismissing the effect of compensation altogether, however, they have found that its negative effect is stable throughout all stages of the compensation process. For example, Blanchard and Hickling found that people injured in MVAs who did not pursue litigation had lower levels of psychological distress than litigants, however, the litigants' symptoms did not dissipate at greater rates among those whose claims had settled at 12 months in comparison to those for whom a compensation result was still pending.
In work supporting the apparent association between compensation and poor recovery, Harris et al.\textsuperscript{17} conducted a meta-analysis of the literature related to 211 studies of the effects of compensation status on health outcomes after surgery. Of these, 175 reached conclusions that receiving compensation was related to poorer health outcomes, 35 found no difference, and only 1 found that compensation status was beneficial. A meta-analysis of those studies demonstrated that compensable patients were also 3.8 times more likely to report an unsatisfactory outcome than non-compensable patients. No conclusions regarding the mechanism for this association beyond those found in the existing literature were reached.

In a study focused on the Victorian context, Gabbe et al.\textsuperscript{39} also found that injured persons who had received orthopaedic injuries and had been compensated under a personal injury insurance scheme\textsuperscript{6}, had poorer physical and mental health outcomes than matched controls. The authors argued that possible causes were poor experience with the compensation system, illness behaviour directed toward secondary gain, and differences in the mechanism and nature of the traumatic event in which the client was involved. A methodological limitation of this study, however, was that ‘compensable’ clients were involved in serious MVAs, whereas persons in the non-compensable sample were primarily injured in falls. This suggests that accident circumstance variables relating to the manner in which injuries were obtained may have overlapped with compensable status (see Section 1.1).

Whilst rarely measured directly (and separate from the effect of the compensation being sought), some authors have alluded to the negative effect that simply ‘dealing’ with an insurer or compensation scheme may have on recovery. For example, O’Donnell et al.\textsuperscript{14} reported that when the effect of stressful interactions with
compensation agencies was removed, differences in anxiety observed between compensable and non-compensable clients in their study disappeared. The authors suggested that stressful interactions between clients and compensation agencies could possibly affect mental health outcomes. Grant\textsuperscript{19} published recent similar work underscoring the potential negative role that stressful interactions with compensation schemes can have on long-term recovery.

Beyond the machinations involved in interacting with compensation schemes, there are also broader social and cultural aspects of road trauma that may conceivably influence recovery either positively or negatively. Viewed in a wider context that considers individuals’ behaviour within social relations, institutions and health system structures (e.g., family, medical professionals, social and employment structures, insurers / compensation agencies)\textsuperscript{40, 41}, it is plausible that public awareness campaigns designed to prevent road trauma through graphic depiction of its consequences could influence illness behaviour\textsuperscript{35}. For example, no-fault elements of compensation schemes not only have a role in providing support for people injured as a result of accidents, but often (due to their requirement to also manage the financial liabilities associated with trauma) also have a role in injury prevention. In Victoria, the TAC spends around $50 million per year\textsuperscript{6} in often graphic and emotive awareness campaigns designed to demonstrate the traumatic and often life-long consequences associated with road trauma. Whilst conducted in a bid to prevent further road injuries, it may be difficult for already injured road users to reconcile messages of the threat of ongoing trauma and chronic debilitation portrayed by such campaigns with expectations that their own recovery should be somehow smooth or rapid.
The discussion above demonstrates the complex association between injuries and compensation as just one (albeit influential) element within individual patient recovery. Once again, it highlights the likely inability of disease-models focused only on patient pathophysiology to adequately predict recovery trajectories and points to additional reasons why outcomes among people injured in MVAs may vary so dramatically. In addition to adjusting to the consequences of their physical injuries, a person injured in an MVA who is compensated under a personal injury insurance scheme is immediately drawn into a set of dynamic personal, professional, and social relationships (voluntarily or otherwise) that may influence their illness perceptions, behaviour and ultimately, outcomes.

As discussed above, there is a strong sense in the literature that social and economic conditions surrounding persons who receive compensation for injuries may, in some circumstances, produce perverse incentives to delay recovery. Added to this is that maintenance of the ‘sick-role’ can also produce levels of attention, sympathy, and exemption from obligation not always considered by patients to be entirely negative. Combined, this highlights the importance of recognising that health outcomes are not driven purely by physical injuries, but also comprise structural, social, psychological, and cultural components.

1.2.1 Assumptions underlying the benefits of no-fault injury insurance schemes

In addition to simple exposure to injury compensation, the design of personal injury compensation schemes and their role in helping or hindering recovery has also come under increasing scrutiny in recent years. In Australia, this debate has been contributed to by the Australian Productivity Commission’s investigation into the merits of a National Injury Insurance Scheme (NIIS), the results of which
recommended that the NIIS be based on a ‘no-fault’, rather than a ‘fault-based’
common-law model of compensation. The Productivity Commission’s justification
for this position reflected common themes in the academic literature, noting that in
comparison to fault-based structures, no-fault compensation schemes;

- did not produce incentives for clients to delay recovery or exaggerate the
  extent of their injuries in order to maximise receipt of benefits,
- were less likely to feature delays in receipt of medical services for clients as a
  result of protracted legal disputes,
- provided more flexibility for adjustments to services over the life of a claim
  should individual clients’ circumstances or needs change over time,
- provided incentives for schemes to better understand and manage client
  outcomes in order to reduce lifetime costs and liabilities, and;
- were less likely to produce adversarial relationships between clients and
  insurers that could also result in poorer outcomes.

Importantly, the Productivity Commission also cited multiple studies and meta
analyses strongly suggesting that exposure to fault-based schemes was linked to
poorer health outcomes for clients than those achieved by alternative ‘no-fault’
systems.\textsuperscript{17, 18, 22, 23, 45} Therefore, despite the curtailment of some rights relating to the
ability of clients to pursue common-law damages for pain and suffering, the authors
regarded no-fault schemes as providing the fairest, most efficient, and most effective
overall design.\textsuperscript{11}

An assumption that appears to pervade various investigations and comparisons of
‘no-fault’ and ‘fault-based’ compensation schemes is that the removal of fault-based
disputes from an administrative and legal standpoint concomitantly removes the

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negative effects of administrative delays and perverse incentives produced by the system. That is, if fault-based systems produce poorer health outcomes and delays to recovery through the dual mechanisms of incentives to exacerbate illness, or greater adversarial interactions between clients and compensation systems, then no-fault systems that do not produce such incentives should be largely quarantined from these issues.

It appears inarguable that fault-based systems present a raft of challenges and potential conflicting incentives for clients recovering from injury. However, a view that regards client behaviour and post-injury health outcomes as being largely driven by compensation scheme design, and maintains that removal of fault-based eligibility is also likely to remove any effect of ‘fault’ in recovery, may be overly simplistic. In particular, such a view may unreasonably assign responsibility for outcomes (good or bad) to the adversarial nature of common-law compensation schemes whilst ignoring the role that individual perceptions of fault and responsibility for accidents have in facilitating or hindering recovery, regardless of scheme design.

For example, even within no-fault schemes, it may be unlikely that removal of fault-based legal or administrative hurdles to accessing compensation will result in a similar diminution of one’s role in an accident as an ‘at-fault’ or ‘not-at-fault’ party. Individuals that have been injured in MVAs may still remember (or be informed) of the circumstances surrounding their accident, desire punishment of an ‘at-fault’ party that caused them harm, consider themselves to be ‘victims’ or ‘perpetrators’, may be subject to secondary social privileges and obligations associated with the ‘sick role’, or be vulnerable to particular psychological consequences based on the nature of the accident and their role within it.
The individual effect of self-reported fault and personal responsibility for accidents on health outcomes is external to the effects of scheme design, yet presence and contribution of both to recovery may significantly overlap – especially within fault-based schemes. Despite this, few studies have acknowledged the co-occurrence of factors contributing to outcomes at the individual level and those produced by compensation system design. If, as is assumed in the literature, schemes with no-fault benefits do not produce incentives for clients to delay recovery or exaggerate injuries, and are less likely to produce adversarial relationships between clients and insurers, then differences observed between ‘at-fault’ and ‘not-at-fault’ clients across measures of recovery and health within no-fault schemes should be minimal. If observed differences are not minimal, further questions regarding the relative contribution of compensation or compensation scheme design on health outcomes in post-accident recovery may be warranted.

In short, removing fault from administrative or legal requirements of compensation scheme design may not remove it as an important element of people’s psychological response to their accident, nor as an element of importance to their recovery and outcomes. Therefore, prior to fully understanding the role of compensation in recovery within a scheme such as the TAC, a more comprehensive understanding of the factors that contribute to within-group heterogeneity among clients who receive no-fault personal injury insurance benefits is required.
1.3 A brief review of health outcomes studies undertaken with MVA and similar injury populations

Health outcomes and recovery research among people injured in MVAs and other traumatic events has been conducted by investigators from a wide range of backgrounds and disciplines. It is therefore useful for the reader to understand the recent history of trauma research as it relates to MVAs and the context within which this series of studies exists. For the purposes of introduction, this section will focus on research associated with mental and physical health outcomes, functional recovery (e.g., return to work), and patient satisfaction among people injured in MVAs and compensable populations.

1.3.1 Mental health and functional recovery following traumatic injury

1.3.1.1 Posttraumatic stress disorder

Posttraumatic stress disorder (PTSD) is not a focus of the current study. It is, however, instructive to briefly review the literature relating to this condition given that it is arguably the most widely and consistently researched mental health-related syndrome associated with post-accident trauma and its comorbidity with a number of other mental and physical health outcomes of interest\textsuperscript{49, 50}. This is perhaps not surprising given its unique occurrence as a result of a traumatic event\textsuperscript{35}. In this regard, PTSD differs from other anxiety disorders (e.g., agoraphobia) and specific phobias (such as fear of public speaking or driving).

The lifetime prevalence of PTSD in the general population is thought to be around 7% for all causes, with MVAs contributing around 20% of these cases\textsuperscript{31}. Recorded prevalence of PTSD and sub-syndromal PTSD among MVA survivors has, however,
shown considerable variation among sample populations, ranging anywhere from 1% to 100%.\textsuperscript{51, 52}

Differences in methodologies and sampling procedures have contributed to uncertainty regarding the true prevalence of PTSD within injured populations, however, these diverse approaches have shed light on a broad range of demographic, accident-related, and early-stage factors that contribute to its development and ongoing presence. For example, Blanchard et al.’s\textsuperscript{53} study of the prevalence and remission of PTSD post MVA demonstrated that four variables, including severity of initial symptoms, degree of injury, extent of recovery at 4 months, and whether a family member suffered a trauma during the intervening period accounted for 84% of the likelihood of ongoing PTSD symptoms at 6 months post-MVA.

Blanchard and Hickling\textsuperscript{54} also reviewed 19 studies published from 1996-2002 that specifically attempted to record the proportion of MVA survivors who developed PTSD. Again, recorded prevalence was highly variable (between 5% and 35%). Their meta-analysis concluded that a definitive prevalence in MVA samples was variable to the degree that it was dependent upon the nature of the sample population, itself. For example, they were able to explain almost 38% of the variance in PTSD prevalence within previous studies by considering only the gender balance of the sample. These results were not dissimilar to those found by Coronas and Garcia-Pares\textsuperscript{55} who reported that female gender, severity of physical injury, perceived social deprivation, and loss of employment post-accident were predictive of increased PTSD symptomatology.

Harris and Young\textsuperscript{45} found that 36% of trauma victims met criteria for PTSD at follow-up periods between 1 and 6 years post-accident. Importantly, they also...
showed that patients who blamed someone else for their accident were more likely to develop and maintain symptoms. Age, employment status at follow-up, engagement of a legal practitioner, initiation of a compensation claim, and having an unresolved compensation claim all predicted the presence of PTSD. Together, these factors accounted for over 40% of the variance in symptom severity experienced by the sample.

As the discussion above suggests, literature surrounding the mental health consequences of traumatic events has generally been skewed toward a focus on PTSD, possibly at the expense of other equally prevalent or debilitating disorders such as depression. It is difficult to determine, however, whether distinctions made in the literature between these disorders have been made on the basis of consideration or convenience as discerning between PTSD and other mental health disorders such as depression and anxiety in the aftermath of traumatic events has proved challenging. Indeed, patterns of comorbidity between PTSD and Major Depressive Disorder (MDD) have led some researchers to consider whether these disorders are distinct or simply a case of ‘general distress’\(^{49, 56-58}\). Others have questioned whether the thresholds for diagnosis of MDD should be raised when in the presence of comorbid disorders such as PTSD\(^ {38}\). It appears, however, that although there may be significant comorbidity and shared symptomatology between depression, PTSD, and some anxiety disorders following trauma (e.g., anhedonia, concentration difficulties, sleeping disturbance), they remain unique phenomena\(^ {59, 60}\), particularly in the acute phases of recovery\(^ {49}\).
1.3.1.2 PTSD, comorbid depressive disorders, and anxiety

The reported prevalence of depressive disorders following trauma also shows great variability across studies. This is likely due to methodological and cultural differences in transportation, hospitalisation, litigation, and insurance patterns\(^60\). Blanchard and Hickling\(^61\) studied 158 recent self and clinician-referred MVA patients who had sought medical attention for their injuries. They found that whilst 39% of MVA victims met criteria for PTSD, 53% of these clients also met criteria for a current major depressive episode. MVA victims who developed PTSD following their accident were also more likely to report having experienced a previous major depressive episode (50%) as opposed to those who did not develop PTSD (23%). The authors point to their study as having methodological advantages over earlier research by more closely controlling the timing of interviews (1-4 months post-accident) and also using structured clinical interviews, trained clinicians, and comprehensive pre-and post MVA psychosocial histories. However, the selection bias in their sample (participants were self-referred) meant that these results could not be assumed typical of a random sample of MVA survivors.

In order to provide a more reliable picture of post-trauma psychological morbidity, O'Donnell et al.\(^49\) conducted a study with particular focus on optimising their research methodology. They found that 10% of patients met diagnostic criteria for PTSD at 3 and 12 months and 20% also met diagnostic criteria for at least one psychiatric disorder 12 months after injury. The authors found that a series of early-stage factors predicted PTSD prevalence including event severity, intensive care unit admission, prior psychiatric or trauma history, anxiety about the injury, and acute responses to the trauma such as depression, arousal and re-experiencing. This pattern of results concurred with similar findings that around 4 in 5 individuals with a
diagnosis of PTSD also have a diagnosis of at least one other psychiatric condition\textsuperscript{62} (with MDD being the most common) and that MDD may be even more prevalent than PTSD in some circumstances\textsuperscript{63}.

In a large, a population-based study of the prevalence of depression and general anxiety, Wenzel et al.\textsuperscript{64} showed that the self-reported existence of whiplash trauma following an MVA was associated with between a 1.5 to 2 times increased risk of depression and anxiety. Interestingly, their results showed that risk was only elevated among persons for whom the injury had occurred more than two years prior. Similar results were found by Berglund et al.\textsuperscript{65} who reported that initial neck pain severity was significantly related to depression at 24 months follow-up. Subjects who reported ‘moderate’ to ‘severe’ initial neck pain were between 2.2 and 2.9 times more likely to report depression than those who reported ‘mild’ pain. This points to the potential role of feedback mechanisms between pain and mental health within recovery, similar to those recognised elsewhere in the literature\textsuperscript{66}.

1.3.1.3 PTSD, depressive disorders, and functional recovery, including return to work

In a later study, O’Donnell et al.\textsuperscript{67} provided further insight into the long-term prevalence of PTSD and depression within a sample of patients admitted to trauma services at four Australian hospitals. In addition to demonstrating rates of post-injury prevalence and remission, the authors showed that PTSD and depression at 1 week and 3 months post-accident significantly predicted risk of ongoing disability and functional capacity across interpersonal communication, mobility, self-care, getting along with others, household activities, work activities, and participation in society.
As these results indicate, depression following traumatic injury can affect areas of functioning such as returning to pre-accident work. For example, Richmond et al.\textsuperscript{68} found that 18\% of individuals developed a depressive episode within 12 months following injury and that these patients were 2.4 times less likely to have returned to pre-accident work status at follow-up. Whilst the mechanism by which participants acquired their injuries (MVA or otherwise), was not controlled for or specified in their methodology, this finding demonstrates the important association between mental health recovery and functional status. These results are further reinforced by more recent findings that whilst physical symptoms and pain significantly contribute to ongoing disability after injury, psychiatric symptoms (including PTSD, anxiety and depression) may play an even greater role in determining return to work rates and other functional outcomes\textsuperscript{7, 69}.

The development and maintenance of depression following trauma and injury has rarely been studied in isolation from PTSD. Similarly, anxiety, chronic pain, and substance abuse (all frequently comorbid disorders) are infrequently studied separately. This is likely because of the increasing recognition of interactions between psychological conditions and between psychological distress and perceptions of health, pain, and quality-of-life\textsuperscript{50, 66, 70-72}.

The close interaction between mental and physical health symptoms was demonstrated by Sharp and Harvey\textsuperscript{66} who reviewed the literature relating to the co-occurrence of PTSD and chronic pain, the majority of which emanates from occupational accidents and MVAs. The authors concluded that chronic pain and PTSD may be mutually maintaining and criticised previous research that has treated them separately.

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To explain the association between chronic pain and PTSD, Sharp and Harvey\textsuperscript{66} proposed operant and cognitive-behavioural models of reinforcement. This suggested that maladaptive behaviour was positively reinforced through attraction of affection and sympathy associated with injuries and negatively reinforced through avoidance of unpleasant work such as chores. This argument is not dissimilar to that forwarded as justification for the negative influence of compensation on outcomes and sick-role behaviour\textsuperscript{37, 42, 43}.

Taken together, these studies indicate that the prevalence of PTSD and other comorbid mental illness following MVAs is driven by a wide range of demographic and accident-related factors. These include differences between referral sources of sample populations (e.g., hospital emergency departments, self-referral, and insurance populations), specific diagnostic tools and criteria used, the gender balance of the study population, and differences in the duration between the accident and when assessments took place\textsuperscript{54}. MVA populations, therefore, are perhaps more heterogeneous than many researchers have previously acknowledged. Hence, it is of great importance that study samples be well understood and/or controlled before broader generalisations about recovery trajectories ‘typical’ of MVA populations should be made. Further, it highlights the importance of acknowledging limitations associated with the pursuit of disease models that place biomedical factors at the core of understanding recovery without understanding how illness perceptions and behaviours also affect outcomes\textsuperscript{43}.

1.3.2 Relevance of diagnostic criteria, functional recovery, and the role of compensation schemes in rehabilitation

Although PTSD, depression, and anxiety disorders are distinguishable, often comorbid, psychiatric phenomena emanating from MVAs, it is their effect on
ongoing disability and functional recovery (e.g., return to work) that often remains practically important for individuals, families, and compensation schemes\textsuperscript{2, 6, 7, 69, 73}. For many individuals and organisations, therefore, diagnostic criteria attached to mental health symptoms may be of secondary relevance to more global, perhaps practical, measures of injury severity or recovery (e.g., hospitalisation resulting in the initiation of an insurance claim or having returned to work)\textsuperscript{74}. This orientation is consistent with the ‘recovery model’ of claims management within the TAC\textsuperscript{75} and that of Australia’s national framework for mental health service design\textsuperscript{76, 77}. It is also reflected in performance indicators often adopted by no-fault injury insurers, which can often include total claim numbers (as a proxy for total accidents), claim durations, return to work rates, overall mental and physical health of injured clients, and clients’ overall satisfaction with compensation schemes\textsuperscript{6, 78}.

A number of studies have included measures of return-to-work within broader health outcomes study designs\textsuperscript{8, 14, 39, 67}, though relatively few have set out to investigate the factors associated with return to work specifically among people injured in MVAs\textsuperscript{79, 80}. Generally, studies concentrating on return to work involve general trauma populations\textsuperscript{69} or those injured in occupational accidents, only\textsuperscript{81-86}.

However, as mentioned above (see Section 1.1), the commitment to life-time care that no-fault compensation schemes have to clients means that schemes are heavily invested in ensuring that health outcomes, satisfaction and functional recovery are optimised\textsuperscript{11}. Whilst this results in ongoing investment in treatment and management practices designed to improve outcomes\textsuperscript{87}, it poses potential issues for defining the role of no-fault compensation schemes and whether they should take more passive or active roles in client screening, assessment, interventions and recovery. For example,
if (through analysis of its claims data or other process), a compensation scheme is able to determine with relative accuracy whether an individual client is likely to experience ongoing psychiatric concerns and consequent delays to functional recovery post-injury, what is their responsibility to the client? On the one hand, the client may appreciate direct contact from the scheme and recommendation to engage in early intervention treatment as has been advocated by both academic researchers and practitioners. On the other, clients may consider that such contact is beyond the role of the scheme, which should simply pay for reasonable services deemed appropriate by clients, their medical practitioners and legislation.

Therefore, for schemes with both an interest in improving client outcomes, and a capacity to predict who among their clients is at greatest risk of poor outcomes, the appropriate scope and extent of intervention that can or should be taken by schemes is not always clear.

1.3.3 The potential effect of attributions of responsibility for MVAs on outcomes

As discussed in the preceding sections, illness behaviours and perceptions may have considerable influence on longer-term health outcomes following injury. A factor that may affect illness perceptions and behaviours is attributions of responsibility for MVA or injury.

Various theories propose that blame and causal attributions are important for the development and/or maintenance of ill health in circumstances where objectively measured illness or injury may be similar. Despite the breadth of such research, the direction of association between causal attributions following serious negative events remains contested. Similar to discussions regarding incidence of mental health disorders following MVAs and potential effects of compensation mentioned...
above, this appears largely due to methodological differences between studies and sample populations. Reviews of the relative importance of attributions of responsibility for accidents on outcomes have generally grouped various illness and injury types together making it difficult to draw out the effect of attributions within MVA populations.

In a pivotal study exploring the role of blame as either a positive or negative coping mechanism in PTSD among a sample of MVA survivors, Delahunty et al.96 showed that MVA survivors who reported that another party was responsible for their accident were more likely to exhibit PTSD and sub-syndromal PTSD at 6 and 12-months follow-up. The authors suggested that diminished environmental control among other-responsible MVA survivors might have promoted the maintenance of symptoms.

In light of these findings, Hickling et al.97 re-visited data from their prior study into PTSD and MVA survivors53 and were able to replicate the results of Delahunty et al.96. They found that all subjects who were diagnosed with PTSD initially and perceived themselves as ‘at fault’ within their accident had remitted at 6 months. This contrasted with those who reported that another party was at fault, where only 42% had remitted at 6 months. Similar to Delahunty et al.96 the authors were also unable to attribute the differences between at-fault and not-at-fault groups to the employment of different coping strategies. Instead, they suggested a combination of perceived victimisation, protracted dealings with the legal system, and perceived increased vulnerability for future MVAs might all contribute to continued symptomatology among injured persons.
As mentioned above, Harris et al.\textsuperscript{45} found similar results, indicating that those who blamed someone else for their accident were more likely to develop and maintain symptoms of PTSD at follow-up. The authors did not explain these results in relation to cognitive frameworks except to cite previous work on the effect of coping styles.

More recently, Nickerson et al.\textsuperscript{98} analysed data from a subset of 165 participants surveyed as part of a broader mental health survey in the United States. Isolating data from those participants that had experienced an MVA and had identified it as the ‘worst trauma’ they had experienced, they assessed the relationship between role in the accident, attributions of responsibility, perceived injury severity and presence of PTSD. Consistent with findings above, those who considered others to have been at fault in the accident were significantly more likely to have received a diagnosis of PTSD than those who attributed responsibility to themselves.

Ho et al.\textsuperscript{99} considered the effect of attributions of responsibility and blame as separate constructs among 321 Australian persons involved in a MVA. Their cross-sectional survey found that drivers who held another person responsible for their accident showed significantly higher levels of psychological distress and poorer self-reported well-being than drivers who held themselves responsible. Similar findings were also observed among drivers and passengers who blamed another party for their accident. Importantly, however, the authors found that when personal responsibility was combined with self-blame coping, resultant feelings of guilt manifested in higher levels of distress.

Hart et al.\textsuperscript{100} examined changes in attribution of blame and association with recovery at 12-month follow-up among patients with traumatic brain injury received from both accidental and intentional injury. The authors were interested in distinguishing
between factors that had consistently been associated with intentional injury as an explanation for differences in poor post-injury recovery including minority group status, unemployment, educational attainment, income, pre-injury substance abuse history, gender, and marital status. Results demonstrated that beyond demographic variables and pre-injury status, attributing blame to another person predicted depression and reduced later productivity status in the community. Increasing concerns over attributions of blame from injury to follow-up were also associated with high levels of emotional distress.

Littleton et al.\textsuperscript{28} also demonstrated differences in the acute mental health states between at-fault and not-at-fault persons involved in MVAs who sustained relatively minor injuries. Surveyed an average of 9 days after their accident, people who were not at fault were more likely to report worse psychological health despite no difference in pain or other physical symptoms between groups. The authors suggested that fault was potentially associated with levels of distress, anger, and frustration at being involved in an accident that could be potentially maintaining of longer-term physical symptoms.

Contrasting with these results, a study of 57 people injured in an MVA by Fitzharris et al.\textsuperscript{101} found that attributing responsibility to oneself was associated with higher levels of depression between 6 and 8 weeks post-accident. Whilst these results appear to contradict those mentioned above, the relatively small sample used (11 participants identified as ‘self-responsible’) may have contributed to this somewhat aberrant finding. It is, however, reflective of the continued uncertainty that surrounds the association between attributions of responsibility for traumatic events and outcomes across various populations\textsuperscript{48}. 

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1.3.4 The relationship between cognitive models of mental illness following trauma and the potential link with attributions of responsibility for accidents

A number of theoretical models drawn from social and health psychology related to perceptions of illness and injury are intuitively attractive in considering why attributions of responsibility for accidents may affect post-accident outcomes and the mechanisms by which they may operate. Broadly, each of these models share common elements often relating to concepts of control and stability across time or situations. The elements contained within these models also appear common to those in more clinically-related models of trauma. For example, Foa, Steketee and Rothbaum’s review of the cognitive frameworks associated with trauma considered concepts of learned helplessness and victimisation, both of which are precipitated by uncontrollable aversive events and which are proposed to generalise to perceptions of uncontrollability and futility of future behavioural responses.

Similarly, in their influential ‘learned helplessness’ framework, Abramson et al. proposed that individuals seek to explain traumatic events in terms of three dimensions: the source (internal-external), the generality over time (stable-unstable) and, generality across situations (global-specific). Thus, those who attribute the cause of a traumatic event to external factors (e.g., it was someone else’s fault), believe the uncontrollability of the situation to be unstable (e.g., it was the first and only time I’ll make that mistake), and specific (e.g., it was a particularly bad road and I won’t need to go there again), would be expected to suffer less guilt and depression than those whose attributions were internal, chronic and global.

In relation to the experience of PTSD following MVAs, the learned helplessness framework contains some intuitively attractive attributes; however, it has not been
comprehensively explored. Furthermore, measures of cognitions surrounding Abramson et al.'s proposed three dimensions of PTSD cognitions as they relate to driving (source, generality over time, and generality across situations) have not yet been developed. Perhaps most concerning for the robustness of the theory, however, is the inconsistent literature relating attributions of responsibility for adverse events to good or poor outcomes.

For example, Bulman and Wortman examined the relationship between severely injured trauma victims’ attributions of blame for traumatic accidents and subsequent coping ability. In contrast to results predicted by the learned helplessness theory, the authors found that patients who blamed themselves for their accident (e.g., internal attribution) were more likely to exhibit adaptive coping styles, whereas those who blamed another for their trauma coped more poorly. Almost all patients had created specific hypotheses as to why their accidents had happened to them. The authors believed this illustrated the need for people to find meaning for their traumatic event, despite its randomness.

Following this study, Janoff-Bulman sought to distinguish between patterns of self-blame that appeared adaptive or maladaptive under various circumstances. These efforts resulted in a delineation between ‘characterological’ (i.e., I am of bad character) and ‘behavioural’ (i.e., I behaved badly) self-blame. Based on an initial study of female college students, it was found that self-blame as a global variable did not distinguish between depressed and non-depressed persons. However, when broken down into behavioural versus characterological components, characterological self-blame distinguished between depressed and non-depressed persons, whereas behavioural self-blame did not. A second study of sexual assault

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victims further reinforced behavioural versus characterological self-blame distinctions, finding that sexual assault victims were more likely to demonstrate behavioural self-blame. The author argued that whilst characterological self-blame represented stable traits and was therefore maladaptive, behavioural self-blame acted as a protective factor, ensuring that mistakes perceived to have been made remained transient and controllable into the future. The results of this study served to assist understanding of the ‘depression paradox’ mentioned above where the effect of self-blame on mental health outcomes was on occasion contrary to that predicted by classic models of learned helplessness and depression\textsuperscript{102, 103}.

More recently, Ehlers and Clark\textsuperscript{104} proposed an alternative cognitive model of PTSD that may provide a more complete understanding of the experience of persistent PTSD symptoms among MVA survivors. Their model suggested that two processes are key to the development and maintenance of anxiety associated with trauma; appraisal of the traumatic event and its sequelae, and the nature of the memory for the event and its link to other autobiographical memories. More specifically, they suggested that appraisals within these two processes lead individuals to believe that a traumatic past event continues to constitute a serious current threat to their safety. When these two processes are activated among individuals with persistent PTSD, the perception of current threat among individuals is accompanied by arousal, anxiety, and other re-experiencing symptoms that produce behavioural and cognitive responses designed to reduce the perceived threat. The actual consequence of these responses, however, is to prevent cognitive change. In doing so, this maintains the disorder.
Related to the specific experience of an MVA, Ehlers and Clark’s\textsuperscript{104} model proposes that individuals who demonstrate persistent PTSD following an MVA fail to recognise their accident as an isolated, time-limited event that does not have more generalised negative implications for their future. Rather, their accident may continue to provide a source for perception of serious current threat through beliefs that driving is now more dangerous than it was previously. Furthermore, they may overgeneralise their role in the accident and come to see their involvement as evidence that “accidents always occur to me” or “I attract bad luck”, leading to an unrealistic level of fear and avoidance of driving which in turn may reinforce the perceptions of fear.

With the preceding discussion in mind, it is possible to imagine circumstances in which differences in cognitive appraisals might occur between individuals involved in MVAs who attributed responsibility for their accidents either to themselves or to other parties and circumstances. For example, a driver unexpectedly struck by someone else who they regard as at fault may reasonably attribute responsibility for their accident to the other party. The driver may have been driving within the law and in accordance with traffic regulations, but regardless, was unable to prevent the accident from happening. Aside from avoiding driving in the future at all, there is also no guarantee that they could prevent a similar accident occurring again. Consequently, they may consider the accident as a serious, ongoing threat and that driving from that point onwards poses great risk. Based on cognitive theories as described above\textsuperscript{36,102,104}, they may also be likely to suffer post-accident psychological disturbance.
By contrast, a driver who causes an accident and takes responsibility for doing so may appraise the meaning of the event for their future differently. The driver may consider that their accident was clearly a result of their behaviour (e.g., because of distraction or running a red light) and can identify what led to the incident. Under these circumstances they may appraise the accident as potentially controllable and representative of no more than a single, transient state to be avoided in the future by ensuring that distractions while driving are minimised. Excluding potential disturbance caused by knowledge of his/her role in causing injuries to another person\textsuperscript{95, 102, 105, 106}, the ‘self-responsible’ driver may perceive greater behavioural control and be less likely to suffer ongoing psychological trauma post injury. In this regard, both drivers described above experienced an MVA, but under differing circumstances. These differing circumstances may lead to maladaptive or adaptive appraisals and hence, differing outcomes.
1.4 The importance of patient satisfaction within compensation schemes

A further, significant consideration of no-fault compensation schemes resulting from their commitment to lifetime care of injured persons is that of client satisfaction (herein referred to as patient satisfaction)\(^6\),\(^{11}\). A focus of compensation schemes on patient satisfaction is perhaps also unsurprising given the broad recognition within rehabilitation and health care research that satisfied patients are indicative of well-functioning systems\(^{11}, 24, 107-110\).

The majority of literature relating to patient satisfaction has occurred within health and rehabilitation services rather than compensation schemes. The services that health and rehabilitation facilities (e.g., hospitals) provide also differ from those provided by personal injury insurers such as the TAC (the breadth of which are outlined in section 1.5, below). However, the two areas share many commonalities that may lead us to presume that the existing patient satisfaction literature may also be relevant to personal injury compensation schemes.

Research into patient satisfaction peaked in the 1980s and 1990s, receiving relatively little attention in recent years. Research that exists, however, has generally followed along two lines of enquiry, 1) investigations into the structure of patient satisfaction, and 2) investigations into factors that influence satisfaction.

1.4.1 Investigating the structure of patient satisfaction

Satisfaction is measured by health care providers to enable the assessment of quality of care from the perspective of the patient\(^{111}\). In this sense, measuring satisfaction is thought to provide an important subjective evaluation of services\(^{112}\) that orients focus toward patients and facilitates patients’ representation as part of a broader effort to
‘re-humanise’ care\textsuperscript{113,114}. Satisfaction surveys provide a mechanism through which patients can highlight areas of concern or need that may be important for health care services to consider\textsuperscript{111}.

Although there are broad differences in its assumed structure and dimensionality, patient satisfaction can perhaps most usefully be defined as an evaluation based on the fulfilment of expectations\textsuperscript{113}. Dissatisfaction with health care services can arise in situations when expectations and experiences are no longer congruent, or more specifically, where experience falls short of expectations\textsuperscript{114}. Under this definition, it can therefore be reasonably assumed that the extent to which either expectations or experiences vary for different people or populations will contribute to satisfaction outcomes.

Alongside conceptual issues associated with the definition of satisfaction, some authors have outlined a lack of consistency in methods for measuring satisfaction\textsuperscript{114-117}. The measurement of satisfaction has taken on both global and multi-dimensional frameworks\textsuperscript{114}, with survey instruments required to capture each perspective differing in their generality to populations. For example, Ware et al.’s\textsuperscript{112} Patient Satisfaction Questionnaire containing 52 items was designed to be used in general population settings to assess their satisfaction with medical care. Alternatively, Schwab and Stone\textsuperscript{118}, proposed that specialised patient satisfaction surveys should be developed for mental health treatment populations, and in particular, for child treatment groups. In an applied setting among patients with multiple sclerosis, Kohlmann et al.\textsuperscript{119} measured a combination of global satisfaction and satisfaction with five separate elements of service specifically provided by patient support programs unique to the population.
The discussion above highlights that the conceptualisation and assessment of patient satisfaction varies between populations under study and for the applied or theoretical purposes for which surveys have been designed. Similar to the debate surrounding satisfaction as either an objective or subjective state\textsuperscript{120}, the assessment of satisfaction definitions and adequacy of employed survey methodologies may perhaps best be viewed as a judgement that is unique to the circumstances surrounding the purpose and goal of the research.

1.4.2 Drivers of patient satisfaction

Similar to the discussion above (see Section 1.2) regarding the suggested influence of compensation schemes’ design on outcomes, patient satisfaction is often viewed as driven by the behaviour and characteristics of health services, themselves\textsuperscript{121}.

Factors under the control of services and assumed to affect patient satisfaction include perceived technical competence, interpersonal manner, accessibility and convenience (e.g., reduced delays, ease of making appointments), financial arrangements (e.g., coverage of insurance, reasonableness of costs), continuity of care, and general efficacy\textsuperscript{112}. Other, likely overlapping influential factors have been identified as personal qualities of physicians, professional qualities of physicians, and competence\textsuperscript{122, 123}.

Subjective measures of satisfaction based on the behaviour of services, however, are not necessarily without error or bias; viewed as a balance between expectations of service and experience\textsuperscript{115}, drivers of satisfaction may be linked to either side of the expectation vs. experience equation. Perceptions may be indicative of patients’ existing preferences, previous experiences, and expectations\textsuperscript{112, 124-126}, all of which may be external to a health service or compensation schemes sphere of influence. As
such, a view that considers patient satisfaction as driven by, and reflective of, objective service quality may potentially overstate the extent to which services can influence patient satisfaction whilst ignoring other important patient population factors.

Beyond expectations, experiences and preferences, a wide range of demographic and patient characteristics can also influence patient satisfaction. These can include gender, age, education, socioeconomic status, mental health status, pain, depression, and post-injury or illness health outcomes. Combined, these findings reinforce a view that individual characteristics of patients, plus their post-injury health outcomes, are likely to have considerable influence over their assessment of satisfaction with compensation schemes.

As mentioned in section 1.4.1, many measured factors’ relevance to specialised populations that have received care under unique circumstances (e.g., post-accident rehabilitation populations) may be at once too general and too specific in order to be either relevant or generalisable to other populations. In such circumstances, an approach that appreciates the desire to ascertain levels of overall satisfaction with care provided through a service, combined with an assessment of specific service elements relevant to the specific health service in question and their specific population of interest (e.g.,) may form the most pragmatic and interpretable approach.

Despite the importance of patient satisfaction to health, rehabilitation and compensation providers, research into the drivers of satisfaction outside of those conducted within injury compensation research (e.g.,) has remained fairly static during the past two decades. However, in contrast to previous work...
mentioned above that has attempted to isolate the drivers of patient satisfaction, the quality of interaction and relationship between patients and services within compensation research is most often viewed as a moderator of recovery rather than an outcome. This divergent theoretical positioning introduces the possibility of more dynamic interactions between satisfaction and health outcomes than have typically been explored. It does not, however, greatly advance our understanding of the drivers of patient satisfaction within compensation schemes. This is an area of knowledge that remains unsettled.
1.5 Study aims, objectives, and setting

1.5.1 Aims and objectives

The preceding discussion highlights that whilst a great deal of literature has been published on the subject of post-injury recovery and its predictors, significant variance in post-injury outcomes remains unexplained across health outcomes, functional outcomes, and patient satisfaction. Furthermore, the potentially important role that attributions of responsibility may have in assisting to differentiate between persons likely to experience good or poor outcomes remains unclear. This series of studies will address these identified gaps in the literature.

Paper 1 will investigate the association between attributions of responsibility for accidents and physical and mental health outcomes alongside other demographic and accident circumstance variables typically controlled for in MVA samples. Paper 2 will assess the association between attributions of responsibility for accidents, depressive symptoms and return to work outcomes. Finally, paper 3 will assess the association between attributions of responsibility for accidents and satisfaction with the compensation system. Together, this series of papers will provide a broad overview of the association between attributions of responsibility for accidents on health outcomes and recovery among people injured in MVAs and compensated under the Victorian Transport Accident Compensation scheme..

1.5.2 Study setting

1.5.2.1 Scheme design

This series of papers will pursue its aims and objectives through interrogation of administrative and survey data from the Victorian Transport Accident Commission (TAC). Whilst acknowledging discussion concerning terminology used within the
safety and trauma literature\textsuperscript{136-138}, for the purposes of this study, the term motor vehicle ‘accident’ (MVA) will be used in order to reflect terminology used by other authors noted in sections above\textsuperscript{53, 61, 80, 97, 98}, and also that adopted within the study setting\textsuperscript{75}.

The TAC is the state-owned, monopoly personal injury insurance provider for injuries resulting from transport accidents in the state of Victoria, Australia. The TAC was formed in 1987 after the passing of the Transport Accident Act (1986)\textsuperscript{10} and operates as a state-owned enterprise, receiving income from premiums generated from vehicle registrations and through investment\textsuperscript{139}.

The TAC has five major objectives enshrined under legislation. These are to: 1) reduce the cost to the Victorian community of compensation for transport accidents, 2) provide, in the most socially and economically appropriate manner, suitable and just compensation in respect of persons injured or who die as a result of transport accidents, 3) determine claims for compensation speedily and efficiently, 4) reduce the incidence of transport accidents, and 5) provide suitable systems for the effective rehabilitation of persons injured as a result of transport accidents\textsuperscript{10}. As such, the activities of the TAC should be viewed in respect of their orientation toward these objectives.

Support the TAC is able to provide to injured clients in order to ‘provide suitable and just compensation’ is also legislated under the Transport Accident Act (1986)\textsuperscript{10}. It includes access to ‘no-fault’ benefits for injured persons to cover reasonable costs associated with emergency services and transport (e.g., ambulance), hospital and surgery costs, allied health care (e.g., physiotherapy, osteopathy, psychology, and other rehabilitation services), pharmaceutical services (e.g., prescription medication),

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aids, equipment, and transport to and from medical services, and child or attendant care. In most instances, support is provided without specific time limit for as long as is reasonably required by the client. The definition of what is reasonable is made by TAC staff who follow practice guidelines drawn from the legislation and the recommendations of health care professionals.

Beyond payment for services, the TAC is also able to offer time-limited (18-months) loss-of-earnings benefits for people who were working at their time of accident and, due to injuries sustained in their accident, have been incapacitated for work for a period greater than 5 days. Additionally, for clients who are unlikely to return to pre-accident work capacity, ‘loss of earnings capacity’ benefits are also available for eligible clients that provide compensation for pre-accident vs post-accident earning power.

Under no-fault benefits, the TAC offers impairment benefits to clients whose injuries have either stabilised or reached beyond 3 years’ duration and are deemed to have contributed to a greater than 10% degree of impairment. In what is perhaps a recognition that degree of disability does not readily equate with the degree of support required with disability, this lump-sum benefit is scaled to provide clients with greater degrees of disability, enhanced financial assistance. For example, between 11% and 19%, a flat rate of $4500 plus an increment of $1000 per 1% increase in disability is available. For clients recording between 20% and 49% disablement, however, this rises to $15000 plus an additional $1500 per 1% increase. In total, the amount of no-fault financial benefit distributed to injured clients by the TAC in 2011/2012 equated to $1.01 billion dollars.

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The second level of benefit available through the TAC is lump-sum compensation for serious injury pursued through common law. Under the Transport Accident Act (1986)\textsuperscript{10}, the TAC provides insurance to registered drivers of motor vehicles in the event that they are sued by a third party for negligence resulting in a ‘serious injury’ to the plaintiff. A serious injury defined by the Act is one that results in a serious long-term impairment or loss of a body function, permanent serious disfigurement, severe long-term mental or severe long term behavioural disturbance or disorder, or loss of a foetus\textsuperscript{10}. The Act also defines a whole person permanent impairment of 30% or more as a serious injury.

In cases where a serious injury has occurred as a result of negligence by an insured driver and a plaintiff attempts to sue the driver, the TAC acts in the driver’s ‘defence’\textsuperscript{140}. Through either court determination or negotiation with the plaintiff’s legal representative, a lump-sum benefit can then be agreed for ‘pain and suffering’ up to a total of $487,100 and ‘economic loss’ up to a maximum of $1,097,020. Common law benefits are also available for the dependents of persons killed by the negligence of other drivers up to a maximum of $797,820\textsuperscript{6}. As described in section 1.2.1, common law processes have been associated with poorer outcomes for clients due in part to process delays they engender and the adversarial nature of interactions they tend to promote. In the Victorian context, a range of dispute protocols and model litigant guidelines have therefore been established and are followed in an attempt to reduce delays and adversarial interactions between parties\textsuperscript{6}.\textsuperscript{141} In the 2011/2012 financial year, a total of 945 common law claims were resolved (approximately 5% of total lodged claims per year). Fifty-one percent of these common-law claims were completed within a year of application\textsuperscript{6}. 

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A stated goal of the TAC is to remain financially viable through “sound financial management, prudent investment and financial risk management” (p.16). This may be particularly pertinent given its establishment in place of its unviable predecessor, the Motor Accident Board. The TAC therefore closely monitors and reports against its insurance operations (differences between premium revenues and operational costs) and its longer-term investment portfolio. Where possible, the TAC provides a financial dividend to the Victorian Government based on the profitability of its operations, the amount of which is determined by the State Treasurer in consultation with the TAC.

Perhaps the most publicly visible and understood aspect of the TAC’s objectives under the Transport Accident Act (1986) is its commitment to improving road safety and to reduce the incidence of transport accidents (p.31). The TAC funds a considerable suite of marketing, infrastructure, and community partnership projects designed to influence safer driver attitudes and behaviours, safer vehicles, safer roads and safer speeds, spending over $160 million per year. Most notably, the TAC has been a pioneer in the use of high-impact mass advertising campaigns to positively influence driver and community attitudes around road safety issues. Such campaigns often involve targeted messaging to high-risk groups (e.g., motorcyclists, pedestrians, speeding, distracted, and drink-drivers), and are conducted in concert with other regulatory or enforcement bodies such as VicRoads and the Victorian police. Whilst the effectiveness of advertising campaigns on reducing the road toll has been queried on some occasions, it seems likely that they are effective at least in influencing stated attitudes. The TAC therefore continues to devote considerable resource to such campaigns, spending over $50 million in 2011/12, alone.
1.5.2.2 Client monitoring and data collection within the TAC

The TAC is in a unique position within the Victorian community as it is the monopoly insurance provider for personal injury arising from transport accidents. This means that virtually all people injured in an MVA in Victoria, and who receive emergency hospital or other treatment for their injuries, become clients of the TAC. Therefore, by accessing data from the TAC, the ability to study this client population and ensure that it presents a broadly representative sample of the overall Victorian MVA survivor population receiving compensation for injuries is unparalleled. Additionally, any conclusions drawn from the research can be directly related back to the work of the TAC given their direct interest in road trauma from prevention to full recovery and/or lifetime care of injured persons.

The TAC conducts two major series of surveys among its client population, one of which, the Client Outcomes Survey, forms the basis of data used within this thesis. The Client Outcomes survey was first conducted in 2009 in an effort to better understand the factors that contribute to positive (or otherwise) health outcomes for injured clients. Additionally, it was conducted to provide a base against which an annual survey or client outcome performance indicator could be measured and reported. The result of this survey’s development and implementation has been the incorporation of client outcomes key performance indicators (KPI) that are now reported alongside a measure of scheme satisfaction in the TAC’s annual report.

After its inception in 2009, the Client Outcomes Survey was conducted in each following year to 2011. In 2012, a pilot longitudinal Client Outcomes study was also conducted with participants from the 2011 study. Together with the 2011 study data,
this Client Outcomes Follow-up Pilot Study forms the basis of data used within this thesis.

1.5.3 Survey methodology

1.5.3.1 Data Collection

Data collected for this study was drawn from existing de-identified dataset supplied by the TAC in SPSS\textsuperscript{147} format. This dataset was collected between 2010 and 2011 as part of the TAC’s ongoing, standard practice of investigating health outcomes as described in section 1.5.2.2. The dataset consists of 1137 individual client records, 419 of which include follow-up interviews undertaken in 2011. After close consultation with the TAC, the researcher and TAC determined that the optimal means of securing these records was through an FOI process, which was conducted between February and June, 2012. The datasets were released by the TAC to the researcher with the express permission that they only be used for the purposes of this research. Full details of release conditions are contained within the ethics application submitted as part of this research and contained in Appendix D and Appendix E.

1.5.3.2 Nature of respondents included in the Client Outcomes Survey dataset

Participants included in the 2010 Client Outcomes Survey were those who were deemed by TAC criteria at the time of interview to be either ‘active’ or had been ‘inactive’ for 24 months or less (TAC ‘active’ status is determined by whether payments have been made on client files within the previous 6 months).

Excluded respondents were those that were ‘Dependency’ clients (dependents of deceased accident victims) or ‘Independence’ clients (clients that have severe, life-long injuries and disabilities, including paraplegia, severe ABI, quadriplegia, or other catastrophic injury). Additional exclusions determined by the TAC were clients:
• under 18 years of age

• classified as a ‘risk file’ by the TAC (i.e., have brought multiple complaints or direct legal proceedings against the TAC)

• multiple family members of clients in the sample population

• whose accident anniversary fell within or 2 weeks either side of their potential interview period

• who are employees of the TAC or Worksafe, Victoria

• who initiated an Emergency Expenses Only (EEO) claim meaning that they received very low-level injuries and were most likely to have been taken to hospital after their accident as a precaution, only

• who had participated in other TAC client research within the previous 6 months

• who had contacted the TAC previously and indicated that they do not want to participate in any future TAC research

• who did not speak English to a level required by the demands of the study

• excluded by any other criteria deemed appropriate by the TAC

1.5.3.3 Interview process for the 2010 Client Outcomes Survey

Prior to interview, a potential sample of 3500 clients who met criteria for inclusion were drawn from the total existing TAC client database by members of the TAC’s Business Intelligence team. This dataset was then delivered to the Client Research team alongside contact details for each potential participant. Prior to participating in
the study, each client in the potential sample was then sent a letter from the TAC describing the research, its purpose, the timelines and commitment required, and their rights to ‘opt-out’ of the study at any stage. Clients who were potential participants were then informed that in order to opt-out, they must either write to the TAC by return, pre-paid envelope or call the TAC’s customer service centre and indicate that they did not wish to participate within a 2-week period. Alternatively, clients could opt-out when contacted directly by survey interviewers.

Running in parallel with this process, TAC representatives forwarded a paper-based questionnaire to a contracted research company who translated it into a CATI (Computer Assisted Telephone Interview) questionnaire. Members of the TAC’s Client Research team then conducted training with interviewers within the contracted research agency, providing them with background to the study and the client population. Training with each of the instruments to be used in the study was also conducted at this time. Interviewers involved in the study were highly experienced in conducting research with TAC and like client groups and understood potential sensitivities surrounding injured populations.

Interviews for each wave of research were conducted over a 4 week period during the hours of 10am to 8pm via during the period 11th of October to 7th November 2010 (n=1394). No interviews commenced after 7.15pm. The average interview length was 25 minutes, however, some extended up to 1 hour dependent upon the pace of the clients’ responses. Upon commencement of the interview period, members of the TAC’s Client Research team monitored a sample of the interviews to ensure consistency between interviewers and ensure that each of the survey instruments was being delivered by the contracted research company competently.
and consistently. Where issues were identified with individual questionnaire items or interviewers, interventions are made on these or subsequent interviews.

Some clients became upset during the interview as they recalled aspects of their accident or experiences post-accident. In these circumstances, clients were ‘flagged’ and invited to contact the TAC’s Client Research Team if they were concerned about the questions covered in the research. The TAC offered each of these clients access to external psychological services to assist with concerns that may have arisen during the research. Clients had the option to withdraw from the research at any stage.

In addition to data derived through questionnaire responses for each client, TAC service-related information such as injury types, and aggregate payment information was also collected through the study and included in the dataset.

1.5.3.4 Additional client outcomes follow-up pilot study data

As mentioned above, the TAC conducted a client outcomes follow-up pilot survey in 2011 involving four hundred and nineteen (419) clients interviewed between the 21st of November and 5th of December 2011. Respondents met current TAC criteria for participation (excluding active status) and had agreed to be re-contacted. Criteria for inclusion in the study were identical to that employed in the 2010 Client Outcomes survey. From the initial sample of 640 respondents who agreed to be followed up in 2010, observation of exclusion criteria reduced the total available sample for the follow-up study to 610.

1.5.3.5 Client outcomes follow-up study recruitment

Recruitment took place by way of a primary approach letter sent out on the 17th of November, 2011, reminding clients of their previous participation in 2010, re-introducing the purpose of the study, and informing them that they may be called and
invited to participate again in the coming weeks. In addition to this letter, a bulk email was also distributed to those clients (n=389) that had previously supplied their email address as part of the 2010 TAC Client Outcomes Survey. The content of the email was identical to that in the primary approach letter. Similar to the original Client Outcomes Survey, potential participants were provided with a two-week window in which they could contact the TAC Research Team and withdraw their consent to participate. Alternatively, they could withdraw at the point of contact by the research interviewers.
1.6 References


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Chapter 2: The basis of an initial investigation of the association between attributions of responsibility for accidents on health outcomes
2.1 About this chapter

The purpose of this chapter is to discuss the development and design of the initial investigation (Paper 1) and to describe challenges and learning associated with its conduct.

2.1.1 Development, design and challenges

Review of the literature pertaining to people injured in MVAs (see Chapter 1) showed that knowledge gaps exist in our understanding of the factors that contribute to outcomes and recovery among people insured within personal injury compensation schemes. In particular, this review pointed to the fact that, despite the removal of significant administrative hurdles to compensation and benefits in no-fault and hybrid schemes, perceptions of fault and responsibility for accidents may still play a role in influencing outcomes\(^1,2\). Consequently, this initial study (Paper 1) was designed to examine the association between attributions of responsibility for accidents and mental and physical health outcomes among people injured in MVAs who have accessed no-fault compensation benefits.

As Chapter 1 indicates, the various approaches taken to researching health outcomes among people injured in MVAs and the variety of outcome measures chosen for analysis are diverse. From the TAC’s perspective, however, successful client outcomes are somewhat simpler to define. From a simple operational insurance perspective, it is important that an injured client’s mental and physical health recovers to the extent that they no longer require rehabilitation assistance in the form of payment for services\(^3\). Global measures of mental health, physical health, and occupational functioning are therefore usually considered more pertinent to the scheme as outcome measurements than are individual clinical diagnoses or concerns.
The focus of the TAC toward an emphasis on global measures of health is reflected in its corporate key performance indicators. These include mean physical and mental health scores on the SF-12 V2⁴, mean overall client satisfaction with the scheme, and, the proportion of people who were working at their time of accident and have returned to work at 3 months post-accident⁵. Remaining key performance indicators for the TAC relate to the projected long-term profitability of its insurance operations.

Importantly, independent variables chosen to be included within the study design reflected those likely to be known by the insurance scheme at the initiation of a personal injury insurance claim (i.e., would be included on insurance claim forms or included in police record data). The decision to only analyse variables known at claim lodgement rather than those that were also available within the dataset (e.g., social support, financial health, marital status) that may have provided equally strong association with outcomes was made for two reasons.

Firstly, in cross-sectional designs such as that undertaken here, it is not possible to determine the direction of association between items such as social support and health outcomes as both factors are likely to be affected by one another. Demographic and accident circumstance variables such as gender, age, role in the accident, vehicle type, and self-reported level of responsibility for accidents, however, were more likely to remain stable over time and provided greater confidence (but not certainty) about the direction of associations observed.

Secondly, for the sake of practical application, it was important that results from this study could conceivably be translated for use by compensation schemes. For example, in 2012, the TAC processed over 19,000 new accident compensation claims and had around 40,000 clients under management⁵. Any screening process
that requires additional information to be gathered from clients beyond information contained on the claim form and/or which potentially delayed the process of initial segmentation into management teams could pose a large administrative burden on the TAC and miss a crucial early window for allocating rehabilitation resources to clients. Further, the collection of additional socio-demographic information on a wide scale may be impractical based on the limitations of schemes’ assumed or legislated responsibilities in post-accident care (see section 1.3.2). An example of this separation is that even within the TAC scheme, participants in client outcomes are provided with a guarantee that their responses to surveys will be kept confidential and divorced from details of their insurance claim. There is therefore no means whereby the TAC claims managers dealing with clients on a day-to-day basis may match results from surveys with targeted interventions.

The decision to use structural equation modelling (SEM) for analysis within Paper 1 was taken because it was considered to be the most robust method of demonstrating the comparative influence that each independent variable had on latent mental and physical health outcome variables, whilst controlling for correlation between predictors. SEM was also considered appropriate given the nature and structure of data available for analysis. Other alternatives considered through the process of study development were multinomial logistic regression and cluster analysis. The structure of the data, however, and desire for Paper 1 to set a basis for remaining Papers within the series resulted in SEM being the chosen approach.

Challenges of Paper 1 included those concerned with data integrity and determining the best options for publication of results. In relation to data integrity, the use of SEM involved dealing with a large number of independent and dependent variables.
Although missing data points were relatively rare, the fact that cases were excluded based on their combination across the number of individual and scale items used in the study meant that a greater number of participants than desired (n=233) were ultimately excluded from analysis. This did not, however, pose a threat to study power or violate assumptions of the modelling procedure.

The choice of avenue for publication was challenging given a number of variables. Firstly, attributions of responsibility for accidents have not received recent attention in the literature and as such, their potential effects are not widely recognised. Secondly, the ‘general’ nature of compensation research means that the subject matter can appear both too broad for specialist journals and also too narrow for public health journals. Careful tailoring of the final manuscript was required in order to ensure it was specialised to the extent that it would be suitable for review and acceptance within the American Psychological Association’s Rehabilitation Psychology journal.
Chapter 3: Attributions of responsibility and recovery within a personal injury compensation system
3.1 Abstract

Objective: Although a great deal of literature supports the negative relationship between post-injury health outcomes and compensation, it has not fully examined the relative influence of the diverse factors that underlie compensable status and a substantial part of the outcome variance remains unknown. In particular, this study sought to understand the relative influence that attributions of responsibility for accidents have on mental and physical health outcomes.

Method: Using a structural equation modelling approach, assessment was made of the strength of relationships between demographic and accident circumstance variables, and post-injury mental and physical health for 934 road-trauma survivors insured under a single personal injury compensation system.

Results: Analysis of direct and indirect effects demonstrated that whilst a range of standard demographic and accident circumstance variables influenced health outcomes, by far the greatest effect was generated from perceptions of responsibility for the accident. People who reported lower levels of responsibility for their accident showed significantly poorer mental and physical health outcomes.

Conclusion: Perceptions of responsibility for accidents are strongly associated with post-accident mental and physical health outcomes within compensable road trauma populations. Future studies should control for attributions of responsibility when assessing the effect of compensation, or any other variable, on health outcomes among injured populations. Mechanisms underlying the effect of attributions of responsibility on outcomes, particularly in relation to its association with self-blame, warrant further exploration.

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3.2 Introduction

Despite it being regarded as a mark of progress for societies to provide systems of compensation, rehabilitation and health system access for persons injured or disabled through road injury, it remains widely accepted that people who access compensation after injury experience worse health outcomes than those who do not. Some have suggested that the association between accessing compensation and poor outcomes is so well established that it is akin to that shown between smoking and lung cancer.

At face value, the iatrogenic conceptualisation of compensation appears counter-intuitive. Further, it begs the question of why, in an environment where road trauma has climbed to be the 10th greatest cause of disability worldwide, societies would continue to underwrite systems that potentially damage injured persons’ prospects of recovery. There is clearly a requirement to better understand the make-up of compensable populations and drivers of post-injury health outcomes.

Although literature used to support the negative relationship between compensation and outcomes appears both prolific and consistent, it has not fully examined nor disentangled the relative influence of the diverse factors that underlie compensable status. Compensable status has been often viewed as a single, independent variable rather than a complex factor arising as a consequence of diverse demographic influences and personal circumstances triggered by accident or injury. Further, compensation’s effect on post-injury outcomes has not been the primary purpose of most studies used as evidence to quantify its impact, limiting the analysis of compensation’s effects largely to simple comparisons between ‘compensable’ and ‘non-compensable’ groups. These themes were recognised by Littleton et al. who...
reported that, although compensable status in their study of people with musculoskeletal injuries arising from road accidents demonstrated poorer health status at follow-up, it was not possible to determine whether this effect was due to claiming compensation itself, or the presence of other unmeasured factors associated with compensable status.

Only recently have factors associated with compensation and outcomes begun to be understood with greater fidelity. For example, O’Donnell et al.\textsuperscript{13} demonstrated that through removal of patients in a non-compensable group who had received assistance by way of private health insurance, differences in outcomes between compensable and non-compensable post-injury outcomes were negligible. Further, Harris et al.\textsuperscript{14} found that while compensation was associated with poorer psychological outcomes post-trauma, the effect was only present for those whose compensation claim was unsettled. Whilst the definition of unsettled claims for patients covered under diverse ‘fault-based’ and ‘no-fault’ legal frameworks was unclear for the latter study, both results reinforce the limitations of defining compensable status as dichotomous, ‘compensable’ or ‘non-compensable’ groups without appreciation of other within-group factors influencing outcomes.

A factor that may influence post-accident recovery within compensable populations is self-reported responsibility for accident. Despite the effect of responsibility and related themes (e.g., blame, anger) on outcomes having been noted previously\textsuperscript{14-21}, the extent of their effect is an area that has received relatively scant attention. This belies the importance of responsibility, however, as compensable populations by their very nature (e.g., within fault-based systems or jurisdictions), are less likely to be responsible for an accident or injury. It may be true that self-reported
responsibility accounts for a substantial proportion of the variability in outcomes within compensable populations.

The limitations of previous studies’ exploration of subtleties within compensable groups are in part due to practical methodological restrictions often placed around efforts to study injured populations\textsuperscript{10}. Study sample sizes are often relatively small and self-selecting, requiring researchers to treat samples as single, homogenous groups, and requiring responses to trauma to be generalised to ‘typical’ trauma populations. Larger samples, more representative of the broader road trauma population are therefore paramount to progressing an understanding of post-injury outcomes\textsuperscript{22}.

Through examination of a large-scale sample of road trauma survivors insured under a single personal injury compensation system, this study aims to assess the relative influence of attributions of responsibility and other stable demographic and accident circumstance variables on physical and mental health outcomes post-accident. Specifically, it is hypothesised that attributions of responsibility for accidents will significantly affect mental and physical health outcomes alongside other stable demographic factors known at accident and routinely controlled for in prior trauma research.
3.3 Method

3.3.1 Data Collection

Data were drawn from an existing de-identified database provided by the Victorian Transport Accident Commission; an Australian, state-owned, road trauma compensation system (the system). This dataset consisted of 1173 individual, cross-sectional client records collected in 2011 as part of the system’s client research program. Ethical consent for conduct of the research was granted from the respective Human Research and Ethics Committee of Deakin University (2012-234) and the compensation system’s client research body.

3.3.2 Participants

Potential participants who met criteria for inclusion in the study were randomly drawn from a sample of clients within an existing database held by the system consisting of all current and prior clients and current at the time of sample extraction (2011). Included in the database were participants deemed by the system at the time of interview to be either ‘currently active’ with a claim duration of 6 years or less, or had been ‘inactive’ for less than 25 months. ‘Active’ claims were those that had received payments for medical services in the previous 6 months. Excluded participants were dependents of deceased accident victims, clients with severe, life-long or catastrophic injuries, were under 16, had previously indicated to the system that they did not want to participate in research, were multiple family members of clients in the sample population, were clients whose accident anniversary fell within or two weeks either side of their potential interview period, were clients who were employees of the scheme, or were clients that were excluded by any other criteria deemed appropriate by the scheme for reasons of interviewee burden or sensitivity.
3.3.3 Procedures

Prior to participating in the study, each potential participant (3500 persons) were sent a letter by the TAC describing the research, its purpose, voluntariness of participation, the timelines and commitment required. Once this process was complete, a contracted research company conducted the survey with trained interviewers under the supervision of the scheme representatives via Computer Assisted Telephone Interview. A total of 1173 interviews were conducted over a four-week period between the hours of 10am to 8pm. The average interview length was 25 minutes.

3.3.4 Questionnaire

3.3.4.1 Short-Form-12 Health Survey, Version 2

General physical and mental health status was measured using the Short-Form-12 Health Survey, Version 2 (SF-12 V2). The SF-12 V2 has been demonstrated to be a reliable measure relative to the SF-36 in the general population and has been used in multiple trauma studies with comparable populations e.g., . Higher MCS and PCS scores on the SF-12 are indicative of more positive mental and physical health, respectively.

3.3.4.2 Travel anxiety

Participants were asked to respond to a simple, three-item question relating to whether they now felt ‘a lot more’ anxious around traffic in general since their accident, ‘a little more’ anxious around traffic in general, or whether they ‘hadn’t noticed a difference’.
3.3.4.3 Persistent pain

Persistent pain was assessed according to the scheme’s classification criteria, defined as current pain experienced as a result of injuries sustained in the accident that had lasted for three months or more.

3.3.4.4 Attributions of responsibility for the accident

Attributions of responsibility for the accident were assessed using a similar methodology reported in previous work \(^{14,17,19}\). Participants were asked whether they believed they were ‘totally responsible’, ‘partially responsible’, or ‘not responsible at all’ for their accident.

3.3.4.5 Demographic, vehicle and claim information

Demographic information was collected for each respondent, including gender, employment status at time of accident, educational achievement, role in accident, age, and claim duration (see Table 3-i). Basic scheme-related service information including claim duration, and injury classification was also collected. The injury coding scheme applied by the system uses the most severe injury suffered by the client as its basis for classification. Injuries are grouped within four categories, covering musculoskeletal injuries (e.g., soft tissue sprains, strains and whiplash), orthopaedic injuries (e.g., fractures, dislocations), ‘other’ injuries (e.g., lacerations, abrasions, concussions), and ‘other severe’ injuries (e.g., amputations, mild brain injury, head injury, de-gloving, internal or spinal injuries).

3.3.5 Data screening and manipulation prior to analysis

In order to better classify respondents’ roles in the accident, standard distinctions between ‘vulnerable’ road users (pedestrians, cyclists, motorcyclists, pillion passengers) and standard road users (vehicle drivers, vehicle passengers) were made.
resulting in the creation of a binary ‘vulnerable road user’ variable\textsuperscript{23}. Due to the categorical, non-normally distributed nature of many variables and the requirement in AMOS Version 20\textsuperscript{24} asymptotically distribution-free structural equation modelling procedures for removal of cases containing missing data, a list-wise deletion of 233 cases was conducted, leaving 934 complete records. Variables most frequently contributing to missing data points were; attributions of responsibility for the accident (n=118), MCS score (n=115), PCS score (n=115), travel anxiety (n=25); and highest level of education (n=17). Analysis of respondents with missing data demonstrated little difference across demographic or accident circumstance variables compared to those with complete records with the exception of increased mean age for participants with missing data (49.0 vs 43.2 years, \(p<.001\)).

3.3.6 Data analysis

Basic descriptive analysis including frequencies, means, standard deviations and correlation matrices were conducted using SPSS Version 21\textsuperscript{25}. Structural Equation Modelling (SEM) was conducted using Analysis of Moment Structures (AMOS) Version 20\textsuperscript{24} to test the relationships between variables in the model due to its ability to assess complex relationships and provide clarity around comparative strength of association with outcomes among input variables.

A base, asymptotically distribution free model (Model 1) was initially specified (see Figure 1) with unidirectional association between mental and physical health. This direction of association was chosen due to the historic conceptualisation of injury and recovery as a predominantly physically-oriented assessment process and the gearing of injury legislation, compensation, treatment and rehabilitation services
towards consideration of injured persons in relation to their physical injury profiles.

The model contained eight exogenous predictor variables; vulnerable road user status (cyclists, pedestrians, motorcyclists, public transport users), employment status at time of accident, gender, self-reported responsibility for accident, age, highest level of education, injury severity classification; and claim duration. The two latent outcome variables were ‘physical health’ and ‘mental health’. Physical health was made up of contributions from the SF-12 V2 physical health composite score and persistent pain. Mental health was comprised of the mental health component score of the SF-12 V2 and travel anxiety. The construction of the latent variables was chosen to reflect factors regarded as important measures of recovery by both the scheme and within the road trauma literature.

Following fit of the initial model (Model 1), a secondary simplified model was then produced (Model 2) using similar procedures as above to adjust for error but with removal of all non-significant pathways ($p<.05$) from the base model. To assess both models’ respective fits, $\chi^2$, the root mean square of approximation (RMSEA), and the Comparative Fit Index (CFI) were used. A RMSEA of .08 or less has been considered to indicate close fit between the model and the data, while a CFI around .95 or above reflect good fit of a model.
Figure 3-i. Base model containing all variables and pathways (Model 1).
3.4 Results

Table 3-i shows basic demographic and accident circumstance information for exogenous variables for all respondents including age, gender, claim duration, role in accident, highest level of education, employment status at time of accident, self-reported responsibility, and injury classification. Figures indicated that 26% of participants had suffered musculoskeletal injuries (e.g., soft tissue sprains, strains and whiplash), 41% orthopaedic injuries (e.g., fractures, dislocations), 12% ‘other’ injuries (e.g., lacerations, abrasions, concussions), and 21% ‘other severe’ injuries (e.g., amputations, mild brain injury, head injury, de-gloving, internal or spinal injuries). Comparison of injury classification data with overall scheme-level reports indicate that while broadly reflective of the compensable populations under management, this population likely had greater levels of injury than the population of road accident survivors typically serviced by the scheme5.
Table 3-i Demographic and Accident Circumstance Characteristics of the Sample

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>Mean (Range)</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Participants in Analysis</td>
<td>934</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>56%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>44%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Age (Years)</td>
<td></td>
<td>43.2 (16 - 88)</td>
<td>15.8</td>
<td></td>
</tr>
<tr>
<td>Role in Accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>43%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle Rider</td>
<td>25%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle Passenger</td>
<td>1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Transport</td>
<td>1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury Classification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>26%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>41%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Injuries</td>
<td>12%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Severe</td>
<td>21%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Claim Duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-12 Months</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-24 Months</td>
<td>35%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-36 Months</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37-72 Months</td>
<td>19%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibility for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totally Responsible</td>
<td>15%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially Responsible</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Responsible at All</td>
<td>62%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed at Time of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, Paid Employment</td>
<td>78%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>22%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest Level of Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary School or Below</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did Not Complete High School</td>
<td>19%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 12 or Equivalent</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade / Apprenticeship</td>
<td>15%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAFE / Technical Certificate</td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate Diploma / Degree</td>
<td>22%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate Qualification</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-ii provides descriptive statistics for continuous variables and ranges for ordinal variables included in the model and indicates the direction of coding.

Significant deviations from normality related to skewness and kurtosis were
observed for the majority of variables, justifying the decision to conduct an
asymptotically distribution free SEM. Feeling ‘a lot more’ anxious around traffic in
comparison to before their accident was reported by 36% of participants and 32%
reported that they felt ‘a little more’ anxious. The remaining 32% reported that they
‘had not noticed a difference’. Persistent pain since the accident was reported by
61% of participants.
Table 3-ii. Descriptive Statistics for Exogenous Variables in Model 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim Duration</td>
<td>0 (0-12 Months)</td>
<td>3 (37-72 Months)</td>
</tr>
<tr>
<td>Injury Classification</td>
<td>0 (Musculoskeletal)</td>
<td>3 (Other Severe)</td>
</tr>
<tr>
<td>Vulnerable Road User Status</td>
<td>0 (Not Vulnerable)</td>
<td>1 (Vulnerable)</td>
</tr>
<tr>
<td>Employment Status at Accident</td>
<td>0 (Not Employed)</td>
<td>1 (Employed)</td>
</tr>
<tr>
<td>Age</td>
<td>43.1 (15.8)</td>
<td>16</td>
</tr>
<tr>
<td>Gender</td>
<td>0 (Female)</td>
<td>1 (Male)</td>
</tr>
<tr>
<td>Responsibility for Accident</td>
<td>1 (Not Responsible at All)</td>
<td>3 (Totally Responsible)</td>
</tr>
<tr>
<td>SF-12 MCS Score</td>
<td>44.3 (13.4)</td>
<td>7.1</td>
</tr>
<tr>
<td>SF-12 PCS Score</td>
<td>43.3 (11.5)</td>
<td>11.6</td>
</tr>
<tr>
<td>Persistent Pain</td>
<td>0 (No Persistent Pain)</td>
<td>1 (Persistent Pain)</td>
</tr>
<tr>
<td>Traffic Anxiety</td>
<td>1 (No Difference)</td>
<td>3 (A Lot More Anxious)</td>
</tr>
</tbody>
</table>

Table 3-iii shows the covariances between observed variables in Model 1. Significant covariance between a number of variables was demonstrated. Responsibility for the accident co-varied with age, employment status, and vulnerable road user status, and gender. Employment status co-varied with education and vulnerable road user status. Gender co-varied with all variables with the exception of claim duration (CD). Claim duration did not show significant covariance with any other variable, providing reassurance that in this cross-sectional design, remaining variables were not influenced by time elapsed since accident.
Table 3-iii. Covariance Estimates Between Variables in Model 1.

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ▶ Claim Duration</td>
<td>-.09</td>
<td>.52</td>
<td>-.16</td>
<td>.87</td>
</tr>
<tr>
<td>Responsibility ▶ Claim Duration</td>
<td>-.03</td>
<td>.03</td>
<td>-1.08</td>
<td>.28</td>
</tr>
<tr>
<td>Gender ▶ Claim Duration</td>
<td>.02</td>
<td>.02</td>
<td>1.34</td>
<td>.18</td>
</tr>
<tr>
<td>Employment Status ▶ Claim Duration</td>
<td>.02</td>
<td>.01</td>
<td>1.37</td>
<td>.17</td>
</tr>
<tr>
<td>Vulnerable Road User ▶ Claim Duration</td>
<td>-.01</td>
<td>.02</td>
<td>-1.31</td>
<td>.76</td>
</tr>
<tr>
<td>Age ▶ Injury Classification</td>
<td>-.26</td>
<td>.56</td>
<td>-.46</td>
<td>.64</td>
</tr>
<tr>
<td>Responsibility ▶ Injury Classification</td>
<td>.02</td>
<td>.02</td>
<td>.80</td>
<td>.47</td>
</tr>
<tr>
<td>Gender ▶ Injury Classification</td>
<td>.07</td>
<td>.02</td>
<td>4.32</td>
<td>.00</td>
</tr>
<tr>
<td>Employment Status ▶ Injury Classification</td>
<td>.00</td>
<td>.02</td>
<td>.19</td>
<td>.85</td>
</tr>
<tr>
<td>Vulnerable Road User ▶ Injury Classification</td>
<td>.04</td>
<td>.02</td>
<td>2.62</td>
<td>.01</td>
</tr>
<tr>
<td>Education ▶ Age</td>
<td>-.58</td>
<td>1.24</td>
<td>-1.47</td>
<td>.64</td>
</tr>
<tr>
<td>Education ▶ Responsibility</td>
<td>-.06</td>
<td>.06</td>
<td>-1.06</td>
<td>.29</td>
</tr>
<tr>
<td>Gender ▶ Education</td>
<td>-.09</td>
<td>.04</td>
<td>-2.30</td>
<td>.02</td>
</tr>
<tr>
<td>Education ▶ Employment Status</td>
<td>.09</td>
<td>.03</td>
<td>2.75</td>
<td>.01</td>
</tr>
<tr>
<td>Education ▶ Vulnerable Road User</td>
<td>-.01</td>
<td>.04</td>
<td>-.15</td>
<td>.88</td>
</tr>
<tr>
<td>Age ▶ Responsibility</td>
<td>-1.09</td>
<td>.38</td>
<td>-2.90</td>
<td>.00</td>
</tr>
<tr>
<td>Gender ▶ Age</td>
<td>-.60</td>
<td>.25</td>
<td>-2.35</td>
<td>.02</td>
</tr>
<tr>
<td>Age ▶ Employment Status</td>
<td>-1.75</td>
<td>.25</td>
<td>-6.93</td>
<td>.00</td>
</tr>
<tr>
<td>Age ▶ Vulnerable Road User</td>
<td>-.30</td>
<td>.24</td>
<td>-1.24</td>
<td>.21</td>
</tr>
<tr>
<td>Gender ▶ Vulnerable Road User</td>
<td>.10</td>
<td>.01</td>
<td>13.94</td>
<td>.00</td>
</tr>
<tr>
<td>Gender ▶ Employment Status</td>
<td>.04</td>
<td>.01</td>
<td>5.39</td>
<td>.00</td>
</tr>
<tr>
<td>Gender ▶ Responsibility</td>
<td>.05</td>
<td>.01</td>
<td>4.42</td>
<td>.00</td>
</tr>
<tr>
<td>Employment Status ▶ Vulnerable Road User</td>
<td>.03</td>
<td>.01</td>
<td>5.09</td>
<td>.00</td>
</tr>
<tr>
<td>Responsibility ▶ Vulnerable Road User</td>
<td>.05</td>
<td>.01</td>
<td>3.79</td>
<td>.00</td>
</tr>
<tr>
<td>Responsibility ▶ Employment Status</td>
<td>.02</td>
<td>.01</td>
<td>2.19</td>
<td>.03</td>
</tr>
<tr>
<td>Education ▶ Injury Classification</td>
<td>-.07</td>
<td>.08</td>
<td>-.89</td>
<td>.37</td>
</tr>
<tr>
<td>Education ▶ Claim Duration</td>
<td>.01</td>
<td>.08</td>
<td>.09</td>
<td>.93</td>
</tr>
<tr>
<td>Injury Classification ▶ Claim Duration</td>
<td>-.04</td>
<td>.04</td>
<td>-1.05</td>
<td>.29</td>
</tr>
</tbody>
</table>

Note. Statistically significant covariance estimates < .05 are in boldface.

Table 3-iv shows the standardised direct parameter estimates for all observed exogenous variables on the latent variables in the initial model. Significant direct

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effects were found for claim duration, vulnerable road user status, employment status at the time of accident, level of education, and gender on mental health. By far the greatest contributor to mental health recovery post-accident was self-reported responsibility for accident \( (r^2 = .37, p < .001) \). Age, gender, and education all showed significant direct effects on physical health. Parameter estimates for observed variables contributing to the latent variables of mental health, and physical health were all significant at the \( p < .001 \) level. The relationship between mental and physical health was also significant \( (p < .001) \).

Table 3-iv. Standardised Direct Effects of Observed Variables on Latent Variables in Model 1.

<table>
<thead>
<tr>
<th></th>
<th>Mental Health</th>
<th>Physical Health</th>
<th>SF-12 MCS</th>
<th>SF-12 PCS</th>
<th>Persistent Pain</th>
<th>Travel Anxiety</th>
<th>Total Explained Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim Duration</td>
<td>-0.09(^a)</td>
<td>-0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibility for</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accident</td>
<td>0.37(^c)</td>
<td>-0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment Status</td>
<td>0.13(^b)</td>
<td>-0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerable Road User</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.02</td>
<td>-0.18(^c)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Injury Classification</td>
<td>-0.03</td>
<td>0.05</td>
<td></td>
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</tr>
<tr>
<td>Mental Health</td>
<td>0.55(^c)</td>
<td>0.63(^c)</td>
<td>0.72(^c)</td>
<td>26%</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Physical Health</td>
<td></td>
<td></td>
<td>0.89(^c)</td>
<td>0.68(^c)</td>
<td></td>
<td></td>
<td>35%</td>
</tr>
</tbody>
</table>

Note. \(^a\) \( p < .05 \), \(^b\) \( p < .01 \), \(^c\) \( p < .001 \)

Calculation of indirect effects showed that the effect of self-reported responsibility for accident on physical health outcomes \( (r^2 = -.20) \) was twice that of any other observed exogenous variable. Total explained variance in Model 1 was 26% for
mental health and 35% for physical health. The chi-square fit test ($\chi^2(934, 17) = 88.43, p<.001$) suggested that Model 1 did not fit the data well, however, this was most likely due to the large sample size$^{33}$. Assessment of both CFI (.95) and RMSEA (.07) indicated adequate error of approximation for Model 1.

Analysis of a simplified model (Model 2) was then conducted for interpretative purposes. To create the simplified model, consecutive iterations of Model 1 were run, removing all non-significant pathways ($p>.05$) in order from smallest parameter estimate (least effect) to greatest. In total, 22 non-significant parameter estimates (7 variances and 15 covariances) were removed from the initial model.

Figure 2 shows the standardised covariances and direct parameter estimates for observed exogenous variables on the mental and physical health outcomes for the simplified Model 2. Combined with similar overall model fit estimates ($\chi^2(940, 39) = 113.0, p<.001$, CFI = .95, RMSEA = .05), these estimates are a close approximation of those obtained in Model 1, demonstrating that deletion of non-significant pathways improved model parsimony without compromising fit.

Analysis of direct and indirect effects by observed exogenous variables demonstrated that claim duration ($r^2 = -.10, p<.01$), employment status at accident ($r^2 = .11, p<.01$), vulnerable road user status ($r^2 = .17, p<.001$), gender ($r^2 = .12, p<.01$) and education ($r^2 = .08, p<.05$) were significantly associated with post-accident mental health, with the largest effect again reserved for responsibility for accident ($r^2 = .35, p<.001$).

Variables that had significant effect on physical health recovery were education ($r^2 = -.10, p<.01$), gender ($r^2 = -.10, p<.01$), and age ($r^2 = -.17, p<.001$). Analysis of parameter pathways (see Figure 2) again showed self-reported responsibility’s significant indirect effect on physical health mediated by mental health ($r^2 = -.19$).
Total explained variance in the simplified model was 25% for mental health and 34% for physical health, demonstrating that the performance of the simplified model (Model 2) was analogous to the base model (Model 1).

The direction of effects shown by both models indicate that injured people who have more positive mental health post-accident were more likely to be male, vulnerable road users, employed at the time of their accident, have higher levels of education, have a shorter claim duration (equivalent to elapsed time since their accident), and, were more likely to believe that they were partially or wholly responsible for their accident. Positive physical health recovery was associated with higher levels of education, being female, and being of younger age.

Figure 3-ii. Simplified SEM Model 2 after removal of non-significant parameters pathways from Model 1.
3.5 Discussion

The results found here supported our hypothesis that self-reported responsibility for accident was significantly associated with post-accident mental and physical health outcomes among clients of a personal injury compensation scheme. Lower levels of responsibility for accident were associated with significantly poorer mental and physical health outcomes. While these results align well with previous work\textsuperscript{14-18, 34}, they are unique in that no prior study has assessed the effect of demographic and accident circumstance variables on outcomes in such a large, representative sample using an SEM approach that allows for direct comparison of strength of association between variables in the manner described here.

More positive physical health outcomes were associated with younger age, female gender, and higher levels of education. More positive mental health outcomes were associated first with greater levels of responsibility for accident, vulnerable road user status, employment at the time of accident, male gender, shorter claim duration, and higher levels of education.

These findings have potentially wide-ranging implications for policy-makers, compensation schemes and personal injury insurers, practitioners, and researchers. For clinicians and compensation schemes or insurers attempting to both predict and efficiently allocate rehabilitation resources for the millions of individuals injured on roads worldwide every year\textsuperscript{11}, it demonstrates that assessment of a small, easily accessible set of demographic and accident-related factors is able to explain significant variability in physical and mental health outcomes. This could contribute to the development of simple triage or client management procedures that allocate resources to greatest potential need or assist in planning for future need under various conditions.
population risk scenarios. Importantly, these results do not rely on the estimation of outcomes from administration of complex or detailed diagnostic information, possibly unable to be gathered by insurers or general clinicians without specialist resources or referral. The factors used here are likely to be available as a matter of course for any agency dealing with individuals exposed to road trauma or other injury, regardless of their sophistication.

For researchers exploring the effect of compensation in recovery, this study has methodological significance as it highlights the importance of controlling for the significant effect that perceptions of responsibility have on health outcomes within compensable groups. To this point, very few studies have controlled for this factor through either sample selection or at the point of analysis. Nor have they cautioned against its potential confounding impact when drawing conclusions regarding the negative effect of compensation on health outcomes. As shown here, however, self-reported responsibility may substantially affect outcomes within groups. If compensable populations by their very nature (e.g., within fault-based schemes or jurisdictions), are less likely to be responsible for an accident or injury, it may be true that this factor could account for a substantial proportion of the differences observed in previous work and attributed to an effect of compensation.

For policy-makers, these findings can assist to inform the design of future compensation or insurance schemes. For example, knowledge of likely demographic and accident circumstance profiles of individuals within compensation schemes, between schemes catering for various types of injured populations (e.g., worker’s compensation, disability), or among future compensable populations, may assist the design of schemes that optimise health outcomes for clients. More broadly, as the
nature and mechanism of injuries within populations change over time\textsuperscript{35, 36}, it may be expected that ‘average’ outcomes for injured persons will also change. With a 34% increase in disability caused by road transportation in the last 20 years and the burden of this growth being felt primarily in the developing world\textsuperscript{11}, knowledge of factors that promote or hinder post-injury outcomes will become increasingly important to managing this significant global health issue.

\subsection*{3.5.1 Limitations}

Limitations of this study relate to the cross-sectional nature of its design and that while the model of association between variables is theorised, it is not possible to draw firm conclusions about the mechanisms underlying observed effects or assume causality. This is in part due to the naturalistic nature of the study in accessing existing scheme data and the consequent limitations placed on the authors to have input into the study or questionnaire design, which also hindered inclusion of more theoretically derived or detailed outcome measures. However, this naturalistic element of the study is also a great strength as it ensured that the sample under study was more likely to be broadly representative of typical samples under management within the personal injury compensation scheme. It also provided significant insight using existing ‘everyday’ items likely to be available as a matter of course to like schemes in other jurisdictions.

Although all participants within the study received no-fault compensation benefits, approximately 1000 clients (or 5% of total accepted claims) per year also instigate common law proceedings\textsuperscript{5}. It is therefore likely that a small proportion of ‘not-at-fault’ clients included in this study may have instigated additional common-law action prior to interview. Due to privacy concerns, the TAC did not wish to include
this information within the dataset provided. However, future research may wish to explore the potential impact of this on results described here.

Whilst attributions of responsibility and blame are separate variables, their presentation most likely overlaps to some degree\textsuperscript{37}. Future research may wish to explore the theoretical nature of the relationships observed here as there are a number of existing frameworks, particularly in relation to the effect of self-blame and mental health outcomes, that these results appear to align with or challenge to various degrees\textsuperscript{37-42}.

Further, it is unclear as to the circumstances in which an individual may ascribe responsibility to themselves ‘totally’, ‘partially’, or ‘not at all’. Further examination of objective accident circumstances that give rise to various attributions of responsibility for MVAs are required to understand this relationship.

Whilst based on a system of injury severity, the injury classification used by the TAC is non-standard and unique to the scheme, itself. Future research should attempt to compare results gathered here with those containing employing more accepted or standardised injury severity classification systems\textsuperscript{43} as have been used elsewhere\textsuperscript{44}.

3.5.2 Implications

Led by individual’s perceptions of the degree to which they were responsible for their accident, this study has demonstrated that demographic and accident circumstance variables contribute to considerable within-group heterogeneity in health outcomes for compensable survivors of road trauma. These results highlight the need in future studies to go beyond a view of compensation that is limited to compensable status only, or that controls only for more established variables such as
age, sex, injury, employment status or education when assessing variables important to post-injury outcomes. In particular, it emphasises the importance of first understanding within-group differences among compensable populations that may inform the design of between-group studies and guide interpretation of findings. Future studies should consider controlling for attributions of responsibility for accident in their designs in order to ensure that generally-held assumptions concerning the negative effects of compensation, or any other variable or intervention, are not a corollary of this largely unmeasured factor.
3.6 References


Chapter 4: Investigating the association between attributions of responsibility for motor vehicle accidents, depressive symptoms, and return to work
4.1 About this chapter

The purpose of this chapter is to describe the development of the second paper in this series and the challenges and learning associated with its conduct.

4.1.1 Development, design and challenges

Having established the association between attributions of responsibility for accidents and mental and physical health outcomes in Paper 1, the purpose of Paper 2 was to determine whether attributions of responsibility were also associated with post-accident functional recovery in the form of return to work outcomes. Further, rather than measuring a generalised, latent mental health factor as used in Paper 1, this study investigated whether attributions of responsibility were specifically related to depressive symptoms and whether depressive symptoms mediated attribution of responsibility’s effect on return to work. The working hypothesis was that depressive symptoms would mediate the association between attributions of responsibility and return to work in a similar manner to the way in which mental health outcomes mediated the association between of attributions of responsibility and physical health outcomes in Paper 1.

The reason for aiming to explore the association between attributions of responsibility and depressive symptoms was two-fold. Firstly, whilst compensation schemes such as the TAC have an understanding that poor mental health outcomes potentially contribute to physical ill health and failure to achieve return to work among some clients, they are often not in a position to identify particular psychological disorders that could perhaps be targeted for specific interventions (this is pertinent to discussions regarding the role of compensation schemes in recovery as discussed in Section 1.3.2). Establishing that symptoms of depression were
associated with poorer RTW outcomes, however, would provide clearer guidance regarding interventions that could be developed or funded by compensation schemes for clients into the future.

Secondly, in development of the survey instrument, the TAC considered that more extensive assessment of depressive symptoms through use of the Depression, Anxiety and Stress Scale – 21 (DASS-21) depression\(^1\) subscale was less potentially burdensome for clients and interviewers than assessment of PTSD. Given the often comorbid relationship between PTSD, depression, and anxiety among people injured in MVAs, the TAC considered that assessment of depressive symptoms was a suitable ‘entry point’ for testing the appropriateness of trialing a standard psychometric tool. Finally, the ability of data gathered through the use of the depression sub-scale of the DASS-21 to be compared to the SF-12 V2 single-item depression item provided an opportunity for the TAC to understand whether the performance of this single item was comparable to a more comprehensive tool, at least for the purposes of triage or screening of clients at risk of poor RTW outcomes.

At first, Paper 2 consisted of results gathered from a sample of 303 clients who completed interviews over 2 time periods, 12 months apart (Time 1 and Time 2). This relatively small sample was selected due to the inclusion of additional items such as the DASS-21 depression sub-scale and was designed to provide more specific understanding of a range of illness symptoms within the client base. As the paper developed, however, it was considered that although measures at Time 1 were not identical to Time 2 (preventing a repeated measures design from being conducted using the DASS-21\(^1\) data because depression at Time 1 was measured with SF-12 V2 single-item depression item) the inclusion of Time 1 data was also important and
would add to the depth of the study. This was because the sample size within the Time 1 data was significantly larger (n=1024) than that used at Time 2 and useful comparisons could also be made between the consistency of results over time using alternative measures of depressive symptoms. This comparison could then inform the TAC as to whether, for the purposes of understanding the incidence and effect of depressive symptoms on return to work, the use of a simpler scale (i.e., the single depression item drawn from the SF-12 V2) was valuable. This appeared to be the case as given the significant association between both measures at T2.

Challenges associated with Paper 2 involved determination of a study design that was in accordance with the restrictions present in the data (e.g., inconsistent measures of depression across time periods), but that also provided sufficient rigor to ensure that results were clear to the reader and demonstrated good validity. The decision to use a moderation / mediation approach as proposed by Baron and Kenny was central to this effort because it provided a coherent set of ordered pathway tests that were potentially familiar to the reader and if not familiar, could be adequately explained and followed in the manuscript text.
Chapter 5: The Association Between Attributions of Responsibility for MVAs, Depressive Symptoms and Return to Work Within a Road Trauma Population
5.1 Abstract

Objective: Perceptions surrounding the underlying causes of accidents and injuries may be a key mechanism influencing post-accident health and functional outcomes among people injured in road accidents. In particular, attributions of responsibility for accidents may influence rates of post-accident depressive symptomatology and return-to-work.

Method: A large sample of road trauma survivors who were working at their time of accident and were incapacitated for work as a result of their injuries (n = 1024) were studied. A subset of this sample was then followed-up 12 months after their initial interview (n = 303). Comparisons were made between participants’ levels of depressive symptoms and rates of return to work at each time period based on their assessment of responsibility for their accident.

Results: People who did not attribute any responsibility for their accident to themselves were 3 times more likely to exhibit symptoms of depression at follow-up than those who attributed total responsibility to themselves. People with depressive symptoms were 3.5 times less likely to have returned to work. The effect of attributions of responsibility for accidents on return to work was mediated by the presence of depressive symptoms.

Conclusion: Functional and psychological recovery from road trauma is closely associated with the assessment of responsibility for accidents. Findings are discussed in light of established post-trauma cognitive theories, the potential explanatory power of broader, more socially oriented models, and the changing nature of road trauma populations.
5.2 Introduction

An estimated 1.24 million people are killed and 20 to 50 million people are injured in MVAs (MVAs) around the world each year. Road trauma now represents the 10th leading cause of global disability, having risen from 12th in 1990. In this, the United Nations Decade of Action for Road Safety, there is an important need to highlight not only the physical, but also the psychological and social consequences of what is an often neglected health issue.

Literature dedicated to understanding the mental health consequences of traumatic injury has generally been focused on posttraumatic stress disorder (PTSD), possibly at the expense of other frequent and debilitating conditions such as depression. Whilst commonly observed following traumatic injury, the reported prevalence of depression shows great variability. This is in part due to differences in social and behavioural responses to illness, methodological difficulties in studying road trauma populations, and also differences in transportation, hospitalisation, and litigation / insurance patterns for people injured in accidents across countries and populations. High levels of comorbidity between PTSD and major depressive disorder have also led some researchers to question whether they are distinct disorders or part of a broader ‘general distress’ factor. It appears clear, however, that although there is significant comorbidity and shared symptomatology between depression, PTSD, and also anxiety disorders following trauma, they remain unique phenomena.

Whilst attributing blame to others for accidents or injury has been linked to an increase in depressive symptoms, distress, and decreased educational and work involvement for victims of both intentional and unintentional accidents, both
mixed and contrary trends have also been observed e.g., 26, 27. As such, the direction of association between attributions and recovery remains unsettled and is potentially unique to the trauma population under study and nature of the experienced aversive event 28-30. It appears, therefore, that assumptions regarding relationships between attributions of responsibility and post-trauma recovery may not be easily transferred between injury groups. There is consequently a requirement to better understand how attributions of responsibility affect post-injury mental health and functional recovery among road trauma populations.

Most cognitive models of post-injury psychological disorders focus on the importance of ‘appraisal of events’ and implications that these have for individuals’ ‘world’, ‘self’, and ‘future’ in understanding later responses e.g., 9, 31, 32, 33. For example, Foa et al.’s 31 review considered concepts of learned helplessness and victimisation, both of which are precipitated by appraisal of aversive events leading to perceptions of uncontrollability and futility of future behavioural responses. Similarly, Ehlers and Clarke’s 32 model when applied to people injured in MVAs suggests that individuals who demonstrate persistent post-accident psychological disturbance fail to recognise their accident as an isolated, time-limited event that does not have more generalised negative implications for their future. However, not all persons injured in MVAs encounter depressive symptoms post-accident. As such it is important to understand how circumstances surrounding MVAs may facilitate maladaptive cognitive appraisals, and hence, poor psychological and functional recovery in some individuals.

Unlike alternative trauma populations such as those arising from natural disaster, terrorist attack, sexual assault, or other circumstances where proportions of victims
and perpetrators (if any exist) are consistently and clearly defined, circumstances surrounding MVAs are likely to produce differences in individuals’ assessment of their role in events, even if two people are involved in the exact same incident. Transport systems that produce both single and multi-vehicle MVAs generate a heterogeneous combination of survivors who may variously attribute responsibility to themselves, other parties, or other circumstances (e.g., weather conditions, mechanical failure, animals) for their injury. MVA survivors may rightly or wrongly view themselves as accident victims, perpetrators, or a mixture of both based on the circumstances under which their accident occurred. Their view is also likely to be reinforced by social and legal structures that consistently differentiate between the rights, responsibilities, and moral obligations of victims and perpetrators in most circumstances.

One can conceive of the difference in cognitive appraisals that may occur between individuals by considering the circumstance of two drivers (Driver 1 and Driver 2) involved in a single accident. If Driver 1 was unexpectedly struck by Driver 2 due to Driver 2 being distracted and failing to observe a red light, Driver 1 may rightly attribute responsibility for their accident to Driver 2. Driver 1 was operating their vehicle safely and within the law, but was still unable to control the occurrence of the event. There is therefore no surety that actions Driver 1 takes in the future in the form of ‘safe driving behaviours’ could prevent a similar occurrence. Consequently, Driver 1 may appraise the accident as representative of a serious, ongoing threat and that driving from that point onwards poses great risk. Based on cognitive theories as described above e.g., 31, 32, 33, Driver 1 may be likely to suffer post-accident psychological disturbance.
By contrast, Driver 2, whilst similarly injured within the same accident, may appraise the meaning of the event for his/her future differently. Driver 2 crashed into Driver 1 because of distraction and running a red light and attributes responsibility to themselves. Driver 2 was not operating his/her vehicle safely or within the law and can clearly identify the behaviours (distraction) that led to the accident. Driver 2 may therefore appraise the accident as potentially controllable and representative of no more than a single, time-limited event to be avoided in the future by ensuring that distractions while driving are minimised. Excluding potential disturbance caused by knowledge of his/her role in causing injuries to another person, Driver 2 may perceive greater behavioural control and be less likely to suffer ongoing psychological trauma post injury. In this regard, both drivers experienced the same accident but under differing circumstances, leading to maladaptive (Driver 1) or adaptive (Driver 2) appraisals.

Whilst the discussion of depression above has focused on its role as an outcome of traumatic events, it has also been viewed as a predictor or mediator of functional recovery such as returning to work. Richmond and Amsterdam found that among individuals who developed a depressive episode in the 12 months following emergency medical treatment, those who met the criteria for depression were eight times less likely to return to pre-accident levels of activities of daily living and 2.4 times less likely to return to pre-accident work status. The mechanisms and circumstances that led individuals to develop depressive symptoms in the aftermath of their illness, however, were not explored.

The aim of the current study was therefore to examine the association between attributions of responsibility for accidents and post-accident depressive symptoms.
and return to work within a road trauma population. Consistent with cognitive models of trauma that emphasise the uncontrollability of future events and futility of future actions to avoid harm as pre-cursors to psychological disturbance, it was hypothesised that people who did not attribute responsibility for their accident to themselves would demonstrate higher rates of depressive symptoms and lower rates of return to work than those who attributed responsibility to themselves. This finding would contribute to our understanding of the importance of appreciating accident circumstance variables in determining likely post-injury outcomes. Further, it was expected that depressive symptoms would mediate the association between attributions of responsibility for accidents and return to work.
5.3 Method

5.3.1 Data Collection

Data were obtained from a de-identified dataset provided by the Victorian Transport Accident Commission \(^42\); an Australian, state-owned, personal injury compensation scheme designed to provide compensation, medical, and rehabilitation assistance for people injured in MVAs. This dataset consisted of 1394 individual client records collected between in 2011 and 2012 as part of the scheme’s client outcomes survey. Ethical consent for conduct of the research was granted from the respective Human Research and Ethics Committees of Deakin University (Application #: 2012-234) and the compensation’s scheme’s client research body.

5.3.2 Participants

Participants in the study were interviewed on two occasions, 1 year apart. Inclusion criteria for participants at time 1 (T1) were those who were working at their time of accident, were incapacitated for work as a result of their accident and needed to take time off work, were deemed to have an ‘active’ claim with a claim duration of 6 years or less, or had been ‘inactive’ for 24 months or less (‘active’ claims were those that had received payments from the scheme for medical services in the 6 months prior to recruitment). Participants at time 2 (T2) were those who had indicated at T1 that they were willing to be contacted for future research and who had consented when re-contacted by the scheme. Figure 1 is a diagrammatic representation of the sample showing an initial sample of 1396 cases with 1109 working at T1 and were incapacitated for work as a result of their accident, and 1024 available for analysis. A total of 343 participants then completed T2 interviews, with 303 of these providing complete data and therefore being included in the analysis.

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5.3.3 Procedures

Each potential participant received a letter from the scheme describing the research, its purpose, the voluntary nature of participation, the timelines and commitment required. Once this process was complete, a contracted research company conducted the survey with trained interviewers under the supervision of the scheme representatives via scripted, Computer Assisted Telephone Interview (CATI). Interviews were conducted between 10am and 8pm and were an average of 25 minutes’ duration.
5.3.4 Questionnaire – T1

5.3.4.1 Attributions of responsibility for the accident

Attributions of responsibility for the accident were assessed using a methodology similar to that reported in previous work. Participants were asked whether they believed they were ‘totally responsible’, ‘partially responsible’, or ‘not responsible at all’ for their accident.

5.3.4.2 Return to Work

Pre-injury occupational status and rates of return to work were assessed for each respondent. Participants were considered to have ‘returned to work’ if they were in paid employment at their time of accident, took time off work as a result of their accident, and were working in paid employment at the time of interview. No assessment was made of the extent to which clients’ post-accident work patterns matched their pre-accident work status in terms of employment hours, role, salary level, or the amount of time clients had taken off work.

5.3.4.3 Demographic, vehicle and claim information

Demographic information included gender, employment status at time of accident, role in accident, age, and claim duration (see Table 3-i). Basic scheme-related service information including claim duration, and injury classification was also collected. The injury coding system applied by the scheme uses the most severe injury suffered by the client as its basis for classification (see Table 3-i).

5.3.4.4 Short-Form-12 Health Survey, Version 2

General physical and mental health status was measured using the Short-Form-12 Health Survey, Version 2 (SF-12 V2). The SF-12 V2 has been demonstrated to be reliable relative to the SF-36 in the general population and has been used in...
multiple trauma studies with comparable populations e.g., 45. To estimate the presence of depressive symptoms at T1, the single-item depression measure was used, “During the past 4 weeks, how often have you felt downhearted and depressed”. Participants were then categorised into two groups based on a response of ‘some’, ‘most’ or ‘all of the time’ (depressive symptoms), or a ‘none’/ ‘a little of the time’ (no depressive symptoms). The use of this single-item was chosen as a proxy for the more comprehensive measure of depression used at T2.

5.3.5 Questionnaire – T2

5.3.5.1 The Depression Subscale of the Depression Anxiety and Stress Scale (DASS – 21)

In addition to scales administered at T1, participants at T2 were also administered the Depression subscale of the Depression Anxiety and Stress Scale (DASS-21). This subscale is one of a set of three self-report scales designed to measure the negative emotional states of depression, anxiety and stress 1. The depression sub-scale of the DASS-21 contains seven items and assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. Participants were asked to use 4-point severity/frequency scales to rate the extent to which they had experienced each state ‘over the past week’. Scores were calculated by summing the scores for the relevant items. Participants were grouped into 5 categories of ‘normal’ (0-4), ‘mild’ (5-6), ‘moderate’ (7-10), ‘severe’ (11-13), and ‘extremely severe’ (14 +) symptoms 1.

5.3.6 Analysis

To test the association between attributions of responsibility for accident (ATR), depressive symptoms (DEP), and return to work (RTW), a series of binary logistic regressions using the broad framework proposed by Baron and Kenny 2 were
conducted (see Figure 5-ii). Under this framework, four calculations, first testing the independent relationships of paths $a$ (ATR – RTW), $b$ (ATR – DEP), and $c$ (DEP – RTW) were undertaken. Pathway $a$ (ATR – RTW) was then tested again while controlling for the effect of DEP on RTW (path $c$). Under this circumstance, if pathway $a$ was no longer significant, it was assumed to support the hypothesis that symptoms of depression mediated the relationship between attributions of responsibility and return to work. To control for the effect of demographic variables, age (AGE), gender (GEN), injury group (IGR) and duration of claim (DUR) were entered simultaneously alongside the independent variables in each equation. In total, four separate studies were conducted at T1 and T2. Data were analysed using SPSS V.21.

Figure 5-ii. Pathways tested between attributions of responsibility for accident (ATR), depressive symptoms (DEP), and return to work (RTW) at T1 and T2.
5.4 Results – Time 1

A total of 1147 participants who were working in paid employment at the time of their accident were selected at T1. Ninety-seven per cent of these participants (n = 1109) were incapacitated for work and needed to take time off work as a result of their accident. After screening for cases with missing data, a total of 1024 were included in the analysis. Excluded cases showed no difference to included cases across demographic or accident circumstance variables, although missing cases were most likely to decline to answer questions regarding their responsibility for the accident (n = 78). Table 5-i shows baseline data, means and frequencies for all participants included in the analysis at T1.
Table 5-i. Descriptive statistics associated with demographics, depressive symptoms, return to work status and accident circumstance variables at T1.

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>n</th>
<th>Mean (range)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>65%</td>
<td>668</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>35%</td>
<td>356</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (years)</td>
<td></td>
<td></td>
<td>41 (16 - 87)</td>
<td>13</td>
</tr>
<tr>
<td>Role in accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver of a vehicle</td>
<td>41%</td>
<td>421</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger in a vehicle</td>
<td>11%</td>
<td>112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle rider</td>
<td>31%</td>
<td>318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle passenger</td>
<td>1%</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td>7%</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>8%</td>
<td>81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Transport/Other</td>
<td>1%</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury classification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal (e.g., sprains, strain, whiplash)</td>
<td>22%</td>
<td>222</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthopaedic (e.g., limb fractures, dislocations)</td>
<td>47%</td>
<td>477</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Injuries (e.g., cuts, abrasions, concussions)</td>
<td>12%</td>
<td>118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Severe (e.g., mild head injuries, spinal damage, burns, spinal)</td>
<td>20%</td>
<td>207</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Claim duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-12 months</td>
<td>31%</td>
<td>315</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-24 months</td>
<td>33%</td>
<td>342</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-36 months</td>
<td>18%</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37-72 months</td>
<td>18%</td>
<td>187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibility for Accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totally responsible</td>
<td>18%</td>
<td>179</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially responsible</td>
<td>21%</td>
<td>212</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not responsible at all</td>
<td>62%</td>
<td>633</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive symptoms (SF-12V2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None of the time</td>
<td>38%</td>
<td>393</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A little of the time</td>
<td>27%</td>
<td>277</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some of the time</td>
<td>22%</td>
<td>220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most of the time</td>
<td>9%</td>
<td>93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of the time</td>
<td>4%</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working at T1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Working</td>
<td>23%</td>
<td>234</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>77%</td>
<td>790</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.4.1 Study 1.1

The association between ATR and RTW (path a) was first tested using a binary logistic regression. A test of the full model with ATR and demographic predictors was significant ($\chi^2 (8, N = 1024) = 45.3, p<.001$) indicating that the predictors...
adequately distinguished between those likely to return to work at follow-up or not (Nagelkerke $R^2 = .07$). According to the Wald criterion, results showed that ATR was significantly associated with RTW status at T1 ($\chi^2 (2, N = 1024) = 8.63, p<.05$) with participants ‘partially responsible’ ($\chi^2 (1, N = 1024) = 6.31, p<.05$) or ‘not responsible at all’ ($\chi^2 (1, N = 1024) = 8.25, p<.01$) for their accident 2.0 times less likely to have returned to work than those reporting to be totally responsible. Injury group (IGR) was also associated with RTW ($\chi^2 (3, N = 1024) = 27.94, p<.001$). People with orthopaedic ($\chi^2 (1, N = 1024) = 24.78, p<.001$), and musculoskeletal injuries ($\chi^2 (1, N = 1024) = 11.14, p<.01$) were 2.6 times more likely to have returned to work at follow-up than those with 'severe' injuries.

### 5.4.2 Study 1.2

Next, analysis of the full model of ATR on DEP (path $b$) showed that the set of predictors significantly ($\chi^2 (8, N = 1024) = 59.5, p<.001$) distinguished between persons likely to show symptoms of depression or not at follow-up (Nagelkerke $R^2 = .08$). Path $b$ showed that ATR was significantly associated with DEP ($\chi^2 (2, N = 1024) = 28.6, p<.001$) and that people who reported not being responsible at all for their accident were 2.9 times more likely to report depressive symptoms at least ‘some’ of the time during the past four weeks than those who reported being ‘totally responsible’ for their accident ($\chi^2 (1, N = 1024) = 24.3, p<.001$) (see Figure 5-iii). People who reported being ‘partially responsible’ for their accident were 1.6 times more likely to report depressive symptoms ($\chi^2 (1, N = 1024) = 4.0, p<.05$) than ‘totally’ responsible participants. Age ($\chi^2 (1, N = 1024) = 4.9, p<.05$) and injury group ($\chi^2 (3, N = 1024) = 8.5, p<.05$) were also associated with depressive symptoms. Each additional year in age was associated with an approximate 1% rise in likelihood of reporting depressive symptoms at least ‘some of the time’, while
people with orthopaedic and musculoskeletal injuries were 1.6 and 1.7 times less likely to report depressive symptoms than people with severe injuries, respectively.

Figure 5-iii. Association between responsibility for accident (ATR) and proportion of participants with depressive symptoms (DEP) at T1.

5.4.3 Study 1.3

Analysis of path $c$ showed that the full model was statistically significant ($\chi^2 (7, N = 1024) = 120.7, p<.001$), explaining almost 17% of the variance in RTW (Nagelkerke $R^2 = .17$) and that depressive symptoms (DEP) were strongly associated with RTW status ($\chi^2 (1, N = 1024) = 81.83, p<.001$). People who reported depressive symptoms at least ‘some of the time’ during the previous 4 weeks were 4.3 times less likely to have returned to work at interview than those who reported no depressive symptoms (see Figure 5-iv). Results also showed that injury classification was associated with RTW ($\chi^2 (3, N = 1024) = 21.6, p<.001$) with participants suffering orthopaedic and musculoskeletal injuries 2.4 ($\chi^2 (1, N = 1024) = 19.6, p<.001$) and 2.3 ($\chi^2 (1, N =$
1024) = 7.9, p<.01) times more likely to have returned to work than those with severe injuries.

5.4.4 Study 1.4

To assess the mediating effects of DEP on the relationship between ATR and RTW, ATR was regressed on RTW (path a) while controlling for the effect of DEP on RTW (path c). The full model explained 18% (Nagelkerke $R^2 = .18$) of the variance in RTW outcomes at follow-up ($\chi^2 (9, N = 1024) = 125.1, p<.001$). Results also showed that although the relationship between DEP and RTW remained mostly unchanged ($\chi^2 (1, N = 1024) = 76.7, p<.001$), the association between ATR and RTW (path a) was no longer significant ($\chi^2 (2, N = 1024) = 4.25, p>.10$). This provided support for the mediational model, indicating that the effect of attributions of responsibility for accidents on likelihood of returning to work was mediated by the presence of depressive symptoms (see Figure 5-iv). No other demographic variable or accident circumstance variable was associated with RTW.
Figure 5-iv. Overview of the relationship between ATR, DEP, and RTW at T1.
5.5 Results - Time 2

An identical process was undertaken with participants at T2 as occurred at T1, with the exception that the measure of depressive symptoms used was the depression subscale of the DASS-21. Examination of the relationship between both scales at T2 showed good overlap, with 94% of participants categorised as demonstrating ‘mild depressive symptoms or above’ on the DASS-21 indicating that they had felt downhearted or depressed at least ‘a little of the time’ on the SF-12 single item. Similarly, only 13% of those reporting ‘no symptoms’ on the DASS-21 also reported feeling downhearted or depressed, ‘some of the time’ or more (see Table 5-ii).

Table 5-ii. Relationship between categorisation of scores from the DASS-21 depression subscale and reported symptoms on the SF-12 V2 single item depression score at T2.

<table>
<thead>
<tr>
<th>SF-12 V2 depression item</th>
<th>DASS–21 Depression Subscale</th>
<th>No Symptoms</th>
<th>Cumulative %</th>
<th>Mild Symptoms or Above</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the time</td>
<td>No</td>
<td>0%</td>
<td>0%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Most of the time</td>
<td>No</td>
<td>0%</td>
<td>0%</td>
<td>19%</td>
<td>28%</td>
</tr>
<tr>
<td>Some of the time</td>
<td>No</td>
<td>13%</td>
<td>13%</td>
<td>36%</td>
<td>64%</td>
</tr>
<tr>
<td>A little of the time</td>
<td>No</td>
<td>30%</td>
<td>43%</td>
<td>30%</td>
<td>94%</td>
</tr>
<tr>
<td>None of the time</td>
<td>No</td>
<td>57%</td>
<td>100%</td>
<td>6%</td>
<td>100%</td>
</tr>
</tbody>
</table>

A total of 343 participants who participated at T1, were working at their time of accident, and reported taking time off work as a result of their accident-related injuries were interviewed at T2. After screening for missing data, 303 participants were included in the analysis. Table 5-iii shows demographic and accident circumstance variables associated with participants at T2. Despite only 30% of
respondents from T1 participating at T2, negligible difference between samples in relation to demographic or accident circumstances was observed.
Table 5-iii. Descriptive statistics associated with demographic data, depressive symptoms, return to work status and accident circumstance variables.

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>n</th>
<th>Mean (range)</th>
<th>sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>67%</td>
<td>202</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>33%</td>
<td>101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (years)</td>
<td></td>
<td></td>
<td>43.3 (18 - 87)</td>
<td>12.7</td>
</tr>
<tr>
<td>Role in accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver of a vehicle</td>
<td>39%</td>
<td>118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger in a vehicle</td>
<td>11%</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle rider</td>
<td>33%</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle passenger</td>
<td>1%</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td>6%</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>8%</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Transport</td>
<td>2%</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury classification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>19%</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g., sprains, strain, whiplash)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>52%</td>
<td>158</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g., limb fractures, dislocations)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Injuries</td>
<td>9%</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g., cuts, abrasions, concussions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Severe</td>
<td>20%</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g., mild head injuries, spinal damage, burns, spinal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Claim duration (at T1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-12 months</td>
<td>26%</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-24 months</td>
<td>32%</td>
<td>98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-36 months</td>
<td>21%</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37-72 months</td>
<td>21%</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibility for Accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totally responsible</td>
<td>17%</td>
<td>51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially responsible</td>
<td>25%</td>
<td>76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not responsible at all</td>
<td>58%</td>
<td>176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive symptoms (SF-12 V2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None of the time</td>
<td>37%</td>
<td>113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A little of the time</td>
<td>30%</td>
<td>91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some of the time</td>
<td>21%</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most of the time</td>
<td>8%</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of the time</td>
<td>3%</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive symptoms (DASS-21 depression subscale)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>60%</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>24%</td>
<td>73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>11%</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>4%</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely severe</td>
<td>1%</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working at T2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not working</td>
<td>20%</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>80%</td>
<td>203</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.5.1 Study 2.1

Analysis of path $a$ within the mediational model showed that the full model did not adequately distinguish between RTW outcomes at T2 ($\chi^2 (8, N = 303) = 12.7, p>.05$) and ATR was not independently associated with likelihood of return to work (RTW) at T2 ($\chi^2 (1, N = 303) = 3.7, p>.05$). Trends ($p<.10$) consistent with T1 results were observed, however, indicating that persons partially or totally responsible for their accident were around 2.6 times more likely to have returned to work than those who were not responsible at all.

5.5.2 Study 2.2

Consistent with findings from T1, the full model of path $b$ showed that the set of predictors adequately distinguished ($\chi^2 (8, N = 303) = 16.5, p<.05$) between people with depressive symptoms and those without (Nagelkerke $R^2 = .07$). ATR was significantly associated with DEP (path $b$) as measured by scores on the DASS-21 ($\chi^2 (2, N = 303) = 7.5, p<.05$). Participants who reported not being responsible for their accident were 2.7 times ($\chi^2 (1, N = 303) = 6.9, p<.01$) more likely to demonstrate symptoms of depression than those who reported being totally responsible for their accident (see Figure -v). No other measured demographic or claim-related information was associated with the presence of depressive symptoms at T2.
Figure 5-v. Proportion of participants who reported mild depressive symptoms or above within each category of self-reported responsibility for accident.

5.5.3 Study 2.3

Analysis of path $c$ at T2 again showed a significant relationship between DEP and RTW ($\chi^2 (1, N = 303) = 15.1, p < .001$). Participants who demonstrated symptoms of depression categorised as ‘mild or above’ using the depression sub-scale of the DASS-21 were 3.4 times less likely to have returned to work than those who reported ‘normal’ symptom levels. Analysis of the full model showed a significant relationship between the set of predictors and RTW ($\chi^2 (7, N = 303) = 23.8, p > .01$), accounting for around 12% of the variance in outcomes (Nagelkerke $R^2 = .12$).

5.5.4 Study 2.4

Despite no strong, direct relationship between ATR and RTW being demonstrated in study 1 at T2, for purposes of comparison an assessment of the mediating effects of DEP was conducted by regressing ATR on RTW (path $a$) while controlling for the effect of DEP on RTW (path $c$). Results of the full model were consistent with those at T1, showing that together, predictors distinguished between RTW outcomes ($\chi^2 (9, N = 303) = 26.7, p < .01$), explaining 14% of the variance (Nagelkerke $R^2 = .14$).
Further, it supported the assumption that the effect of attributions of responsibility for accidents on returning to work was contingent on the presence of depressive symptoms. When entered alongside the effect of ATR on RTW, people with symptoms of depression were 3.3 times ($\chi^2 (1, N = 303) = 14.0, p < .001$) more likely to have not returned to work than asymptomatic participants, whilst the effects of ATR on RTW weakened further. Figure 5-vi provides an overview of the results obtained at T2.

### 5.5.5 Study 2.5

Given the use of a different, more robust measure of depressive symptoms at T2, a subsequent analysis was conducted substituting the DASS-21 subscale with the single-item SF-12 depression variable administered at T2. Results yielded very similar results to those above. Again, ATR did not show a significant relationship with RTW (path $a$), ATR was significantly associated with DEP (path $b$) ($\chi^2 (2, N = 303) = 11.5, p < .01$) with those ‘not responsible at all’ for their accident 3.2 times more likely to exhibit depressive symptoms than people ‘totally responsible’. People reporting depressive symptoms at least ‘some of the time’ were 4.0 times ($\chi^2 (1, N = 303) = 12.6, p < .001$) less likely to have returned to work (path $c$).

Figure 5-vi. Overview of the relationship between ATR, DEP, and RTW at T2.
5.6 Discussion

The aims of the present study were to examine the relationship between attributions of responsibility for accidents and presence of depressive symptoms and rates of return to work in a road trauma population. As hypothesized, the results show that attributions of responsibility for accidents are strongly associated with the presence of depressive symptoms among road trauma survivors. People who did not attribute any responsibility for their accident to themselves were around 3 times more likely to exhibit symptoms of depression than those who reported being ‘totally responsible’ for their accident. Further, the findings supported our hypotheses in revealing that the presence of depressive symptoms mediated the relationship between attributions of responsibility and return to work status; people who reported depressive symptoms were over 3.5 times less likely to have returned to work than those who were asymptomatic.

Classic attribution theory\textsuperscript{33, 37, 38} may lead us to predict that people who attribute responsibility to themselves for accidents would experience greater levels of depressive symptoms and poorer outcomes. The opposite, however, appears to be true among road trauma survivors. This points to perhaps a second level of self-blame; namely characterological versus behavioural\textsuperscript{36}, that may be associated with response to accidents. Whilst some people may attribute responsibility to themselves for accidents, they may isolate this error to a behavioural rather than characterological flaw that enables (possibly illusory) future behavioural control.

Similarly, accident circumstances may precipitate cognitive appraisals that produce adaptive or maladaptive psychological and functional recovery, consistent with cognitive theories of post-trauma adjustment e.g., \textsuperscript{31, 32}. It is feasible to expect that
people who were at fault in their accident could identify the behaviours (e.g.,
distraction, speeding, not giving way) that led to their injury. As such, they may also
believe they can exert control in the future to avoid accidents or injury\textsuperscript{25}, regardless
of the accuracy of this assumption in practice. For people ‘not responsible’ for their
accidents, however, previous safe driving did not prevent them from having an
accident and there is no surety that operating a vehicle safely in the future can
prevent harm. Future actions to avoid injury could therefore be perceived as futile in
the face on an ongoing threat and leave the individual helpless; a key element
associated with the presence of depression\textsuperscript{33, 47}.

Another possible explanation for the results observed here is the involvement of
illness behaviours\textsuperscript{15} associated with being the victim of an MVA. In the state of
Victoria, safety messaging surrounding road trauma is one of the most successful,
highly funded and widely visible public health issues, with expenditure on safety and
marketing campaigns reaching $50 million per annum\textsuperscript{42}. Viewed in a wider context
that considers individuals’ behaviour within social relations, institutions and health
system structures (e.g., family, medical professionals, social and employment
structures, insurers and compensation agencies)\textsuperscript{13, 14}, it is plausible that high-impact,
widely recognised public awareness campaigns designed to prevent future road
trauma reinforces assessment of one’s role in an accident as either a victim or
perpetrator\textsuperscript{34}, leading to adaptive or maladaptive consequences for road trauma
survivors. Certainly, much prior work has focused on the detrimental role that
compensation may play in producing poorer outcomes\textsuperscript{16, 43, 45, 48, 49}, however, the
mechanisms by which compensation is thought to affect them is not well explicated.
Future research may wish to extend the focus on compensation, perhaps to also
include consideration of individuals as social agents operating and interacting within a broader societal context and culture of trauma.

5.6.1 Limitations

It is a limitation of this study that neither controllability nor illness behaviours were measured. A further limitation of the present study is that the directional relationship between return to work and depressive symptoms in this cross-sectional study is unclear, and may well be dynamic in nature\(^{50, 51}\). Further exploration of the nature of pre-accident employment characteristics (e.g., salary levels, work organisation, physical work status) associated with post-accident unemployment conditions is warranted as this may demonstrate patterns of interest such as predictors of successful return to work\(^{52}\). A more sophisticated understanding of injury severity may have also demonstrated greater association between injury and RTW status.

A further limitation that warrants exploration in future research is the extent to which clients’ post-accident work patterns matched those at the time of their accident. Participants within this study were considered to have returned to work if they were working at the time of their accident and were now in some form of paid employment at follow-up. Whilst unlikely to have altered the direction of effect observed between variables under study, it is possible that the magnitude of effects may be altered through engagement of different return to work criteria.

Similar to previous studies within this series, it is likely that a small percentage of clients within the sample had also attempted to engage in lump-sum common-law litigation processes in addition to accessing no-fault medical and like benefits. Although the present study controlled for injury severity group and injury severity is
a strong predictor of undertaking a common-law suit, future research may wish to control for the effect of litigation within the sample.

Lastly, whilst the direction of effect between depression and RTW within the current study is hypothesised to be unidirectional, there is also the likelihood that failure to RTW is also associated with greater levels of depressive symptoms. Future researcher incorporating longitudinal designs may be useful in addressing this issue.

5.6.2 Conclusions
Attributions of responsibility for accidents appear to affect the psychological and functional recovery of road trauma survivors. Potential mechanisms through which attributions operate may be both cognitive and social in nature. It is imperative that future research understands the relative contribution of both social and cognitive factors impacting recovery, as interventions emanating from each perspective will require changes at either the individual (cognitive) or social (health, compensation and rehabilitation systems) level.
5.7 References


PhD Dissertation – Deakin University School of Medicine


Chapter 6: Investigating the Association Between Attributions of Responsibility for Motor vehicle accidents and Satisfaction with Injury Compensation Schemes
6.1 About this chapter

This chapter describes the development of, and challenges associated with, the final paper of this series, exploring the association between attributions of responsibility for accidents and satisfaction with the personal injury compensation scheme.

6.1.1 Development, design and challenges

The issue of clients’ satisfaction with compensation agencies has received scant attention in the literature. Despite this, it is a significant focus of many healthcare, rehabilitation and injury compensation organisations and the TAC is no exception. As mentioned above, the TAC holds client satisfaction as one of its key performance criteria and significant effort goes into ensuring that clients’ experience is as positive as possible. To reinforce the importance of client satisfaction at all levels of the TAC, training modules are delivered to staff by the TAC’s client research team. These include significant initiatives such as the ‘Client Zone’, which provides in-depth analysis of client feedback survey results and in-depth and interviews from select TAC clients. Further, annual individual financial bonuses are also provided to staff, in part based on the overall client satisfaction score and other stretch targets nominated by the TAC.

Having explored the association between attributions of responsibility for accidents and mental and physical health outcomes, depression and RTW in Papers 1 and 2, Paper 3 therefore focused on the relationship between attributions of responsibility and client satisfaction. As well as providing a comprehensive picture of the experience of injured clients, this ensured that through the course of Papers 1, 2, and 3, all four of the TAC’s corporate key performance indicators that relate to client
outcomes and experience were assessed in relation to their association with attributions of responsibility for accidents.

Due to the relatively novel nature of Paper 3, challenges associated with its conduct involved the conceptualisation of satisfaction as an outcome rather than its traditional place within the compensation literature as a moderator of outcomes. This distinction involved the pairing together of literature from disparate sources (e.g., medical, legal, rehabilitation and health services literature), much of which tended to view satisfaction and related concepts (e.g., stressful interactions) in dissimilar ways. For example, literature from health services tended to express an understanding of satisfaction as an indicator of service quality, was focused on ‘defining’ satisfaction, and was conscious of the role that patient outcomes had in skewing perceptions of service quality. By contrast, legal and compensation-related research tended to view clients’ perceptions of satisfaction with schemes as a driver of outcomes. It may be that both perspectives are not only valid, but true.

Whilst recent work focusing on the quality of interactions with compensation or health services has generally taken the latter approach, the volume of research into satisfaction appeared to have passed through a significant lull since the mid 1980s. This proved challenging in terms of attempting to ensure that background research and theory included in Paper 3 accounted for contemporary perspectives.

Lastly, the tailoring and placement of Paper 3 for publication also proved challenging. A combination of decades-long absence of focus of satisfaction research in the literature combined with the relatively narrow population under study (MVA survivors insured under a Victorian personal injury compensation scheme) brought some concern that the results would not be broadly applicable to other rehabilitation
or patient populations. Within the manuscript, it was then important to carefully describe the nature of the scheme and its similarities with other motor vehicle and occupational rehabilitation schemes situated within Australia and around the world.
Chapter 7: More than just outcomes: The association between attributions of responsibility for motor vehicle accidents and satisfaction with personal injury compensation schemes.
7.1 Abstract

Objective: Satisfied patients are considered indicative of well-functioning health care schemes and government financial incentives are often linked to satisfaction ratings. Whilst considerable attention has focused on the contribution of individual patient characteristics such as health outcomes to patient satisfaction, the influence of attributions of responsibility for accidents among injured populations has been largely overlooked. This study set out to test the relationship between attributions of responsibility for MVAs and satisfaction with personal injury compensation schemes.

Method: A cross-sectional sample of 1097 people injured in a MVA and insured under a single, personal injury compensation scheme were surveyed. Ratings of satisfaction with the compensation scheme were recorded alongside attributions of responsibility for accidents, physical and mental health outcomes, and additional demographic and accident-related variables.

Results: A Multivariate Analysis of Covariance indicated that attributions of responsibility for accidents were independently associated with satisfaction, above and beyond the influence of mental and physical health outcomes. Persons who did not attribute any responsibility for their accident to themselves were significantly less satisfied with the personal injury compensation scheme than those who attributed responsibility either partially or wholly to themselves.

Conclusion: The association between attributions of responsibility for accidents and patient satisfaction has implications for assessment of service quality. Personal injury compensation schemes or other health services monitoring patient satisfaction among
people injured in MVAs may wish to either adjust for attributions of responsibility for accidents or specifically include it as a variable of interest when assessing satisfaction between time periods, services, and injured populations. Potential mechanisms for observed associations are discussed.
7.2 Introduction

Around the world each year, approximately 1.2 million people are killed and up to 50 million more are injured in MVAs (MVAs)\(^3\). Already the 10\(^{th}\) leading contributor to the global burden of disease, injury from MVAs is on track to become the 5\(^{th}\) leading cause by 2030\(^4\). Whilst the state of Victoria’s adoption of comprehensive no-fault personal injury compensation and associated motivations such schemes consequently have in reducing road trauma is often heralded as contributing to its road safety success story\(^5\), it is still not immune from the burden associated with MVAs and the challenges associated with patients’ successful rehabilitation.

Well-functioning rehabilitation and health care schemes are often distinguished by their association with satisfied patients\(^6,7\). Further, patient satisfaction is often tied to government financial incentives for both hospitals and injury insurers\(^8,9\). As such, satisfaction is regularly assessed as a key measure of organisational performance and considerable effort goes toward ensuring that services are delivered to injured clients in ways that provide for positive interactions\(^1\).

As well as a comparative indication of service quality and function, patient satisfaction has also been considered a benefit in itself. Higher levels of patient satisfaction are associated with positive outcomes such as improved adherence to medical regimens\(^10,11\), reduced likelihood of changing medical providers\(^12\), reduced likelihood of litigation\(^13\), and increased care-seeking from medical professionals rather than lay-people\(^14\). Increasing patient satisfaction therefore appears to benefit both organisations and individuals.

Attempts to improve patient satisfaction among health care, rehabilitation and compensation services are based on the assumption that satisfaction is an
environmentally determined phenomenon, driven primarily by the behaviour and characteristics of services\textsuperscript{15}. Factors assumed to affect patient satisfaction include interpersonal manner, perceived technical competence of staff, accessibility and convenience of organising care (e.g., short waiting times, ease of making appointments), financial arrangements (e.g., coverage of insurance, reasonableness of costs), continuity of care, and efficacy of service\textsuperscript{16}. However, subjective measures of satisfaction do not solely assess the performance of organisations, they are also reflective of patients’ expectations, preferences, prior experiences, and desired levels of care\textsuperscript{16-19}. Because such factors can be outside service providers’ influence, the degree to which services can improve satisfaction may be more limited than is commonly recognized.

Similarly, a wide range of demographic and patient characteristics can also affect patient satisfaction\textsuperscript{18,20}. These include age, gender, socioeconomic status, education\textsuperscript{6,21,22}, mental health status\textsuperscript{23-25}, pain\textsuperscript{26}, depression\textsuperscript{26,27}, and absolute health outcomes after injury or illness\textsuperscript{28}. Therefore, both the individual characteristics patients bring into rehabilitation setting, and the eventual health outcomes they achieve, have considerable influence over their ultimate assessment of satisfaction. This highlights the potential importance of adjusting for case mix when comparing satisfaction ratings over time\textsuperscript{29}.

In assessing the relationship between health outcomes and satisfaction, Kane and Maciejewski\textsuperscript{28} suggested that more goes into satisfaction than just health outcomes, alone. What ‘more’ constitutes, is, however, somewhat unclear as theoretical understanding of patient satisfaction has advanced little in the past two decades. One small area of development relates to injury compensation research. Here, perceptions
of organisational justice following injury, and the quality of patient interaction with injury compensation scheme processes, have emerged as potential areas of interest\textsuperscript{30-36}. However, in contrast to previous work mentioned above, the quality of interaction between patients and services within these studies is viewed as a moderator of recovery rather than an outcome. Whilst pointing to the possibility of more dynamic interactions between satisfaction and health outcomes than have commonly been explored, this does little to enhance our current understanding of the drivers of patient satisfaction.

Within road trauma and injury populations, internal attributions of responsibility for accidents have been shown to have protective effects across PTSD\textsuperscript{37-40}, depression\textsuperscript{41}, and general psychological distress\textsuperscript{42}. Similarly, heightened perceptions of injustice, blame, and anger have been shown among compensable patients and those who attribute responsibility for accidents and injuries to others\textsuperscript{34, 35, 43, 44}. Despite this body of research suggesting that not being responsible for accident or injuries may lead to interactions with service providers more likely to be viewed as unjust, attributions of responsibility have been absent from previous assessment of factors associated with patient satisfaction\textsuperscript{17, 20, 26, 45-47}. If there is indeed ‘more’ contributing to patient satisfaction than service and outcomes\textsuperscript{26}, attributions of responsibility for accidents may play a significant role. Attributions of responsibility may drive satisfaction even in circumstances where accessibility of health care services and support is largely indistinguishable, as is the case for individuals accessing no-fault injury compensation benefits.

The aim of this study was to assess whether attributions of responsibility for MVAs contributes to the prediction of satisfaction, over and above health outcomes, among
clients who have received benefits within a personal injury compensation scheme\textsuperscript{48}. It was hypothesized that after controlling for physical health outcomes, mental health outcomes, compensation claim duration, age, and gender, people who did not attribute responsibility for their accident to themselves would be less satisfied with the personal injury compensation scheme than those who attributed responsibility to themselves. In doing so, the aim was to highlight both the role of attributions of responsibility in affecting patient satisfaction, and the potential importance of adjusting for case mix when assessing levels of satisfaction within compensation schemes.
7.3 Method

7.3.1 Data Collection:

Data were extracted from a de-identified dataset consisting of 1394 persons who had been injured in a MVA and were compensated by the Victorian Transport Accident Commission (TAC) (the scheme) in the state of Victoria, Australia. The TAC is a State Government-owned enterprise that provides no-fault personal injury and restricted common-law insurance benefits to all persons injured as a result of a MVA in the state of Victoria, Australia.

People who receive benefits under the TAC’s 'no-fault' personal injury insurance have access to ambulance cover, hospital treatment, medical services, allied health services, occupational rehabilitation, pharmaceuticals, loss of earnings payments for time taken away from work, and a wide range of other assistance including lump-sum payments for ongoing disability\(^49\). In addition, persons considered 'not-at-fault' in their accident who suffer serious injuries have recourse to additional lump-sum payments through the pursuit of common-law (tort) cases\(^48\).

The physical and mental health rehabilitation services available to both 'at-fault' and 'not-at-fault' clients through the TAC are virtually identical and are considered among the most generous in Australia\(^50\). Where any differences do exist between 'at-fault' and 'not-at-fault' parties (i.e., reduced access to compensation for drink-drivers), they favour 'not-at-fault' parties through removal of ‘contributory negligence’ provisions and access to common-law\(^5\). The TAC operates similarly to personal injury compensation schemes operating in New Zealand, Canada and many jurisdictions within the United States\(^5, 51\).
Ethics approval for this research was granted by the human research and ethics committees of Deakin University (2012-234) and the equivalent body within the TAC.

7.3.2 Participants

Participants were deemed by the scheme at the time of recruitment to be either currently ‘active’ (i.e., had received payment for medical services in the past 6 months) or had been ‘inactive’ for a period of 25 months or less. Participants were excluded from the study if they had suffered catastrophic injuries as deemed by the scheme, were dependents of deceased accident victims, had previously indicated to the scheme that they did not want to participate in research programs, were multiple family members of other persons in the sample populations, were persons whose accident anniversary occurred two weeks either side of the potential interview period, were employees of the compensation scheme, or were excluded due to any other reason as deemed appropriate by the scheme such as interviewee burden or sensitivity.

7.3.3 Procedures

Potential participants eligible for inclusion in the study (approximately 3500 persons) received a hard-copy letter from the scheme describing the research, voluntariness of participation, likely period of interview and time commitment requested. At this stage, participants had a two-week period in which they could contact the scheme’s client research department and withdraw consent for participation. Once this initial consent was complete, a contracted research company conducted the survey with trained interviewers familiar with the research population and under the supervision of the scheme representatives via Computer Assisted Telephone Interview.
Participants were free to withdraw consent for participation at any stage through the initial contact or interview process. Interviews were conducted over a four-week period between the hours of 10am and 8pm. The average interview length was 25 minutes.

7.3.4 Measures

*Short-Form-12 Health Survey, Version 2*

General physical and mental health status were measured using the Short-Form-12 Health Survey, Version 2 (SF-12 V2)\(^52\). Higher Mental health Composite (MCS) and Physical health Composite (PCS) scores on the SF-12 V2 are indicative of more positive mental and physical health, respectively. The SF-12 V2 has been shown to be a reliable measure relative to the SF-36 in the general population\(^52\) and has been used in multiple trauma studies with comparable populationse.g., \(^53\).

7.3.4.1 Attributions of responsibility for the accident

Participants were asked to answer whether they believed they were ‘totally responsible’, ‘partially responsible’, or ‘not responsible at all’ for their accident. This was a similar methodology to that used in previous studies \(^38, 39, 42\).

7.3.4.2 Satisfaction with the scheme

Satisfaction with the compensation scheme was measured using five variables rated on a scale from 1 to 10. Participants were asked to consider: ‘How satisfied are you on a scale of 1 to 10 with 1 being the least satisfied and 10 being the most satisfied with the way the scheme ‘resolves your issues’, ‘keeps you up to date’, ‘treats you as an individual’, and ‘cares about you’. Finally, participants were asked to respond to the question, ‘Overall, how satisfied are you with the scheme on a scale of 1 to 10 with 1 being least satisfied and 10 being the most satisfied you could possibly be?’.
This scale has been in use by the Transport Accident Commission to assess satisfaction among its client base since 2000, with results forming one of three corporate key performance indicators.

7.3.4.3 Demographic, vehicle and claim information
Demographic information was collected for each respondent, including gender, age, and claim duration, which is a claim administration variable that closely approximates time since accident.

7.3.5 Statistical Analysis
To determine the association between attributions of responsibility for accidents and satisfaction with compensation services, a Multivariate Analysis of Covariance (MANCOVA) was undertaken with five dependent variables (overall satisfaction, kept up to date, resolved issues, cares about me, treats me as an individual) and the three independent variables of responsibility for accident, MCS score quartiles, and PCS score quartiles. To adjust for the influence of age, gender, and time since accident, these were entered as covariates into the model. Planned post-hoc tests (Fischer’s LSD) were then undertaken to assess differences between groups on levels of satisfaction with the compensation scheme. Eta-squared ($\eta^2$) statistics were calculated in order to provide effect size estimates of these differences.
7.4 Results

After screening for missing data and univariate outliers, a total of 297 participants were excluded, leaving a total of 1097 available for analysis. Table 7-i shows basic demographic and claim duration statistics for the sample population.

Table 7-i. Descriptive statistics associated with age, gender and duration of claim for all participants.

<table>
<thead>
<tr>
<th>Gender</th>
<th>%</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>62.7%</td>
<td>688</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>37.3%</td>
<td>409</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-12months</td>
<td>29.1%</td>
<td>319</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-24months</td>
<td>32.2%</td>
<td>353</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-36months</td>
<td>19.1%</td>
<td>209</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37+months</td>
<td>19.7%</td>
<td>216</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment of differences between included and excluded participants showed no significant differences between groups on variables under study, with the exception that those excluded from analysis were, on average, marginally older ($\mu = 46.5$ years, $\sigma = 16.7$) than included participants ($\mu = 42.3$ years, $\sigma = 14.9$) ($p<.05$).

Observing Pillai’s trace criteria, results demonstrated a significant multivariate effect for attributions of responsibility for accident across the combined satisfaction-related variables ($F(10, 2084) = 3.7, p<.001, \eta^2 = .02$) indicating that attributions of responsibility were independently associated with satisfaction with the compensation scheme. Between-subject effects demonstrated significant associations between attributions of responsibility and all satisfaction-related variables under study, including; overall satisfaction with the scheme ($F(2, 1095) = 14.90, p<.001, \eta^2$
rating of how the scheme resolves issues \( (F(2, 1095) = 11.41, p<.001, \eta^2 = .02)\); rating of how the scheme keeps the patient up to date \( (F(2, 1095) = 7.07, p<.01, \eta^2 = .01)\); rating of whether the patient believes the scheme treats them as an individual \( (F(2, 1095 = 8.54, p<.001, \eta^2 = .02)\), and; rating of whether the scheme cares about them \( (F(2, 1095) = 8.97, p<.001, \eta^2 = .02)\).

A series of post-hoc tests (Fisher’s LSD) revealed the direction of effects between levels of attributions of responsibility and satisfaction (see Table 7-ii). This showed that persons who did not attribute responsibility for their accident to themselves for accidents reported lower ratings of overall satisfaction, resolution of issues, being kept up-to-date, being treated as an individual, and ratings of whether patients believed the scheme cared about them in comparison to those who reported being totally responsible for their accident \( (p<.001)\). Linear trends were observed between level of responsibility and estimates of individual elements of patient satisfaction indicating that satisfaction with the compensation scheme increased with increasing internal attributions of responsibility for accidents (see Figure 7-i).
Table 7-ii. Estimates of satisfaction elements associated with levels of attributions of responsibility for accidents.

<table>
<thead>
<tr>
<th></th>
<th>Totally Responsible</th>
<th>Partially Responsible</th>
<th>Not Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheme resolves your issues</td>
<td>Mean 8.03&lt;sub&gt;c&lt;/sub&gt;</td>
<td>7.66&lt;sub&gt;c&lt;/sub&gt;</td>
<td>7.08&lt;sub&gt;a,b&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>SE 0.20</td>
<td>0.18</td>
<td>0.10</td>
</tr>
<tr>
<td>Scheme keeps you up-to-date</td>
<td>Mean 7.84&lt;sub&gt;b,c&lt;/sub&gt;</td>
<td>7.18&lt;sub&gt;a&lt;/sub&gt;</td>
<td>6.94&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>SE 0.22</td>
<td>0.19</td>
<td>0.10</td>
</tr>
<tr>
<td>Scheme treats you as an individual</td>
<td>Mean 8.10&lt;sub&gt;c&lt;/sub&gt;</td>
<td>7.69&lt;sub&gt;c&lt;/sub&gt;</td>
<td>7.20&lt;sub&gt;a,b&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>SE 0.21</td>
<td>0.19</td>
<td>0.10</td>
</tr>
<tr>
<td>Scheme cares about you</td>
<td>Mean 7.74&lt;sub&gt;b,c&lt;/sub&gt;</td>
<td>7.08&lt;sub&gt;c&lt;/sub&gt;</td>
<td>6.68&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>SE 0.23</td>
<td>0.21</td>
<td>0.11</td>
</tr>
<tr>
<td>Overall satisfaction with scheme</td>
<td>Mean 8.21&lt;sub&gt;b,c&lt;/sub&gt;</td>
<td>7.46&lt;sub&gt;a,c&lt;/sub&gt;</td>
<td>6.98&lt;sub&gt;a,b&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>SE 0.21</td>
<td>0.19</td>
<td>0.10</td>
</tr>
</tbody>
</table>

*Note:* Values in the same row not sharing the same subscript are significantly different at p< .05 level.

Figure 7-i. Estimates of satisfaction elements associated with levels of attributions of responsibility for accidents.
Significant multivariate effects were also observed for SF-12 PCS ($F(15, 2877) = 1.7, p<.05, \eta^2 = .01$) and SF-12 MCS quartile groups ($F(15, 2877) = 1.7, p<.05, \eta^2 = .01$), indicating that both mental and physical health status were independently associated with levels of satisfaction after controlling for age, gender, and duration of claim. Consistent with previous research, post-hoc tests showed a positive association between both MCS and PCS scores and satisfaction, with higher health outcome scores associated with higher levels of satisfaction (see Figures 7-ii and 7-iii). Duration of claim was the only covariate to record a multivariate effect ($F(5, 1042) = 7.0, p<.001, \eta^2 = .03$) with descriptive data showing that shorter claim durations were associated with higher levels of satisfaction. No significant multivariate interaction effects were observed between independent variables.

Figure 7-ii. Estimates of satisfaction elements associated with SF-12 V2 PCS quartile groups.
Figure 7-iii. Estimates of satisfaction elements associated with SF-12 V2 MCS quartile groups.
7.5 Discussion

The aim of this study was to determine whether perceptions of responsibility for accidents were independently associated with satisfaction with services provided by personal injury compensation schemes above and beyond the effect of health outcomes and demographic differences. Results supported our hypothesis in that, after controlling for mental and physical health status, age, gender, and duration of claim, people who did not attribute any responsibility for their accident to themselves were significantly less satisfied, overall, with the injury compensation scheme than those who attributed responsibility either partially or completely to themselves. This finding is novel because to the authors’ knowledge, no previous investigation has considered the role of attributions of responsibility for accidents or injury on perceptions of satisfaction with injury compensation or other health services within the broader rehabilitation scheme.

The compensation and rehabilitation resources available to both 'at-fault' and 'not-at-fault' clients within the scheme is virtually identical. Where differences do exist between ‘at-fault’ and 'not-at-fault' parties, they favour the 'not-at-fault' party. It is therefore curious that despite these relative advantages at both a within and between-scheme level, persons who did not attribute responsibility for their accident to themselves remain less satisfied with the support they receive. This is particularly intriguing given that the differences observed between levels of responsibility are independent of injury severity groups and health outcomes.

These findings are important from both an applied and theoretical perspective for the conceptualisation and study of patient satisfaction among injury compensation and rehabilitation service providers. From an applied perspective, they highlight that
factors associated with satisfaction among clients of injury compensation schemes are not wholly under the control of the service provider. Services seeking to measure the quality and function of the services they deliver are met by a case mix that may vary in relation to the degree in which clients attribute responsibility for injury or illness to themselves or others. It is plausible that two services delivering identical care to separate groups of patients for whom the genesis of their ailment is either internally or externally attributable could provide considerable differences in their mean ratings of satisfaction. Without adjusting for case mix between the two services, satisfaction results (and hence perceptions of service quality) may not provide an accurate reflection of differences in service quality. Similarly, compensation or health services that monitor satisfaction over time, but do not adjust for case mix, may misconstrue the true nature of observed changes in satisfaction ratings between periods.

Adjusting for case mix may be particularly important in injury compensation services where the changing popularity of transport modes over time (e.g., cars, cycling, walking, motorcycles) produces differences in the circumstances under which ‘average’ compensable injuries occur. For example, between 2008 and 2013 there was a 31% increase in motorcycle registrations within Australia, a more rapid increase than of any other vehicle type. A large proportion of motorcyclists are involved in single-vehicle ‘run-off road’ accidents and hence, may more likely attribute responsibility for accidents to themselves. If recent trends of increased mode share by motorcycles translates into increased proportional representation of motorcyclists within injured populations, it could conceivably affect levels of satisfaction within the compensations scheme, leading them to be higher than they may otherwise have been.

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For injury compensation schemes, these findings also support the assumption that even among people receiving no-fault compensation benefits where differences between access to medical care or services between ‘at-fault’ and ‘not-at-fault’ groups are minimal, attributions of responsibility may still play an important role in contributing to individuals’ perceptions of service quality. Although unmeasured in this study, this may add weight to themes relating to perceptions of injustice, blame, and anger noted previously\textsuperscript{34, 35, 41, 43, 44} that may contribute to decreased levels of satisfaction among not-responsible injured persons. It is a limitation of this study that this was not able to be explored. Further limitations that must be acknowledged relate to the degree to which findings are transferrable to populations other than those injured in MVAs (e.g., workplace accidents, assaults, sporting injuries). Future research may wish to explore the effect of attributions of responsibility on recovery among individuals injured under alternative circumstances to determine whether outcomes are stable across groups.

A proposed model linking the concepts of attribution theory, outcomes and patient satisfaction was forwarded by Strasser et al.\textsuperscript{15}. Their model proposed that patients who made various internal or external attributions relating to the success (or failure) of their recovery would be more (or less) or less satisfied with the health services they received. Where recovery was poor they suggested that satisfaction with health care providers would also be poor based on patients’ internal (e.g., health care provider was lazy / incompetent) or external (e.g., health care provider tried hard / did all they could) attributions of the provider’s actions. Similarly, in the case of positive recoveries, satisfaction would be contingent upon internal (e.g., provider worked hard / was clever) versus external (e.g., provider was lucky / patient would have recovered anyway) attributions made about the provider’s actions.
In an extension of Strasser et al.’s model, it is proposed that the effect of attributions of responsibility for accidents may contribute to the attribution of responsibility for recovery to either oneself or the compensation / health care provider. Where injured persons are not responsible for their accidents or injuries, they may more likely place the responsibility of recovery on external parties (i.e., to the compensation scheme or health service) whose role it becomes to make good on the wrong that has beset the individual (i.e., to compensate them). When recovery is good (success condition), the compensation scheme is then credited with the results of care (internal provider attributions) and satisfaction is more positive. However, when recovery is poor, attributions of responsibility for recovery placed on the compensation scheme or health service contributes to higher rates of dissatisfaction. This is because the scheme is considered responsible for the individual’s failure to recover (failure condition). A representation of this proposed framework is presented in Figure 7-iv.
If attribution A or C, value judgement will be more negative. If attribution A or C, value judgement will be more negative.

Figure 7-iv. Representation of a theoretical model extending that of Strasser et al. (1993) to incorporate the influence of attributions of responsibility for accidents, injury or illness on satisfaction with services.
7.5.1 Conclusions

Attributions of responsibility for accidents are independently associated with satisfaction with personal injury compensations schemes among people injured in MVAs. This effect is independent of mental and physical health outcomes, age, gender, and elapsed time since accident. Even within personal injury compensation schemes where access to benefits and resources to assist one’s rehabilitation are largely indistinguishable or may even favour ‘not-at-fault’ parties, persons who did not attribute responsibility for their accident to themselves demonstrate lower levels of patient satisfaction than those who attribute responsibility either partially or wholly to themselves. It is possible that the mechanism for this association is through attribution of responsibility’s influence on provider attributions for recovery. Compensation schemes, rehabilitation providers or other health services attempting to monitor patient satisfaction may wish to adjust for attribution case mix, or specifically include measures of attributions of responsibility for accidents and injuries when assessing results over time or when attempting to compare performance between services or injured populations. Future research may wish to control for the effect of attributions of responsibility for accident or injury when assessing satisfaction or quality of interactions between patients and compensation schemes.
7.6 References


30. Franche, R.L. and N. Krause, *Readiness for return to work following injury or illness: conceptualizing the interpersonal impact of health care,* PhD Dissertation – Deakin University School of Medicine


PhD Dissertation – Deakin University School of Medicine


Chapter 8: Discussion
8.1 About this chapter

This chapter serves to summarise the findings of the preceding chapters and discuss their contribution to our knowledge regarding the effect of attributions of responsibility on recovery among people injured in MVAs. It will summarise the findings of the research, provide linking rationale for their conduct, discuss the strengths and weaknesses of the research methodology, consider directions for future work, and highlight the implications of this work for no-fault compensation schemes and rehabilitation efforts more generally.
8.2 Summary of findings

This series of papers was undertaken to assess the extent to which attributions of responsibility contribute to physical health outcomes, mental health outcomes, RTW outcomes, and patient satisfaction among people injured in MVAs and compensated under a no-fault personal injury insurance scheme. Across nearly all variables under study, results showed that people who did not attribute responsibility for their accident to themselves had poorer outcomes than those who attributed responsibility either partially or wholly to themselves. In addition to contributing new knowledge to the field of post-injury rehabilitation and compensation outcomes, the aim of these studies was to provide insight into aspects of injured populations that would be immediately relevant to the work of compensation schemes, including the Victorian Transport Accident Commission (TAC) from which data used within the studies was drawn. The series was broken into three separate studies focused on the impact of attribution of responsibility on (1) mental and physical health outcomes, (2) return to work and symptoms of depression, and (3) satisfaction with the compensation scheme.

The initial study was configured to set the groundwork for the series as a whole. Although the effect of attributions of responsibility for accidents on post-accident recovery had been explored to a limited extent in previous work, its comparative influence over and above demographic or other accident-related information had not been specifically investigated. In particular, little was known about its influence when considered alongside other variables likely only to have been at the time of (rather than post) accident. The decision to only include variables likely to be known at the time of accident by compensation schemes was considered vitally important.
from a research translation perspective. Although more detailed psychological or physical assessment of patients may have yielded more detailed (and potentially mechanistic) results than those presented here, such detail is currently beyond the ability of most compensation schemes to implement for both practical and legislative reasons.

Utilising a structural equation modelling approach, results of Paper 1 showed that attributions of responsibility for accidents were more strongly associated with post-accident mental health than any other demographic or accident-related variable under study, accounting for 35% of variance in mental health outcomes. Consideration of all demographic and claim-related variables showing direct associations with mental health outcomes, more positive mental health outcomes were associated with vulnerable road user status (e.g., being a cyclist, pedestrian or motorcyclist), being employed at the time of accident, being male, having a shorter claim duration, and higher levels of education. Through the mediating role of mental health, attributions of responsibility for accidents were also indirectly associated with physical health outcomes, accounting for 19% of the variance in physical health status and greater than the direct effect of any remaining variable in the model. The direction of effects between demographic and claim-related variables and physical health showed that better physical health outcomes were associated with younger age, female gender, and higher levels of education.

These results highlighted that people who did not attribute responsibility for their accident to themselves were more likely to experience poorer post-injury mental and physical health outcomes than those who attributed responsibility either partially or completely to themselves. This appears to be true even within no-fault schemes.
where access to post-accident medical services between ‘at-fault’ and ‘not-at-fault’ patients are virtually indistinguishable.

Following the establishment of attributions of responsibility’s direct association with mental health outcomes and indirect association with physical health outcomes in Paper 1, a study exploring attribution of responsibility’s association with return to work outcomes was then conducted. The aim of this study was to test the mediation / moderation role of mental health (depressive symptoms) in the association between attributions of responsibility for accidents and likelihood of having returned to work. To conduct this study, data was analysed separately from two cross-sectional surveys conducted 12 months apart. The second of these surveys contained a sub-set of participants from Time 1 and included additional, more robust, measures of depression.

Although study 2 in Paper 2 was methodologically similar to that undertaken in study 1, its conduct was considered important as it reinforced the results obtained in study 1 at follow-up and demonstrated the practical utility of a single-item measure of depression as it might conceivably be used in a real-world compensation setting.

Results of Paper 2 showed that depressive symptoms mediated the relationship between attributions of responsibility for accidents and the likelihood of having returned to work at follow-up. Patterns at both Time 1 and Time 2 using different measures of depression were similar. People who did not attribute responsibility for their accident to themselves were around 3 times more likely to exhibit symptoms of depression than those who attributed responsibility for accidents to themselves. In turn, people with symptoms of depression were approximately 3.5 times less likely to have returned to work at follow-up that those who were asymptomatic.
These results again showed that even within no-fault compensation schemes where access to benefits and services is similar, attributions of responsibility were strongly associated with mental health outcomes (in this case, depressive symptoms) and consequently, indirectly associated with rates of return to work.

Whilst much has been made in the literature of the relationship between health outcomes and patient satisfaction, prior research had not explored the relative influence of attributions of responsibility on satisfaction. As such, the third paper of this series (Paper 3) sought to understand the association between attributions of responsibility for accidents and satisfaction with services delivered by the personal injury compensation scheme over and above that contributed by mental and physical health outcomes.

A multivariate analysis of covariance showed that after controlling for standard demographic factors of age, gender and duration of claim, attributions of responsibility for accidents made a significant independent contribution to the prediction of levels of patient satisfaction with the personal injury compensation scheme. Consistent with results obtained in Papers 1 and 2, injured persons who did not attribute responsibility for their accident to themselves reported significantly lower levels of satisfaction with the compensation scheme in comparison to those who attributed responsibility either partially or completely to themselves. Across the five satisfaction variables under study, there was an approximate 1 point difference (out of a possible 10) between mean satisfaction scores of the ‘not responsible at all’ and ‘totally responsible’ groups. The trend appeared to be linear, with participants who reported being ‘partially responsible’ for their accident falling midway between these groups when asked to rate their levels of satisfaction with the scheme.
8.3 Implications of the findings

Up to 50 million people are injured in road accidents around the world each year. Road trauma now represents the 10th leading cause of disability worldwide and is a considerable, burgeoning public health issue\(^1\). This series of studies has demonstrated the important role that cognitive appraisals associated with attributions of responsibility for MVAs play in recovery among road trauma survivors.

To the expressed frustration of some clinicians, relatively little is understood about the recovery process of road trauma populations. This is due to an unfortunate combination of social indifference\(^2\), neglect of road trauma as a public health concern\(^3\), \(^4\), and practical difficulty in studying this population\(^5\), \(^6\). Significant controversy also exists about the role of compensation in helping or hindering recovery after injury, much of which is also driven by methodological differences between samples, conflicts of interest among stakeholders\(^7\), and the definition of compensation itself\(^8\). Each paper in this series has recognised such shortcomings and contributed new knowledge about recovery among road trauma survivors, benefiting researchers and practitioners.

This series significantly advances research in health and rehabilitation psychology by capturing information from a large sample of road trauma survivors compensated under a single, no-fault personal injury compensation scheme. The findings can assist researchers, rehabilitation clinicians, personal injury insurers, and compensation schemes to understand the association between cognitive appraisals made as a result of accident circumstances and the effect these have on physical and mental health outcomes, functional recovery, and satisfaction with compensation services. Given
its basis in a practical setting, it also has immediate relevance for the translation of science into practice.

**8.3.1 Implications – Paper 1**

Implications drawn from Paper 1 are that attributions of responsibility for accidents may be central to understanding both within and between group differences in compensable populations. Research into the effects of compensation on health outcomes has generally compared ‘compensable’ and ‘non-compensable’ groups without discerning between individuals and the varying attributions of responsibility for accidents they have for their road accident. Although limited prior research has alluded to the potential importance of attributions and related themes, this methodological oversight resulted in the majority of prior literature controlling only for standard demographic and injury-related variables when attempting to predict recovery.

Practically, the implications for the results of Paper 1 are that a relatively limited set of predictors known at claim lodgement, including attributions of responsibility for accidents, are likely to prove useful in identifying persons injured in motor vehicle accidents who are at greater risk of experiencing poor outcomes. This knowledge can assist in the efficient triage of clients into claims management pathways that may best be suited to speedy recovery. Compensation schemes such as the TAC are large-scale personal injury insurers. As such, there is much emphasis placed on attempting to decrease claim durations as this has a direct bearing on financial liabilities whether through hospital stays, medical or loss of earnings payments. Preliminary findings presented here have already had a significant effect on procedures of the TAC. The recognition of attributions of responsibility for accidents as an important factor
driving outcomes has seen its incorporation into regular market segmentation and screening operations, assisting the efficiency of claims handling processes and ensuring that greater resources are at the ready to assist persons more likely to have delayed or prolonged recoveries. Prior to recognition of its importance and association with health outcomes, the routine collection of information relating to attributions of responsibility for accidents was not regarded as necessary because it was not of administrative relevance to the TAC’s administration of ‘no-fault’ benefits.

8.3.2 Implications – Paper 2

The implications of Paper 2 are that attributions of responsibility for accidents are strongly associated with mental health outcomes, this time in the form of depressive symptoms. Researchers may wish to control for attributions of responsibility in future work that considers the mental health outcomes of persons injured in motor accidents or compensable populations. Further, given their indirect association with likelihood of return to work through the mediating factor of depression, consideration of the influence of attributions of responsibility for accidents in occupational rehabilitation or return to work studies may be advisable within future study designs.

For practitioners, these results demonstrate that following MVAs, poor mental health recovery is likely to be a significant barrier to successfully returning to work. In particular, this barrier is also more likely to be present among people who report not being responsible for their accident. This knowledge can assist practitioners and personal injury insurers to ensure that not only physical workplace issues are addressed in assisting injured persons return to work, but that sufficient attention is
placed on addressing underlying mental health issues that may be precluding successful occupational rehabilitation.

8.3.3 Implications – Paper 3

Implications contained within Paper 3 are that attributions of responsibility for accidents should potentially be specifically included or controlled for in assessments of compensation service quality or satisfaction. Without such measures, it remains unknown whether differences in satisfaction observed between groups, services, or over time periods are in part associated with differing levels of responsibility for accidents between samples.

Due to the regular and important assessment of client satisfaction among compensable populations by the TAC and similar personal injury compensation and/or health services, these findings have immediate implications for both the practice of satisfaction monitoring and its interpretation. Furthermore, given the dynamic nature of accident populations over time with changing levels of technological or economic development, they indicate that vehicle fleets that give rise to various proportions of ‘responsible’ or ‘not responsible’ operators may generate samples that are more or less likely to be satisfied with injury compensation services they receive. Such changes may be beyond the ability of the service to influence but not beyond their ability to understand and account for.
8.4 Study limitations

Accessing participants through the TAC had advantages and disadvantages for the study design. Whilst the representativeness of the sample as a reflection of claims under management was excellent, the number of participants available was large, and the range of items able to be asked of clients was comprehensive, limitations existed. These related to the contest between objectives of the survey instrument for the TAC’s internal purposes and those of a more theoretical or scientific nature. The TAC is rightfully aware of the responsibility it has for the welfare of its client base. As such, potential participant burden limited the introduction of standardised questionnaires with a comprehensive battery of items (e.g., relating to PTSD symptoms, cognitive frameworks) that were viewed as potentially challenging for TAC clients and contracted interviewers conducting the survey. In turn, this limited detailed exploration of mechanisms underlying the associations between attributions of responsibility for accidents and outcomes.

The samples used in this series of studies were originally stratified by claim duration and rehabilitation management teams within the TAC. While this methodology produced a sample representative of claims under management, it is unlikely to be representative of the entire population of TAC claims. For instance, many clients who are classified as ‘emergency expenses only’ are not monitored by the TAC. This group of clients generally include those not physically injured, who are transported to hospital for precautionary purposes only, do not receive treatment, and are released from care on the same day as their accident. Despite the low level of service they receive, similar groups in like schemes have demonstrated poor outcomes and therefore, may also warrant attention especially in relation to later psychological

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recovery. Additionally, given that this study was conducted among a sample who were primarily from a single state in Australia and received services from a single no-fault compensation provider, there is some question as to the extent to which these results can be generalised to alternate legal or geographic jurisdictions.

A further limitation of the extent to which this sample can be regarded as representative of the total population of injured clients relates to the extent of initial sample screening undertaken by the scheme in order to produce the ‘potential’ sample of participants (see Section 1.5.3). This screening process likely had the effect of removing a relatively small number of clients who were currently extremely unwell or adversarial, but also a large number of those whose post-injury interaction with the TAC was minimal (Emergency Expenses Only clients).

Although all participants within the study were compensated under a no-fault framework, the researchers did not have access to information about whether clients had made common law claims. It is conceivable that some ‘not-at-fault’ clients may have instigated common-law action prior to interview. Given the ‘serious injury’ thresholds associated with common law applications\(^{11, 12}\), it is likely that such clients would be more likely to have ‘severe’ or ‘other’ injuries as defined by TAC protocols and described in this series. Future research may wish to either control for this potential issue or specifically include common law processes as a means of assessing their impact on outcome measures.

Conclusions that may be drawn from the follow-up element of study 2 within Paper 2 are limited by the fact that it was conducted with clients who agreed to participate in a cross-sectional design 12 months earlier (Time 1). Therefore, participants involved in this study were at various stages of their recovery process at Time 1 and Time 2.
and had a wide range of claim durations. Indeed, a significant proportion of clients had already recovered at their initial interview and were no longer receiving benefits or rehabilitation support from their insurer. Ideally, each client would have been monitored at a consistent point (e.g., 3 months, 6 months, 12 months) post-accident.

Study participants who provided ‘missing’ scores on scales such as the SF-12 V2, depression sub-scale of the DASS-21, and other outcome measures demonstrated generally poorer health and RTW outcomes than those with complete records. Given the large number of clients in the sample, a decision not to impute missing scores was taken. This also ensured that methodologies undertaken within each paper were consistent with those applied in internal TAC research practices. Although not considered here, this non-random effect has implications for the accuracy of overall population health measures. Future studies should continue to ensure that as many clients as possible complete all items and scales. Changes to the manner in which missing data or items from within scales are handled may also assist the capture of information from clients that is currently lost, without invalidating results.

Although it was assumed that clients’ attributions of responsibility for their accident would be a relatively stable variable from the point of claim lodgement onward, there remains the possibility that it may not be stable for some individuals. Conceivably, changes to individuals’ perceptions of their extent of responsibility may change in the face of police data or other eyewitness accounts encountered during potential legal proceedings, etc. Within the current design, there was no opportunity to test potential changes in self-reported attributions of responsibility over time.

Similarly, this series of studies is not free from the issue of observer dependence. It is possible that other confounding factors either not able to be observed or not

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accounted for within this series (e.g., personality variables, pre-existing mental health issues) contribute to the documented associations between variables.

Finally, the general cross-sectional nature of the study design across all three papers also limited interpretation somewhat, as although directional effects can be theorised, they were unable to be tested within this framework.
8.5 Directions for future research

The field of rehabilitation research is one of monitoring progress and recovery processes among individuals that are often ongoing over long temporal periods. Furthermore, they occur in the midst of complex and dynamic relationships between patients, health care providers, compensation schemes, legal professionals, legislators, rehabilitation coordinators, spouses, workplaces, families and a host of other potential stakeholders. Despite this complexity, academic literature relating to rehabilitation and recovery is most often conducted within directional, linear frameworks where interference from extraneous variables is sought to be minimised. Traditional investigative frameworks that attempt to conduct ‘genuine’ experiments\textsuperscript{6} and ‘evidenced-based medicine’\textsuperscript{16}, however, may be inadequate for providing an overall picture of the various forces and influences affecting successful recovery from injury.

Whilst the limitations of cross-sectional versus longitudinal designs on interpretation of findings are well recognised within rehabilitation research\textsuperscript{17}, limitations associated with linear, rather than dynamic modelling processes are less well understood\textsuperscript{18}. Even within some of the more advanced theoretical and longitudinal literature that attempts to explicate complex associations between predictors and outcomes presented here\textsuperscript{19, 20}, searches of the literature reveal no studies dealing with the potential influence of feedback mechanisms in rehabilitation settings over time or between variables within their designs. Neither do such searches reveal the development of dynamic theoretical models based on meta-analyses of existing research.
This limitation in scope is not only due to methodological restrictions in common applications traditionally used to test relationships in the social and medical sciences (e.g., linear statistical procedures used in common statistical packages), but because the complex nature of ‘systems-level’ thinking is both conceptually difficult to grasp and counter to the dominant reductionist view held within medicine\textsuperscript{16}, which seeks to explain outcomes in terms of specific causative events. The danger in an increasingly reductionist approach (the antithesis to a holistic approach) is that it actively ignores the behaviour of the individual at a systems-level. Just as a virus’s effect on a population cannot be fully understood by viewing it under a microscope, it can not be expected that studying single factors and outcomes among rehabilitation populations outside the context of the remainder of their complex lives will necessarily yield practical benefit or understanding.

Although relatively little is known about complex systems analysis within rehabilitation and psychological literature, it is gaining ground in numerous other fields\textsuperscript{21-23} that deal with systems arguably as intricate as those confronting health, rehabilitation, and compensation. Future research may wish to explore theoretical understandings of rehabilitation processes through complex systems analysis and agent-based modeling techniques that allow more dynamic interactions between variables to be played out over time and which consider emergent behaviour generated through the aggregation of interactions and exchanges that occur at a micro-level. Not only could such techniques consider individual recovery scenarios and cognitive frameworks, but may they also enable compensation schemes to trial various simulated treatment or rehabilitation management scenarios to estimate effects on overall compensation scheme performance.
Overall, research within rehabilitation and compensation currently occurs within frameworks that are not amenable to appreciating the multiple, complex factors that affect people recovering from injury. The literature presented in this series of studies contributes just one (albeit important) facet of the overall picture that faces rehabilitation professionals and policy-makers attempting to design compensation schemes that optimise outcomes for clients. The next step-change in improving management, practice and outcomes in compensation and rehabilitation for people injured in MVAs may not come from additional observational studies such as those presented here, but from the experimental analysis of dynamic incentives and information exchanges that occur between clients and other influential agents operating within complex rehabilitation environments.

Structural incentives (perverse or otherwise) have already been shown to have a large impact on the behaviour of injured persons and the outcomes produced by compensation schemes\textsuperscript{6,24}. Combined with an appreciation of psychological responses to accident circumstances, the pursuit of new methodological techniques that embrace complexity and reduce reliance upon methodological and statistical reductionism\textsuperscript{16} may provide considerable gains in our understanding of how injury compensation schemes may be best designed into the future.
8.6 References


7. Editor, Half-truths, personal attacks, and innuendo cloud debate over recovery from whiplash injuries, in The Back Letter. 2000, Lippincott, Williams & Wilkins. p. 85,92&hyphen;94.


## Appendix A. AUTHORSHIP STATEMENT

Details of publication and executive author

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Jason Thompson conceived of the project, designed the methodology, undertook all data analysis, drafted the manuscript and revised it for content.

*I declare that the above is an accurate description of my contribution to this paper, and the contributions of other authors are as described below.*

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<td><a href="mailto:jason.thompson@monash.edu">jason.thompson@monash.edu</a></td>
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2. Inclusion of publication in a thesis

<table>
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<th>Is it intended to include this publication in a higher degree by research (HDR) thesis?</th>
<th>Yes</th>
<th>If Yes, please complete Section 3 If No, go straight to Section 4.</th>
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3. HDR thesis author’s declaration

<table>
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<tr>
<th>Name of HDR thesis author if different from above. (If the same, write “as above”)</th>
<th>School/Institute/Division if based at Deakin</th>
<th>Thesis title</th>
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</table>

If there are multiple authors, give a full description of HDR thesis author’s contribution to the publication (for example, how much did you contribute to the conception of the project, the design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)

Jason Thompson conceived of the project, designed the methodology, undertook all data analysis, drafted the manuscript and revised it for content.

I declare that the above is an accurate description of my contribution to this paper, and the contributions of other authors are as described below.

<table>
<thead>
<tr>
<th>Signature and date</th>
<th>15/5/2014</th>
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</thead>
</table>

[Signature Redacted by Library]

4. Description of all author contributions

<table>
<thead>
<tr>
<th>Name and affiliation of author</th>
<th>Contribution(s) (for example, conception of the project, design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael Berk</td>
<td>Methodological input, intellectual content, contribution to draft revision.</td>
</tr>
<tr>
<td>Meaghan O’Donnell</td>
<td>Methodological input, intellectual content, contribution to draft revision.</td>
</tr>
<tr>
<td>Lesley Stafford</td>
<td>Methodological input, intellectual content, contribution to draft revision.</td>
</tr>
</tbody>
</table>

PhD Dissertation – Deakin University School of Medicine
| Trond Nordfjaern | Methodological input, intellectual content, contribution to draft revision. |
5. Author Declarations

I agree to be named as one of the authors of this work, and confirm:

xi. that I have met the authorship criteria set out in the Deakin University Research Conduct Policy,

xii. that there are no other authors according to these criteria,

xiii. that the description in Section 4 of my contribution(s) to this publication is accurate,

xiv. that the data on which these findings are based are stored as set out in Section 7 below.

If this work is to form part of an HDR thesis as described in Sections 2 and 3, I further
xv. consent to the incorporation of the publication into the candidate’s HDR thesis
    submitted to Deakin University and, if the higher degree is awarded, the subsequent
    publication of the thesis by the university (subject to relevant Copyright provisions).

<table>
<thead>
<tr>
<th>Name of author</th>
<th>Signature*</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Michael Berk</td>
<td></td>
<td>11/5/2014</td>
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<tr>
<td>Meaghan O’Donnell</td>
<td></td>
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<tr>
<td>Lesley Stafford</td>
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<tr>
<td>Trond Nordjaern</td>
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6. Data storage

The original data for this project are stored in the following locations. (The locations must be within an appropriate institutional setting. If the executive author is a Deakin staff member and data are stored outside Deakin University, permission for this must be given by the Head of Academic Unit within which the executive author is based.)

<table>
<thead>
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<th>Data format</th>
<th>Storage Location</th>
<th>Date lodged</th>
<th>Name of custodian if other than the executive author</th>
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<td>SPSS files in encrypted format on central directory</td>
<td>Monash University</td>
<td>2012</td>
<td>Mark Stevenson, Director, MUARC</td>
</tr>
</tbody>
</table>

This form must be retained by the executive author, within the school or institute in which they are based.

If the publication is to be included as part of an HDR thesis, a copy of this form must be included in the thesis with the publication.

PhD Dissertation – Deakin University School of Medicine
Appendix D. ETHICS APPLICATION
DEAKIN UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE
APPLICATION FOR EXEMPTION FROM ETHICS REVIEW
(for projects involving only the use of pre-existing, non-identifiable data sets)

Principal Investigator: Michael Berk
Student Researcher (if applicable): Jason Thompson
School: Medicine  Faculty: Health
Campus: Waurn Ponds
Contact Telephone No: 0457502134
Email: jasonthompson@gmail.com
Project Title: The role of attribution of responsibility and blame in recovery after injury

Part A

Project Information

1. Please describe the background to project:
   The project is using data from an existing research program undertaken by the Victorian Transport Accident Commission and Comcare, a national Worker’s compensation scheme.

2. Please outline the project aim and rationale:
   The aim of the project is to consider the role of accident circumstance variables in the recovery process. In particular, the effect of attributions of blame and responsibility for accidents on recovery quality and duration.

3. Please state the source of data or records:
   The Victorian Transport Accident Commission and Comcare.

4. Please describe the format that the non-identifiable data/records will be obtained in:
   SPSS delivered via 128 bit encrypted transfer protocol.

5. Please outline the purpose of the original data collection:
   Normal activities of the TAC Client Research Team.

6. Please describe the nature of consent originally obtained from participants:
   Full consent obtained in a two-stage process. First via mail-out with option to opt-out and secondly at telephone interview undertaken by a professional research agency.
7 Please provide the reason for the request to waive the requirement for consent (where applicable):

The data has already been collected as part of normal research activities undertaken by both organisations, the process of which was approved by both the client and

8 Please state the ethical issues associated with the project and the means by which they will be addressed;

No ethical issues are apparent.

9 Please state the name of the original custodian of the data:

The Victorian Transport Accident Commission.

Part B

Investigators and qualifications

1 Please list the names, roles and qualifications of all researchers who will be involved in the study, including any based outside Deakin:

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Role</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jason Thompson</td>
<td>PhD Student</td>
<td>BSc (Hons) M.Psych</td>
</tr>
<tr>
<td>Professor Michael Berk</td>
<td>Chief Supervisor</td>
<td>MBBCh, MMEd(Psych), FF(Psych)SA, PhD, FRANZCP</td>
</tr>
<tr>
<td>Dr. Lesley Stafford</td>
<td>Co Supervisor</td>
<td>BA BSocSci Hons MA (Psych) MPsych (Clin) PhD</td>
</tr>
<tr>
<td>Dr. Trond Nordfjaern</td>
<td>Co Supervisor</td>
<td>BSc, M.Psych, PhD, Dr.philos</td>
</tr>
<tr>
<td>Dr. Meaghan O'Donnell</td>
<td>Co Supervisor</td>
<td>BApSc(N), B.Sc (Psych), MA (Psych), PhD.</td>
</tr>
</tbody>
</table>
DECLARATION

I/We, the undersigned declare that the information supplied in this application is true and accurate to the best of my/our knowledge.

I / We the undersigned have read the National Statement on Ethical Conduct in Human Research and accept responsibility for the conduct of the project detailed in this application in accordance with the principles contained in the Statement and any other conditions laid down by Deakin University Human Research Ethics Committee.

Signatures:

Principal Investigator

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Jason Thompson</td>
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Co-Investigator/s

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<tr>
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<td>Date: 16 May 2012</td>
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<tr>
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<tr>
<td>Date:16May2012</td>
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</tbody>
</table>

Please tick to acknowledge your agreement:

✓ I am aware that I am required to submit an Annual/Final Report to the Ethics Office for this project when requested and agree to do so in a timely manner.
2 ACKNOWLEDGMENT OF HEAD OF SCHOOL/DIRECTOR OF RESEARCH

I the undersigned acknowledge that the Faculty has considered and approved the academic worth of the project described in this application.

Name: Professor Lee Kennedy
Signature: [Signature Redacted by Library] Date: 9/5/2012

Part C
All Applications please attach:

x A copy of a letter from the original custodian of the data outlining:
   • What access to the data has been granted
   • Who has been granted access to the data and for what purpose
   • What the original purpose of the data collection was and
   • What any conditions or consent were required for its use

Please submit all documents via the Human Research Ethics lodgement page
For further information contact research-ethics@deakin.edu.au or call (03) 9251 7123 or (03) 5227 2975.
Appendix E.  FREEDOM OF INFORMATION REQUEST AND APPROVAL
4 June 2012

Mr Jason Thompson
47 Rae Street
FITZROY NORTH VIC 3068

Dear Jason

Regarding Your Freedom of Information request
FOI reference 1626243

I am writing to you about your freedom of information request received on 23 March 2012, in which you asked for access to de-identified datasets from Health Outcomes studies undertaken by TAC Client Research Team.

The TAC's decision
In accordance with the Freedom of Information Act 1982, I have decided that the de-identified datasets you requested will be released to you, without exception.

Ethics Information
The TAC conducts research surveys to better understand the physical, emotional and mental health outcomes following a transport accident. The findings from this research are used to improve the services the TAC provides.

All TAC clients are sent a copy of the TAC's Client Research Brochure on claims acceptance which provides clients with the opportunity to opt out of TAC research. Sampling for research projects is random within project inclusion criteria. Clients eligible and selected at random would then be sent a primary approach letter explaining the nature of the research, with suitable reassurances that the research is entirely voluntary, confidential, and will not affect their TAC claim in any way.

The TAC conducts research using a combination of telephone interviews, mail surveys, discussion groups, face-to-face interviews and online surveys. The Social Research Centre conducted telephone surveys on the TAC’s behalf in this instance to obtain the information contained in the datasets. Only fully qualified interviewers conduct the surveys.

The results of the survey are reported back to the TAC and are managed by the Client Research department. Any information provided is confidential, and no information that could lead to the identification of any individual is disclosed in any reports on the project. De-identified data can be requested in accordance with the Freedom of Information Act 1982.
There are strict privacy laws and guidelines that guide all TAC research. The TAC is bound by the Code of Behaviour of the Australian Market and Social Research Society, as well as the Government's *Information and Privacy Act (2000)*.

**Getting more information**
If you have any questions about this letter you can call me directly on 5225 6856, on 1300 654 329 for the cost of a local call.

Yours sincerely

Signature Redacted by Library

Emily Holland  
*Freedom of Information Officer*  
*Transport Accident Commission*
FREEDOM OF INFORMATION:
TAC REQUEST FORM

Important notes
This form is designed to assist you to make a valid FOI request under the Freedom of Information Act 1982. More information is available by emailing foi@tac.vic.gov.au, by calling us on 1300 654 329 or by fax (03) 9566 9360.
Please return the completed form and any attachments to:
Freedom of Information Officer
Transport Accident Commission
PO Box 742
GEELONG VIC 3220
or
Ausdoc DX 216079 Geelong

Application fee
There is a non-refundable application fee of $24.40 (GST free) from 1 July 2011 until 30 June 2012. Please make cheques payable to Transport Accident Commission.
Have you attached the application fee?
[ ] Yes
[ ] No – I seek a waiver of the fee on the grounds of hardship and attach supporting evidence e.g. a photocopy of your Health Care Card, Pension Card or other

Applicant details
Name: Jason Thompson
Address: 47 Rae Street, North, Victoria 3063

Claim no. if applicable

Phone no.
Fax no.

Email address: jason.thompson@gmail.com

Information request
Please provide as much information as possible about the documents to which you seek access. This will assist us to locate all the relevant information.
Date range applicable: 1/1/2000 to 31/1/2012
I request access to de-identified datasets from Health Outcomes studies undertaken by TAC Client Research Team in SAS format.
I have been advised by TAC that accessing this data through FOI is the most appropriate pathway. It is to be used for study & research purposes only.

Access type
Please indicate the type(s) of access required:
[ ] I want a copy of the documents in paper form
[ ] I want a copy of the documents in electronic form on CD
[ ] I want to inspect the documents
[ ] I want access provided in a different form. Please specify: 


Applicant's signature
Date: 22/2/2012

Signature Redacted by Library
Appendix F.  PUBLISHED VERSION OF STUDY 1
Rehabilitation Psychology

Attributions of Responsibility and Recovery Within a No-Fault Insurance Compensation System
Jason Thompson, Michael Berk, Meaghan O’Donnell, Lesley Stafford, and Trond Nordfjaern
Online First Publication, April 7, 2014. http://dx.doi.org/10.1037/a0036543

CITATION
Attributions of Responsibility and Recovery Within a No-Fault Insurance Compensation System

Jason Thompson
Deakin University and Monash University

Michael Berk
Deakin University, Orygen Youth Health Research Centre and the Centre of Youth Mental Health, Parkville, Australia, and University of Melbourne

Meaghan O’Donnell
University of Melbourne

Lesley Stafford
Royal Women’s Hospital, Parkville, Australia and University of Melbourne

Trond Nordfjaern
Norwegian Institute for Alcohol and Drug Research, Oslo, Norway

Objective: Although a great deal of literature supports the negative relationship between postinjury health outcomes and compensation, it has not fully examined the relative influence of the diverse factors that underlie compensable status. In particular, this study sought to understand the relative influence that attributions of responsibility for accidents have on mental and physical health outcomes. Method: Using a structural equation modeling approach, we assessed the strength of relationships between demographic and accident circumstance variables, and postinjury mental and physical health for 934 road-trauma survivors compensated under a single no-fault insurance system. Results: Analysis of direct and indirect effects demonstrated that although a range of standard demographic and accident circumstance variables influenced health outcomes, by far the greatest effect was generated from perceptions of responsibility for the accident. People who reported lower levels of responsibility for their accident showed significantly poorer mental and physical health outcomes. Conclusions: Perceptions of responsibility for accidents are strongly associated with postaccident mental and physical health outcomes within compensable road trauma populations. Future studies should control for attributions of responsibility when assessing the effect of compensation, or any other variable, on health outcomes among injured populations. Mechanisms underlying the effect of attributions of responsibility on outcomes, particularly in relation to its association with self-blame, warrant further exploration.

Keywords: compensation, injury, attributions, rehabilitation

Impact and implication

- Although studies exploring factors associated with recovery from motor vehicle accidents are numerous, relatively few have specifically considered associations between attributions of responsibility for accidents and health outcomes – especially within no-fault compensation systems where access to compensation, medical and rehabilitation support is largely identical. This is among the first studies to do so.
- The study confirms that people injured in motor vehicle accidents and compensated under no-fault personal injury systems who attribute responsibility for their accident to others demonstrate poorer post-accident mental and

Jason Thompson, IMPACT Strategic Research Centre, Deakin University, School of Medicine, Geelong, Australia and Monash University Accident Research Centre, Monash University, Clayton, Australia; Michael Berk, IMPACT Strategic Research Centre, Deakin University, School of Medicine, Barwon Health, Orygen Youth Health Research Centre and the Centre of Youth Mental Health, Parkville, Australia, Florey Institute for Neuroscience and Mental Health, University of Melbourne, Parkville, Australia, and Department of Psychiatry and School of Psychological Sciences, University of Melbourne, Melbourne, Australia; Meaghan O’Donnell, Department of Psychiatry and School of Psychological Sciences, University of Melbourne, and Australian Centre for Posttraumatic Mental Health, University of Melbourne; Lesley Stafford, Centre for Women’s Mental Health, Royal Women’s Hospital, Parkville, Australia and Department of Psychiatry and School of Psychological Sciences, University of Melbourne; Trond Nordfjaern, Norwegian Institute for Alcohol and Drug Research, Oslo, Norway.

The authors would like to acknowledge the assistance of Nina Ellis, Rani Khaira, Alan Woodroffe, and Greg Karstens of the Transport Accident Commission for their support in assisting with Freedom of Information requests central to data collection, and assistance in understanding client research sample selection processes peculiar to the system.

Correspondence concerning this article should be addressed to Jason Thompson, MSc, Monash University Accident Research Centre (MUARC), Monash Injury Research Institute, Room 310, Building 70, Level 3, Clayton Campus, Monash University, Vic 3800, Australia. E-mail: jason.thompson@monash.edu
physical health outcomes than those who attribute responsibility to themselves.

- Assessment of attributions of responsibility for accidents may prove helpful in identifying persons injured in motor vehicle accidents who are at greater risk of experiencing post-accident mental and physical health outcomes. For compensation and rehabilitation practitioners, this knowledge may assist in the efficient management of clients into treatment options best suited to speedy recovery. For researchers, this study highlights that attributions of responsibility for accidents should be controlled for when assessing the effect of compensation, or any other variable of interest, on health outcomes following injury.

**Introduction**

Despite it being regarded as a mark of progress for societies to provide systems of compensation, rehabilitation and health system access for persons injured or disabled through road injury (World Health Organization, 2013), it remains widely accepted that people who access compensation after injury experience worse health outcomes than those who do not (Blanchard & Hickling, 1998; Gabbe et al., 2007; Harris, Mulford, Solomon, van Gelder, & Young, 2005). Some have suggested that the association between accessing compensation and poor outcomes is so well established that it is akin to that shown between smoking and lung cancer (Cameron & Gabbe, 2009).

At face value, the iatrogenic conceptualization of compensation appears counterintuitive. Further, it begs the question of why, in an environment where road trauma has climbed to be the tenth greatest cause of disability worldwide (Murray et al., 2012), societies would continue to underwrite systems that potentially damage injured persons’ prospects of recovery. There is clearly a requirement to better understand the make-up of compensable populations and drivers of postinjury health outcomes.

Although literature used to support the negative relationship between compensation and outcomes appears both prolific and consistent, it has not fully examined nor disentangled the relative influence of the diverse factors that underlie compensable status. Compensable status has been often viewed as a single, independent variable rather than a complex factor arising as a consequence of diverse demographic influences and personal circumstances triggered by accident or injury. Further, compensation’s effect on postinjury outcomes has not been the primary purpose of most studies used as evidence to quantify its impact (Harris et al., 2005), rendering the analysis of compensation’s effects largely to simple comparisons between “compensable” and “noncompensable” groups. These themes were recognized by Littleton et al. (2011) who reported that, although compensable status in their study of people with musculoskeletal injuries arising from road accidents demonstrated poorer health status at follow-up, it was not possible to determine whether this effect was due to claiming compensation itself, or the presence of other unmeasured factors associated with compensable status.

Only recently have factors associated with compensation and outcomes begun to be understood with greater fidelity. For example, O’Donnell, Creamer, McFarlane, Silove, and Bryant (2010) demonstrated that through removal of patients in a noncompensable group who had received assistance by way of personal health insurance, differences in outcomes between compensable and noncompensable postinjury outcomes were negligible. Further, Harris, Young, Rae, Jalaludin, and Solomon (2008) found that although compensation was associated with poorer psychological outcomes posttrauma, the effect was only present for those whose compensation claim was unsettled. Although the definition of unsettled claims for patients covered under diverse “fault-based” and “no-fault” legal frameworks was unclear for the latter study, both results reinforce the limitations of defining compensable status as dichotomous, “compensable” or “noncompensable” groups without appreciation of other within-group factors influencing outcomes.

A factor that may influence postaccident recovery within compensable populations is perceived responsibility for accident. Despite the effect of perceived responsibility and related themes (e.g., blame, anger) on outcomes having been noted previously (Bulman & Wortman, 1977; Delahunt et al., 1997; Fitzharris, Fildes, Charlton, & Tingvall, 2005; Harris et al., 2008; Hickling, Blanchard, Buckley, & Taylor, 1999; Ho, Davidson, Van Dyke, & Agar-Wilson, 2000; Martelli, Zasler, & MacMillan, 1998; Miller, 1961), the extent of its effect is an area that has received relatively scant attention. This belies the importance of responsibility, however, as compensable populations by their very nature (e.g., within fault-based systems or jurisdictions), are less likely to be responsible for an accident or injury. It may be true that perceived responsibility accounts for a substantial proportion of the variability in outcomes within compensable populations.

The limitations of previous studies’ exploration of subtleties within compensable groups are in part due to practical methodological restrictions often placed around efforts to study injured populations (Cameron & Gabbe, 2009). Study sample sizes are often relatively small and self-selecting, requiring researchers to treat samples as single, homogenous groups, and requiring responses to trauma to be generalized to “typical” trauma populations. Larger samples, more representative of the broader road trauma population are therefore paramount to progressing an understanding of postinjury outcomes (Blaszczyński et al., 1998).

Through examination of a large-scale sample of road trauma survivors compensated under a single, no-fault personal injury insurance system, this study aims to assess the relative influence of attributions of responsibility and other stable demographic and accident circumstance variables on physical and mental health outcomes postaccident. Specifically, it is hypothesized that attributions of responsibility for accidents will significantly affect mental and physical health outcomes alongside other stable demographic factors known at accident and routinely controlled for in prior trauma research.

**Method**

**Data Collection**

Data was drawn from an existing deidentified database provided by the Victorian Transport Accident Commission; an Australian, state-owned, no-fault road trauma compensation system (the system). This dataset consisted of 1,173 individual, cross-sectional client records collected in 2011 as part of the system’s client research program. Ethical consent for conduct of the research was granted from the respective Human Research and Ethics Committees of Deakin University (2012-234) and the compensation’s system’s client research body.
Participants

Potential participants who met criteria for inclusion in the study were randomly drawn from a sample of clients within an existing database held by the system consisting of all current and prior clients. Included in the database were participants deemed by the system at the time of interview to be either “currently active” with a claim duration of 6 years or less, or had been “inactive” for less than 25 months. “Active” claims were those who had received payments for medical services in the previous 6 months. Excluded participants were dependents of deceased accident victims, clients with severe, lifelong or catastrophic injuries, were under 16, had previously indicated to the system that they did not want to participate in research, were multiple family members of clients in the sample population, were clients whose accident anniversary fell within or two weeks either side of their potential interview period, were clients who were employees of the system, or were clients that were excluded by any other criteria deemed appropriate by the system for reasons of interviewee burden or sensitivity.

Procedures

Prior to participating in the study, each potential participant (approximately 3,500 persons per 1,000 interviews) received a letter from the system describing the research, its purpose, voluntariness of participation, the timelines and commitment required. Once this process was complete, a contracted research company conducted the survey with trained interviewers under the supervision of the system representatives via Computer Assisted Telephone Interview. A total of 1,173 interviews were conducted over a 4-week period between the hours of 10 a.m. to 8 p.m. The average interview length was 25 min.

Questionnaire

Short-Form-12 Health Survey, Version 2. General physical and mental health status was measured using the Short-Form-12 Health Survey, Version 2 (SF-12 V2). The SF-12 V2 has been demonstrated to be a reliable measure relative to the SF-36 in the general population (Ware, Kosinski, & Keller, 1996) and has been used in multiple trauma studies with comparable populations (e.g., Gabbe et al., 2007). Higher mental health composite score (MCS) and physical health composite score (PCS) scores on the SF-12 are indicative of more positive mental and physical health, respectively.

Traffic anxiety. Participants were asked to respond to a simple, three-item question relating to respond the whether they now felt “a lot more” anxious around traffic in general since their accident, “a little more” anxious around traffic in general, or whether they “hadn’t noticed a difference.”

Persistent pain. Persistent pain was assessed according to the system’s classification criteria, defined as current pain experienced as a result of injuries sustained in the accident that had lasted for 3 months or more.

Attributions of responsibility for the accident. Attributions of responsibility for the accident were assessed using a similar methodology reported in previous work (Delahunty et al., 1997; Harris et al., 2008; Ho et al., 2000). Participants were asked whether they believed they were “totally responsible,” “partially responsible,” or “not responsible at all” for their accident.

Demographic, vehicle, and claim information. Demographic information was collected for each respondent, including gender, employment status at time of accident, educational achievement, role in accident, age, and claim duration (see Table 1). Basic system-related service information including claim duration, and injury classification was also collected. The injury coding system applied by the system uses the most severe injury suffered by the client as its basis for classification.

Data screening and manipulation prior to analysis. In order to better classify respondents’ roles in the accident, standard distinctions between “vulnerable” road users (pedestrians, cyclists, motorcyclists, pillion passengers) and “standard” road users (vehicle drivers, vehicle passengers) were made resulting in the creation of a binary “vulnerable road user” variable (Wittink, 2001). Due to the categorical, non-normally distributed nature of many variables and the requirement in Analysis of Moment Structures (AMOS) Version 20 (IBM, 2011a) asymptotically distribution-free structural equation modeling procedures for removal of cases containing missing data, a listwise deletion of 233 cases was conducted, leaving 934 complete

Table 1

<table>
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<th>Demographic and Accident Circumstance Characteristics of the Sample</th>
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<th>SD</th>
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<td>Gender</td>
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<tr>
<td>Male</td>
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<tr>
<td>Female</td>
<td>44%</td>
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<tr>
<td>Mean age (years)</td>
<td>43.2 (16–88)</td>
<td>15.8</td>
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<tr>
<td>Involvement in accident</td>
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<tr>
<td>Driver</td>
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<tr>
<td>Passenger</td>
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<tr>
<td>Motorcycle rider</td>
<td>25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle Passenger</td>
<td>1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public transport</td>
<td>1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury classification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>26%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>41%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other injuries</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other severe</td>
<td>21%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Claim duration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–12 months</td>
<td>23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13–24 months</td>
<td>35%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25–36 months</td>
<td>23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37–72 months</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived responsibility for accident</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totally responsible</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially responsible</td>
<td>23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not responsible at all</td>
<td>62%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed at time of accident</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, paid employment</td>
<td>78%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest level of education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school or below</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not complete high school</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 12 or equivalent</td>
<td>14%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade/apprenticeship</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAFE/technical certificate</td>
<td>18%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate diploma/degree</td>
<td>22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postgraduate qualification</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
records. Variables most frequently contributing to missing data points were: attributions of responsibility for the accident \((n = 118)\); MCS score \((n = 115)\); PCS score \((n = 115)\); travel anxiety \((n = 25)\); and, highest level of education \((n = 17)\). Analysis of respondents with missing data demonstrated little difference across demographic or accident circumstance variables to those with complete records with the exception of increased mean age for participants with missing data \((49.0\) vs. \(43.2\) years, \(p < .001)\).

Data Analysis

Basic descriptive analysis including frequencies, means, standard deviations, and correlation matrices were conducted using Statistical Package for the Social Sciences (SPSS) Version 21 (IBM, 2011b). Structural Equation Modeling (SEM) was conducted using AMOS Version 20 (IBM, 2011a) to test the relationships between variables in the model due to its ability to assess complex relationships and provide clarity around comparative strength of association with outcomes among input variables.

A base, asymptotically distribution free model (Model 1) was initially specified (see Figure 1) with unidirectional association between mental and physical health. This direction of association was chosen due to the historic conceptualization of injury and recovery as a predominantly physically oriented assessment process and the gearing of injury legislation, compensation, treatment and rehabilitation services toward consideration of injured persons in relation to their physical injury profiles (State Government of Victoria, 2011).

The model contained eight exogenous predictor variables of: vulnerable road user status (cyclists, pedestrians, motorcyclists, public transport users); employment status at time of accident; gender; perceived responsibility for accident; age; highest level of education; injury severity classification; claim life; and the two latent outcome variables of “physical health” and “mental health.” Physical health was made up of contributions from the SF-12 V2 physical health composite score and persistent pain. Mental health was comprised of the mental health component score of the SF-12 V2 and traffic anxiety. The construction of the latent variables was chosen to reflect factors regarded as important measures of recovery by both the system and within the road trauma literature (Gabbe et al., 2007; Mayou & Bryant, 1994; Victorian Transport Accident Commission, 2012; Williamson et al., 2009; Zelle et al., 2005).

Following fit of the initial model (Model 1), a secondary, simplified model was then produced (Model 2) using similar procedures as above to adjust for error but with removal of all nonsignificant pathways \((p < .05)\) from the base model. To assess both models’ respective fits, \(\chi^2\), the root mean square of approximation (RMSEA; Browne & Cudeck, 1993), and the Comparative Fit Index (CFI; Bentler, 1990) were used. A RMSEA of .08 or less has been considered to indicate close fit between the model and the data, and a CFI around .95 or above reflect good fit of a model (Kim & Bentler, 2006).

Results

Table 1 shows basic demographic and accident circumstance information for exogenous variables for all respondents including age, gender, claim duration, involvement in accident, highest level of education, employment status at time of accident, perceived responsibility, and injury classification. Figures indicated that 26% of participants had suffered musculoskeletal injuries (e.g., soft tissue sprains, strains, and whiplash), 41% orthopaedic injuries (e.g., fractures, dislocations), 12% “other” injuries (e.g., lacera-
tions, abrasions, concussions), and 21% "other severe" injuries (e.g., amputations, mild brain injury, head injury, degloving, internal or spinal injuries). Comparison of injury classification data with overall system-level reports indicate that while broadly reflective of the compensable populations under management, this population likely had greater levels of injury than the population of road accident survivors typically serviced by the system (Victorian Transport Accident Commission, 2012).

Table 2 provides descriptive statistics for continuous variables and ranges for ordinal variables included in the model and indicates the direction of coding. Significant deviations from normality related to skewness and kurtosis were observed for the majority of variables, justifying the decision to conduct an asymptotically distribution free SEM. Feeling "a lot more" anxious in comparison to before their accident was reported by 36% of participants and 32% reported that they felt "a little more" anxious. The remaining 32% reported that they "had not noticed a difference." Persistent pain since the accident was reported by 61% of participants.

Table 3 shows the covariances between observed variables in Model 1. Significant covariance between a number of variables was demonstrated. Responsibility for the accident covaried with age, employment status, and vulnerable road user status, and gender. Employment status covaried with education and vulnerable road user status. Gender covaried with all variables with the exception of claim duration (CD). Claim duration did not show significant covariance with any other variable, providing reassurance that in this cross-sectional design, remaining variables were not influenced by time elapsed since accident.

Table 4 shows the standardized direct parameter estimates for all observed exogenous variables on the latent variables in the initial model. Significant direct effects were found for claim duration, vulnerable road user status, employment status at accident, level of education, and gender on mental health. By far the greatest contributor to mental health recovery postaccident was perceived responsibility for accident ($r^2 = .37, p < .001$). Age, gender, and education all showed significant direct effects on physical health. Parameter estimates for observed variables contributing to the latent variables of mental health, and physical health were all significant at the $p < .001$ level. The relationship between mental and physical health was also significant ($p < .001$).

Calculation of indirect effects showed that perceived responsibility’s effect on physical health outcomes ($r^2 = -.20$) was twice that of any other observed exogenous variable. Total explained variance in Model 1 was 26% for mental health and 35% for physical health. The chi-square fit test, $\chi^2(934, 17) = 88.43, p < .001$, suggested that Model 1 did not fit the data well, however, this was most likely due to the large sample size (Byrne, 1998). Assessment of both CFI (.95) and RMSEA (.07) indicated adequate error of approximation for Model 1.

Analysis of a simplified model (Model 2) was then conducted for interpretative purposes. To create the simplified model, consecutive iterations of Model 1 were run, removing all nonsignificant pathways ($p > .05$) in order from smallest parameter estimate (least effect) to greatest. In total, 22 nonsignificant parameter estimates (seven variances and 15 covariances) were removed from the initial model.

Figure 2 shows the standardized covariances and direct parameter estimates for observed exogenous variables on the mental and physical health outcomes for the simplified Model 2. Combined with similar overall model fit estimates, $\chi^2(940, 39) = 113.0, p < .001$, CFI = .95, RMSEA = .05, these estimates are a close approximation of those obtained in Model 1, demonstrating that deletion of nonsignificant pathways improved model parsimony without compromising fit.

Analysis of direct and indirect effects by observed exogenous variables demonstrated that claim duration ($r^2 = -.10, p < .01$), employment status at accident ($r^2 = .11, p < .01$), vulnerable road user status ($r^2 = .17, p < .001$), gender ($r^2 = .12, p < .01$) and education ($r^2 = .08, p < .05$) were significantly associated with postaccident mental health, with the largest effect again reserved for perceived responsibility for accident ($r^2 = .35, p < .001$). Variables that had significant effect on physical health recovery were education ($r^2 = -.10, p < .01$), gender ($r^2 = -.01, p < .01$), and age ($r^2 = -.17, p < .001$).

Analysis of parameter pathways (see Figure 2) again showed perceived responsibility’s significant indirect effect on physical health mediated by mental health ($r^2 = .19$). Total explained variance in the simplified model was 25% for mental health and 34% for physical health, demonstrating that the performance of the simplified model (Model 2) was analogous to the base model (Model 1).

The direction of effects shown by both models indicate that more positive physical health outcomes were associated with younger age, female gender, and higher levels of education. More positive mental health outcomes were associated first with greater

Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim duration</td>
<td>0 (0–12 months)</td>
<td>3 (37–72 months)</td>
</tr>
<tr>
<td>Injury classification</td>
<td>0 (Musculoskeletal)</td>
<td>3 (Other severe)</td>
</tr>
<tr>
<td>Vulnerable road user Status</td>
<td>0 (Not vulnerable)</td>
<td>1 (Vulnerable)</td>
</tr>
<tr>
<td>Employment status at accident</td>
<td>0 (Not employed)</td>
<td>1 (Employed)</td>
</tr>
<tr>
<td>Highest level of education</td>
<td>1 (Primary school)</td>
<td>10 (Postgraduate)</td>
</tr>
<tr>
<td>Age</td>
<td>43.1 (15.8)</td>
<td>16 (88)</td>
</tr>
<tr>
<td>Gender</td>
<td>0 (Female)</td>
<td>1 (Male)</td>
</tr>
<tr>
<td>Perceived Responsibility for accident</td>
<td>1 (Not responsible at all)</td>
<td>1 (Totally responsible)</td>
</tr>
<tr>
<td>SF-12 MCS score</td>
<td>44.3 (13.4)</td>
<td>7.1 (67.7)</td>
</tr>
<tr>
<td>SF-12 PCS score</td>
<td>43.3 (11.5)</td>
<td>11.6 (65.4)</td>
</tr>
<tr>
<td>Persistent pain</td>
<td>0 (No persistent pain)</td>
<td>1 (Persistent pain)</td>
</tr>
<tr>
<td>Traffic anxiety</td>
<td>1 (No difference)</td>
<td>3 (A lot more anxiety)</td>
</tr>
</tbody>
</table>
levels of responsibility for accident, vulnerable road user status, employment at the time of accident, male gender, shorter claim duration, and higher levels of education.

The results found here supported our hypothesis that perceived responsibility for accident was significantly associated with post-accident mental and physical health outcomes among clients of a no-fault compensation system. Lower levels of perceived responsibility for accident were associated with significantly poorer mental and physical health outcomes among clients of a no-fault compensation system. Lower levels of perceived responsibility for accident was significantly associated with post-

Table 3
Covariance Estimates Between Variables in Model 1

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>Critical ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ↔ Claim duration</td>
<td>−.99</td>
<td>.52</td>
<td>−.16</td>
<td>.87</td>
</tr>
<tr>
<td>Responsibility ↔ Claim duration</td>
<td>−.03</td>
<td>.03</td>
<td>−1.08</td>
<td>.28</td>
</tr>
<tr>
<td>Gender ↔ Claim duration</td>
<td>.02</td>
<td>.02</td>
<td>1.34</td>
<td>.18</td>
</tr>
<tr>
<td>Employment status ↔ Claim duration</td>
<td>.02</td>
<td>.01</td>
<td>1.37</td>
<td>.17</td>
</tr>
<tr>
<td>Vulnerable road user ↔ Claim duration</td>
<td>−.01</td>
<td>.02</td>
<td>−.31</td>
<td>.76</td>
</tr>
<tr>
<td>Age ↔ Injury classification</td>
<td>−.26</td>
<td>.56</td>
<td>−.46</td>
<td>.64</td>
</tr>
<tr>
<td>Responsibility ↔ Injury classification</td>
<td>.02</td>
<td>.02</td>
<td>.80</td>
<td>.47</td>
</tr>
<tr>
<td>Gender ↔ Injury classification</td>
<td>.07</td>
<td>.02</td>
<td>4.32</td>
<td>.00</td>
</tr>
<tr>
<td>Employment status ↔ Injury classification</td>
<td>.00</td>
<td>.02</td>
<td>.19</td>
<td>.85</td>
</tr>
<tr>
<td>Vulnerable road user ↔ Injury classification</td>
<td>.04</td>
<td>.02</td>
<td>2.62</td>
<td>.01</td>
</tr>
<tr>
<td>Education ↔ Age</td>
<td>.58</td>
<td>1.24</td>
<td>−1.47</td>
<td>.64</td>
</tr>
<tr>
<td>Education ↔ Employment status</td>
<td>−.06</td>
<td>.06</td>
<td>−1.06</td>
<td>.29</td>
</tr>
<tr>
<td>Gender ↔ Education</td>
<td>−.09</td>
<td>.04</td>
<td>−2.30</td>
<td>.02</td>
</tr>
<tr>
<td>Education ↔ Employment status</td>
<td>.09</td>
<td>.03</td>
<td>2.75</td>
<td>.01</td>
</tr>
<tr>
<td>Education ↔ Vulnerable road user</td>
<td>.01</td>
<td>.04</td>
<td>−1.15</td>
<td>.88</td>
</tr>
<tr>
<td>Age ↔ Responsibility</td>
<td>−1.09</td>
<td>.38</td>
<td>−2.90</td>
<td>.00</td>
</tr>
<tr>
<td>Gender ↔ Age</td>
<td>−.60</td>
<td>.25</td>
<td>−2.35</td>
<td>.02</td>
</tr>
<tr>
<td>Age ↔ Employment status</td>
<td>−1.75</td>
<td>.25</td>
<td>−6.93</td>
<td>.00</td>
</tr>
<tr>
<td>Age ↔ Vulnerable road user</td>
<td>−.30</td>
<td>.24</td>
<td>−1.24</td>
<td>.21</td>
</tr>
<tr>
<td>Gender ↔ Vulnerable road user</td>
<td>.10</td>
<td>.01</td>
<td>13.94</td>
<td>.00</td>
</tr>
<tr>
<td>Gender ↔ Employment status</td>
<td>.04</td>
<td>.01</td>
<td>5.39</td>
<td>.00</td>
</tr>
<tr>
<td>Gender ↔ Responsibility</td>
<td>.05</td>
<td>.01</td>
<td>4.42</td>
<td>.00</td>
</tr>
<tr>
<td>Employment status ↔ Vulnerable road user</td>
<td>.03</td>
<td>.01</td>
<td>5.09</td>
<td>.00</td>
</tr>
<tr>
<td>Responsibility ↔ Vulnerable road user</td>
<td>.05</td>
<td>.01</td>
<td>3.79</td>
<td>.00</td>
</tr>
<tr>
<td>Responsibility ↔ Employment status</td>
<td>.02</td>
<td>.01</td>
<td>2.19</td>
<td>.03</td>
</tr>
<tr>
<td>Education ↔ Injury classification</td>
<td>−.07</td>
<td>.08</td>
<td>−.89</td>
<td>.37</td>
</tr>
<tr>
<td>Education ↔ Claim duration</td>
<td>.01</td>
<td>.08</td>
<td>.09</td>
<td>.93</td>
</tr>
<tr>
<td>Injury classification ↔ Claim duration</td>
<td>−.04</td>
<td>.04</td>
<td>−1.05</td>
<td>.29</td>
</tr>
</tbody>
</table>

Note. Statistically significant covariance estimates < .05 are in boldface. C.R. refers to the critical ratio.

Table 4
Standardized Direct Effects of Observed Variables on Latent Variables in Model 1 (Base)

<table>
<thead>
<tr>
<th></th>
<th>Mental health</th>
<th>Physical health</th>
<th>SF-12 MCS</th>
<th>SF-12 PCS</th>
<th>Persistent pain</th>
<th>Travel anxiety</th>
<th>Total explained variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim duration</td>
<td>−.09**</td>
<td>−.06</td>
<td>−.05</td>
<td>−.06</td>
<td>−.06</td>
<td>−.06</td>
<td>26%</td>
</tr>
<tr>
<td>Responsibility</td>
<td>0.37***</td>
<td>−.05</td>
<td>0.06</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>35%</td>
</tr>
<tr>
<td>Employment status</td>
<td>0.13**</td>
<td>−.06</td>
<td>0.06</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>26%</td>
</tr>
<tr>
<td>Vulnerable road user</td>
<td>0.14***</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>35%</td>
</tr>
<tr>
<td>Education</td>
<td>0.08**</td>
<td>0.10**</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>26%</td>
</tr>
<tr>
<td>Gender</td>
<td>−0.13**</td>
<td>−0.12**</td>
<td>−0.12</td>
<td>−0.12</td>
<td>−0.12</td>
<td>−0.12</td>
<td>35%</td>
</tr>
<tr>
<td>Age</td>
<td>−0.02</td>
<td>−0.18**</td>
<td>−0.18</td>
<td>−0.18</td>
<td>−0.18</td>
<td>−0.18</td>
<td>26%</td>
</tr>
<tr>
<td>Injury Classification</td>
<td>−0.03</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>35%</td>
</tr>
<tr>
<td>Mental health</td>
<td>0.55***</td>
<td>0.63***</td>
<td>0.63</td>
<td>0.63</td>
<td>0.63</td>
<td>0.63</td>
<td>26%</td>
</tr>
<tr>
<td>Physical health</td>
<td>0.89***</td>
<td>0.68***</td>
<td>0.68</td>
<td>0.68</td>
<td>0.68</td>
<td>0.68</td>
<td>35%</td>
</tr>
</tbody>
</table>

*p < .05. **p < .01. ***p < .001.
ity in physical and mental health outcomes. This could contribute to the development of simple triage or client management procedures that allocate resources to greatest potential need or assist in planning for future need under various population risk scenarios. Importantly, these results do not rely on the estimation of outcomes from administration of complex or detailed diagnostic information, possibly unable to be gathered by insurers or general clinicians without specialist resources or referral. The factors used here are likely to be available as a matter of course for any agency dealing with individuals exposed to road trauma or other injury, regardless of their sophistication.

For researchers exploring the effect of compensation on recovery, this study has methodological significance as it highlights the importance of controlling for the significant effect that perceptions of responsibility have on health outcomes within compensable groups. To this point, very few studies have controlled for this factor through either sample selection or at the point of analysis. Nor have they cautioned against its potential confounding impact when drawing conclusions regarding the negative effect of compensation on health outcomes. As shown here, however, perceived responsibility may substantially affect outcomes within groups. If compensable populations by their very nature (e.g., within fault-based systems or jurisdictions), are less likely to be responsible for an accident or injury, it may be true that this factor could account for a substantial proportion of the differences observed in previous work and attributed to an effect of compensation.

For policymakers, these findings can assist to inform the design of future compensation or insurance systems. For example, knowledge of likely demographic and accident circumstance profiles of; individuals within compensation systems; between systems catering for various types of injured populations (e.g., worker’s compensation, disability); or among future compensable populations, may assist the design of systems that optimize health outcomes for clients. More broadly, as the nature and mechanism of injuries within populations change over time (Bhalla, Ezzati, Mahal, Salomon, & Reich, 2007; Kopits & Cropper, 2005), it may be expected that “average” outcomes for injured persons will also change. With a 34% increase in disability caused by road transportation in the last 20 years and the burden of this growth being felt primarily in the developing world (Murray et al., 2012), knowledge of factors that promote or hinder postinjury outcomes will become increasingly important to managing this significant global health issue.

Limitations of this study relate to the cross-sectional nature of its design and that although the model of association between variables is theorized, we are unable to drawn firm conclusions about the mechanisms underlying observed effects or assume causality. This is in part due to the naturalistic nature of the study in accessing existing system data and the consequent limitations placed on the authors to have input into the study or questionnaire design, which also hindered inclusion of more theoretically derived or detailed outcome measures. This naturalistic element of the study, however, is also a great strength as it ensured that the sample under study was more likely to be broadly representative of typical samples under management within no-fault compensation systems. It also provides significant insight using existing “everyday” items likely to be available as a matter of course to systems in other jurisdictions.

Although attributions of responsibility and blame are separate variables, their presentation most likely overlaps to some degree (Beck et al., 2004). Future research may wish to explore the theoretical nature of the relationships observed here as there are a number of existing frameworks, particularly in relation to the effect of self-blame and mental health outcomes, that these results

Figure 2. Simplified SEM Model 2 after removal of nonsignificant parameters from pathways from Model 1.
appear to align with and/or challenge to various degrees (e.g., Abramson, Seligman, & Teasdale, 1978; Beck et al., 2004; Bradley, 1978; Ehlers & Clark, 2000; Foa, Steketee, & Rothbaum, 1989; Karl, Rabe, Zollner, Maercker, & Stopa, 2009).

Conclusions

Led by perceptions of the degree to which individuals are responsible for their accident, this study has demonstrated that demographic and accident circumstance variables contribute to considerable within-group heterogeneity in health outcomes for compensable survivors of road trauma. These results highlight the need in future studies to go beyond a view of compensation that is limited to compensable status only, or that controls only for more established variables such as age, sex, injury, employment status, or education when assessing variables important to postinjury outcomes (Coronas, Garcia-Pares, Viladrich, Santos, & Menchon, 2008; Gabbe et al., 2007; Kupchik et al., 2007). In particular, it emphasizes the importance of first understanding within-group differences among compensable populations that may inform the design of between-groups studies and guide interpretation of findings. Future studies should consider controlling for attributions of responsibility for accident in their designs in order to ensure that generally held assumptions concerning the negative effects of compensation, or any other variable or intervention, are not a corollary of this largely unmeasured factor.

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THE EFFECT OF ATTRIBUTIONS ON RECOVERY
Rehabilitation Psychology

Association Between Attributions of Responsibility for Motor Vehicle Crashes, Depressive Symptoms, and Return to Work

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CITATION
Association Between Attributions of Responsibility for Motor Vehicle Crashes, Depressive Symptoms, and Return to Work

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Purpose/Objective: Perceptions surrounding the underlying causes of accidents and injuries may be a key mechanism influencing postaccident health and functional outcomes among people injured in road crashes. In particular, attributions of responsibility may influence rates of postcrash depressive symptomatology and return-to-work. Research Method/Design: We studied a large sample of people injured in motor vehicle crashes who were working at their time of accident and needed to take time off as a result of their injuries. Interviews took place at 2 time points, 12 months apart (T1: \( n = 1,024 \), T2: \( n = 303 \)). Comparisons were made between participants’ levels of depressive symptoms and rates of return to work based on their assessment of responsibility for their accident. Results: People who did not attribute responsibility to themselves for their accident were 3 times more likely to exhibit symptoms of depression at follow-up than those who attributed responsibility to themselves. People with depressive symptoms were 3.5 times less likely to have returned to work. The effect of attributions of responsibility for accidents on return to work was mediated by the presence of depressive symptoms. Conclusions/Implications: Functional and psychological recovery from road trauma is closely associated with the assessment of responsibility for accidents. Findings are discussed in light of established posttrauma cognitive theories, the potential explanatory power of broader, more socially oriented models, and the changing nature of road trauma populations.

Keywords: trauma, depression, attributions, return-to-work, accidents

Impact and Implications

- No-fault injury compensation systems are designed to reduce the potential negative effect of compensation on rehabilitation outcomes. Even within no-fault compensation schemes, however, attributing responsibility for motor vehicle crashes to others appears associated with higher levels of postinjury depressive symptoms.
- In turn, depressive symptoms associated with attributing responsibility for accidents to others may also be a significant barrier to people returning to preaccident employment after injury.
- No-fault compensation systems should ensure sufficient attention is placed on identifying and addressing underlying mental health issues within injured populations that may be precluding successful health outcomes and/or functional recovery.

Introduction

An estimated 1.24 million people are killed and 20 to 50 million people are injured in motor vehicle crashes (MVCs) around the world each year (World Health Organization, 2013). Road trauma resulting from MVCs now represents the 10th leading cause of global disability, having risen from 12th in 1990 (Murray et al., 2012). In this, the United Nations Decade of Action for Road Safety (United Nations Road Safety Collaboration, 2011), there is an important need to highlight not only the physical, but also the psychological and social consequences of what is an often neglected health issue (Redelmeier & McLellan, 2013).
The terms “motor vehicle crash” (MVC) and “road trauma” are not interchangeable. MVCs refer to incidents, themselves, whereas “road trauma” refers to the damaging effects of MVCs across physical and psychological domains. Literature dedicated to understanding the mental health consequences of traumatic injury has generally been focused on posttraumatic stress disorder (PTSD), possibly at the expense of other frequent and debilitating conditions such as depression (Blanchard, Hickling, Taylor, & Loos, 1995; Ehring, Ehlers, & Glucksman, 2006; McQuaid, Pedrelli, McCauley, & Stein, 2001). While commonly observed following traumatic injury (Creamer, Burgess, & McFarlane, 2001; O’Donnell, Creamer, & Pattison, 2004), the reported prevalence of depression shows great variability (Bryant, 2011). This is in part because of differences in social and behavioral responses to illness (Kirmayer, Groleau, Looper, & Dao, 2004; Risor, 2006; Sirri, Fava, & Sonino, 2013), methodological difficulties in studying road trauma populations (Cameron & Gabbe, 2009; Redelmeier & McLellan, 2013), and also differences in transportation, hospitalization, and litigation/insurance patterns for people injured in accidents across countries and populations (O’Donnell, Creamer, Bryant, Schnnyder, & Shalev, 2003). High levels of comorbidity between PTSD and major depressive disorder have also led some researchers to question whether they are distinct disorders or part of a broader “general distress” factor (Cox, Clara, & Enns, 2002; Grant, Beck, Marques, Paloyo, & Clapp, 2008; Slade & Watson, 2006). It appears clear, however, that although there is significant comorbidity and shared symptomatology between depression, PTSD, and also anxiety disorders following trauma, they remain unique phenomena (Ehring et al., 2006; Mayou, Black, & Bryant, 2000; O’Donnell et al., 2004).

While attributing blame to others for accidents or injury has been linked to an increase in depressive symptoms, distress, and decreased educational and work involvement for victims of both intentional and unintentional accidents (Brewin, 1984; Delahanty et al., 1997; Hart, Hanks, Bogner, Millis, & Esselman, 2007; Ho, Davidson, Van Dyke, & Agar-Wilson, 2000), both mixed and contrary trends have also been observed (e.g., Beck et al., 2004; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999). As such, the direction of association between attributions and recovery remains unsteady and is potentially unique to the trauma population under study and nature of the experienced aversive event (Hall, French, & Marteau, 2003; O’Donnell, Elliott, Wogfong, & Creamer, 2007; Startup, Makgekgene, & Webster, 2007). It appears, therefore, that asumptions regarding relationships between attributions of responsibility and posttrauma recovery may not be easily transferred between injury groups. There is consequently a requirement to better understand how attributions of responsibility affect postinjury mental health and functional recovery among road trauma populations, alone.

Most cognitive models of postinjury psychological disorders focus on the importance of “appraisal of events” and implications that these have for individuals’ “world,” “self,” and “future” in understanding later responses (e.g., Abramson, Seligman, & Teasdale, 1978; Ehlers & Clark, 2000; Ehring et al., 2006; Foa, Steketee, & Rothbaum, 1989). For example, Foa et al.’s (1989) review considered concepts of learned helplessness and victimization, both of which are precipitated by appraisal of aversive events leading to perceptions of uncontrollability and futurity of future behavioral responses. Similarly, Ehlers and Clark’s (2000) model when applied to people injured in MVCs suggests that individuals who demonstrate persistent postaccident psychological disturbance fail to recognize their accident as an isolated, time-limited event that does not have more generalized negative implications for their future. However, not all persons injured in MVCs encounter depressive symptoms postaccident. As such, it is important to understand how circumstances surrounding MVCs may facilitate maladaptive cognitive appraisals, and hence, poor psychological and functional recovery in some individuals.

Unlike other trauma populations such as those arising from natural disaster, terrorist attack, sexual assault, or other circumstances where proportions of victims and perpetrators (if any exist) are consistently and clearly defined (Breslau, 2004), circumstances surrounding MVCs are likely to produce differences in individuals’ assessment of their role in events, even if two people are involved in the exact same incident. Transport systems that produce both single and multivehicle MVCs generate a heterogeneous combination of survivors who variously attribute responsibility to either themselves or others for their injury. In turn, MVC survivors may rightly or wrongly view themselves as accident victims, perpetrators, or a mixture of both based on the circumstances under which their accident occurred. Their view is also likely to be reinforced by social and legal structures that consistently differentiate between the rights, responsibilities, and moral obligations of victims and perpetrators in most circumstances (Young & Saxe, 2009).

One can conceive of the difference in cognitive appraisals that may occur between individuals by considering the circumstances of two drivers (Driver 1 and Driver 2) involved in a single accident. If Driver 1 was unexpectedly struck by Driver 2 because of Driver 2 being distracted and failing to observe a red light, Driver 1 may rightly attribute responsibility for their accident to Driver 2. Driver 1 was operating their vehicle safely and within the law, but was still unable to control the occurrence of the event. There is therefore no guarantee that actions Driver 1 takes in the future in the form of “safe driving behaviors” could prevent a similar occurrence. Driver 1 may therefore appraise the accident as representative of a serious, ongoing, and uncontrollable threat and that driving from that point onward poses great risk. Based on cognitive theories as described earlier (e.g., Abramson et al., 1978; Ehlers & Clark, 2000; Foa et al., 1989), Driver 1 may be likely to suffer postaccident psychological disturbance.

By contrast, Driver 2, although similarly injured within the same accident, may appraise the meaning of the event for his or her future differently. Driver 2 crashed into Driver 1 because of distraction and running a red light and attributes responsibility to themselves. Driver 2 was not operating his or her vehicle safely or within the law and can clearly identify the behaviors (distraction) that led to the accident. Driver 2 may therefore appraise the accident as potentially controllable and representative of no more than a single, time-limited event to be avoided in the future by ensuring that distractions while driving are minimized. Excluding potential disturbance caused by knowledge of his or her role in causing injuries to another person (Abramson et al., 1978; Bradley, 1978; Greenberg, Pyszczynski, Burling, & Tibbs, 1992; Janoff-Bulman, 1979), Driver 2 may perceive greater behavioral control (Chen, Shao, Xu, & Shang, 2009; Roesch & Weiner, 2001) and be less likely to suffer ongoing psychological trauma post injury. In this regard, both drivers experienced the same accident but under
differing circumstances, leading to maladaptive (Driver 1) or adaptive (Driver 2) appraisals.

While the discussion of depression earlier has focused on its role as an outcome of traumatic events, it has also been viewed as a predictor or mediator of functional recovery (Gudmundsdottir, Beck, Coffey, Miller, & Palyo, 2004; Wang, Tsay, & Bond, 2005; Zatzick et al., 2008) such as returning to work. Richmond et al. (2009) found that among individuals who developed a depressive episode in the 12 months following emergency medical treatment, those who met the criteria for depression were eight times less likely to return to preaccident levels of activities of daily living and 2.4 times less likely to return to preaccident work status. The mechanisms and circumstances that led individuals to develop depressive symptoms in the aftermath of their illness, however, were not explored.

The aim of the current study was therefore to examine the association between attributions of responsibility for accidents and postaccident depressive symptoms and return to work within a road trauma population. Consistent with cognitive models of trauma that emphasize the uncontrollability of future events and futility of future actions to avoid harm as precursors to psychological disturbance, it was hypothesized that people who attributed responsibility for accidents to others would demonstrate higher rates of depressive symptoms and lower rates of return to work than those who attributed responsibility to themselves. This finding would contribute to our understanding of the importance of appreciating accident circumstance variables in determining likely postinjury outcomes. Furthermore, it was expected that depressive symptoms would mediate the association between attributions of responsibility for accidents and return to work.

Method

Data Collection

Data were obtained from a de-identified dataset provided by the Victorian Transport Accident Commission (Victorian Transport Accident Commission, 2012), an Australian, state-owned, no-fault personal injury insurance scheme designed to provide compensation and medical/rehabilitation assistance for people injured in MVCs. This dataset consisted of 1,394 individual client records collected between 2011 and 2012 as part of the scheme’s client outcomes survey. Ethical consent for conduct of the research was granted from the respective Human Research and Ethics Committees of Deakin University (Application #: 2012–234) and the compensation’s scheme’s client research body.

Participants

Participants in the study were interviewed on two occasions, 1 year apart. Inclusion criteria for participants at Time 1 (T1) were those who were working at the time of accident, had taken time off work as a result of their accident, were deemed to be either “active” with a claim duration of 6 years or less, or had been “inactive” for 24 months or less. “Active” claims were those that had received payments from the scheme for medical services (apart from ambulance transportation expenses) in the 6 months prior to recruitment.

Participants’ injuries ranged in severity and included and were classified under categories determined by the compensation scheme. Categories included musculoskeletal injuries (e.g., soft tissue sprains, strains, whiplash), orthopedic injuries (e.g., fractures, dislocations), “severe” injuries (e.g., amputations, mild brain injury, head injury, de-gloving, internal or spinal injuries), and “other” injuries (12%, e.g., lacerations, abrasions, concussion). The proportion of participants classified under each category is detailed in Table 1.

Excluded participants were dependents of deceased accident victims or multiple family members in the sample population, clients with catastrophic injuries (those requiring significant lifetime care because of permanent disability), clients under 16, clients that had previously indicated to the system that they did not want to participate in research, clients whose accident anniversary fell within 2 weeks of the potential interview period, clients who were employees of the system. Participants at Time 2 (T2) were a subset from T1 who had indicated willingness to participate in future research and who had volunteered when recontacted.

From a total of 1,396 cases at T1, 1,109 were working at the time of their accident and needed to take time off. From these, 1,024 with complete data were available for analysis. A total of 343 participants then completed T2 interviews, of which 303 had complete data and were included in the analysis. Mean age of participants at T1 was 41 years ($SD = 13$), and 22 of participants were 65 years of age or older, representing a standard retirement age. At T2, the number of participants greater than 65 years of age was 8. Table 1 shows baseline data, means, and frequencies for all participants included in the analysis at T1.

Procedures

Each potential participant received a letter from the scheme describing the research, its purpose, the voluntary nature of participation, the timelines, and commitment required. Once this process was complete, a contracted research company conducted the survey with trained interviewers under the supervision of the scheme representatives via scripted, computer-assisted telephone interview (CATI). Interviews were conducted between 10 a.m. and 8 p.m. and were an average of 25-min duration.

Questionnaire–T1

Attributions of responsibility for the accident. Attributes of responsibility for the accident were assessed by using a methodology similar to that reported in previous work (Delahanty et al., 1997; Harris, Young, Rae, Jalaludin, & Solomon, 2008; Ho et al., 2000). Participants were asked whether they believed they were “totally responsible,” “partially responsible,” or “not responsible at all” for their accident.

Return to work. Preinjury occupational status and rates of return to work were assessed for each respondent. Participants were considered to have “returned to work” if they were in paid employment at their time of accident, took time off work as a result of their accident, and were working at the time of interview.

Demographic, vehicle, and claim information. Demographic information included gender, employment status at time of accident, role in accident, age, and claim duration (Table 1). Basic scheme-related service information, including claim duration and injury
classification, was also collected. The injury coding system applied by the scheme uses the most severe injury suffered by the client as its basis for classification (Table 1).

**Short-Form-12 Health Survey, Version 2 (SF-12 V2).**

General physical and mental health status was measured using the SF-12 V2. The SF-12 V2 has been demonstrated to be reliable relative to the SF-36 in the general population (Ware, Kosinski, & Keller, 1996) and has been used in multiple trauma studies with comparable populations (e.g., Gabbe et al., 2007). To estimate the presence of depressive symptoms at T1, we used the single-item depression measure, “During the past 4 weeks, how often have you felt downhearted and depressed,” and categorized participants into two groups based on a response of “some,” “most,” or “all of the time” (depressive symptoms), or a “none” or “a little of the time” (no depressive symptoms). The use of this single-item was chosen as a proxy for the more comprehensive measure of depression used at T2.

**Questionnaire–T2**

The Depression Subscale of the Depression, Anxiety, and Stress Scale (DASS-21). In addition to scales administered at T1, participants at T2 were also administered the Depression subscale of the DASS-21. This subscale is one of a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress (Lovibond & Lovibond, 1995). The depression subscale of the DASS-21 contains 7 items and assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/ involvement, anhedonia, and inertia. Participants were asked to use 4-point severity/frequency scales to rate the extent to which they had experienced each state “over the past week.” Scores were calculated by summing the scores for the relevant items. Participants were grouped into 5 categories of “normal” (0–4), “mild” (5–6), “moderate” (7–10), “severe” (11–13), and “extremely severe” (14+) symptoms (Lovibond & Lovibond, 1995).

**Analysis.** To test the association between attributions of responsibility for accident (ATR), depressive symptoms (DEP), and return to work (RTW), we conducted a series of binary logistic regressions using the broad framework proposed by Baron and Kenny (1986) (Figure 1). Under this framework, we undertook four calculations, first testing the independent relationships of paths \( a \) (ATR – RTW), \( b \) (ATR – DEP), and \( c \) (DEP–RTW). We then tested pathway \( a \) (ATR – RTW) again while controlling for the effect of DEP on RTW (path \( c \)). Under this circumstance, if pathway \( a \) was no longer significant, it was assumed to support our hypothesis that symptoms of depression mediated the relationship between attributions of responsibility and return to work. To control for the effect of demographic variables, age (AGE), gender (GEN), injury group (IGR), and duration of claim (DUR) were

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**Table 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>%</th>
<th>n</th>
<th>Mean (range)</th>
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<tr>
<td>Female</td>
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<td>356</td>
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<td></td>
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<td>Mean age (years)</td>
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<tr>
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<td>Cyclist</td>
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<td>81</td>
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<tr>
<td>Public transport/other</td>
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<td>11</td>
<td></td>
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<tr>
<td>Injury classification</td>
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<td>Musculoskeletal (e.g., sprains, strain, whiplash)</td>
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<tr>
<td>Orthopedic (e.g., limb fractures, dislocations)</td>
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<td>477</td>
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<tr>
<td>Other injuries (e.g., cuts, abrasions, concussions)</td>
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<td>118</td>
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<tr>
<td>Severe (e.g., mild head injuries, spinal damage, burns, spinal)</td>
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<td>207</td>
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<td>Claim duration</td>
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<td>0–12 months</td>
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<tr>
<td>37–72 months</td>
<td>18</td>
<td>187</td>
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</tbody>
</table>

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**Figure 1.** Pathways tested between attributions of responsibility for accident (ATR), depressive symptoms (DEP), and return to work (RTW) at T1 and T2.
entered simultaneously alongside the independent variables in each equation. In total, four separate studies were conducted at T1 and T2. Data were analyzed using SPSS V.21 (IBM, 2011).

**Results**

Table 2 shows descriptive statistics for participants at T1 across perceived responsibility for accident, depressive symptomatology as measured by the SF-12 V2, and employment status. Figures indicated that the majority of participants viewed themselves as “not responsible at all” for their accident. Over three quarters of participants were working at the time of interview, and 35% reported feeling “down-hearted and depressed” at least “some of the time.”

**Study 1.1**

We first estimated the association between ATR and RTW (path a) using a binary logistic regression. A test of the full model with ATR and demographic predictors was significant, $\chi^2(8, N = 1,024) = 45.3, p < .001$, indicating that the predictors adequately distinguished between those likely to return to work at follow-up or not (Nagelkerke $R^2 = .07$). According to the Wald criterion, results showed that ATR was significantly associated with RTW status at T1, $\chi^2(2, N = 1,024) = 8.63, p < .05$, with participants “partially responsible,” $\chi^2(1, N = 1,024) = 6.31, p < .05$, or “not responsible at all,” $\chi^2(1, N = 1,024) = 8.25, p < .01$, for their accident 2.0 times less likely to have returned to work at follow-up than those reporting to be totally responsible. Injury group (IGR) was also associated with RTW, $\chi^2(3, N = 1,024) = 27.94, p < .001$. People with orthopedic, $\chi^2(1, N = 1,024) = 24.78, p < .001$, and musculoskeletal injuries, $\chi^2(1, N = 1,024) = 11.14, p < .01$, were 2.6 times more likely to have returned to work at follow-up than those with “severe” injuries.

**Study 1.2**

Next, analysis of the full model of ATR on DEP (path b) showed that the set of predictors significantly, $\chi^2(8, N = 1,024) = 59.5, p < .001$, distinguished between persons likely to show symptoms of depression or not at follow-up (Nagelkerke $R^2 = .08$). Path b showed that ATR was significantly associated with DEP, $\chi^2(2, N = 1,024) = 28.6, p < .001$, and that people who reported not being responsible at all for their accident were 2.9 times more likely to report depressive symptoms at least “some” of the time during the past four weeks than those who reported being “totally responsible” for their accident, $\chi^2(1, N = 1,024) = 24.3, p < .001$, (Figure 2). People who reported being “partially responsible” for their accident were 1.6 times more likely to report depressive symptoms, $\chi^2(1, N = 1,024) = 4.0, p < .05$, than “totally responsible” participants. Age, $\chi^2(1, N = 1,024) = 4.9, p < .05$, and injury group, $\chi^2(3, N = 1,024) = 8.5, p < .05$, were also associated with depressive symptoms. Each additional year in age was associated with an approximate 1% rise in likelihood of reporting depressive symptoms at least “some of the time,” while people with orthopedic and musculoskeletal injuries were 1.6 and 1.7 times less likely to report depressive symptoms than people with “severe” injuries, respectively.

**Study 1.3**

Analysis of path c showed that the full model was statistically significant, $\chi^2(7, N = 1,024) = 120.7, p < .001$, explaining almost 17% of the variance in RTW (Nagelkerke $R^2 = .17$) and that depressive symptoms (DEP) were strongly associated with RTW status, $\chi^2(1, N = 1,024) = 81.83, p < .001$. People who reported depressive symptoms at least “some of the time” during the previous 4 weeks were 4.3 times less likely to have returned to work at interview than those who reported no depressive symptoms (Figure 3). Results also showed that injury classification was associated with RTW, $\chi^2(3, N = 1,024) = 21.6, p < .001$, with participants suffering orthopedic and musculoskeletal injuries 2.4, $\chi^2(1, N = 1,024) = 19.6, p < .001$, and 2.3, $\chi^2(1, N = 1,024) = 7.9, p < .01$, times more likely to have returned to work than those with “severe” injuries (Figure 3).

**Study 1.4**

To assess the mediating effects of DEP on the relationship between ATR and RTW, we regressed ATR on RTW (path a) while controlling for the effect of DEP on RTW (path c). The full model explained 18% (Nagelkerke $R^2 = .18$) of the variance in RTW outcomes at follow-up, $\chi^2(9, N = 1,024) = 125.1, p < .001$. Results also showed that although the relationship between DEP and RTW remained mostly unchanged, $\chi^2(1, N = 1,024) = 76.7, p < .001$, the association between ATR and RTW (path a) was no longer significant, $\chi^2(2, N = 1,024) = 4.25, p > .10$. This provided support for the mediational model, indicating that the effect of attributions of responsibility for accidents on likelihood of returning to work was mediated by the presence of depressive symptoms (Figure 3) No other demographic variable or accident circumstance variable was associated with RTW.

**Time 2**

An identical process was undertaken with participants at T2 as occurred at T1, with the exception that the measure of depressive symptoms used was the depression subscale of the DASS-21. Examination of the relationship between both scales at T2 showed
a high degree of association ($r = .77$), with 94% of participants categorized as demonstrating “mild depressive symptoms or above” on the DASS-21 indicating that they had felt downhearted or depressed at least “a little of the time” on the SF-12 single item. Similarly, only 13% of those reporting “no symptoms” on the DASS-21 also reported feeling downhearted or depressed, “some of the time” or more.

A total of 343 participants who participated at T1 were working at their time of accident and took time off work as a result of their injuries were interviewed at T2. After screening for missing data, 303 participants were included in the analysis. Despite only 30% of respondents from T1 participating at T2, negligible difference between samples in relation to demographic or accident circumstances was observed.

**Study 2.1**

Analysis of path $a$ within the mediational model showed that the full model did not adequately distinguish between RTW outcomes at T2, $\chi^2(8, N = 303) = 12.7, p > .05$, and ATR was not independently associated with likelihood of return to work (RTW) at T2, $\chi^2(1, N = 303) = 3.7, p > .10$. Trends ($p < .10$) consistent with T1 results were observed, however, indicating that persons partially or totally responsible for their accident were around 2.6 times more likely to have returned to work than those who were not responsible at all.

**Study 2.2**

Consistent with findings from T1, the full model of path $b$ showed that the set of predictors adequately distinguished, $\chi^2(8, N = 303) = 16.5, p > .05$, between people with depressive symptoms and those without (Nagelkerke $R^2 = .07$). ATR was significantly associated with DEP (path $b$) as measured by scores on the DASS-21, $\chi^2(2, N = 303) = 7.5, p < .05$. Participants who reported not being responsible for their accident were 2.7 times, $\chi^2(1, N = 303) = 6.9, p < .01$, more likely to demonstrate symptoms of depression than those who reported being totally responsible for their accident (Figure 4). No other measured demographic or claim-related information was associated with the presence of depressive symptoms at T2.

**Study 2.3**

Analysis of path $c$ at T2 again showed a significant relationship between DEP and RTW, $\chi^2(1, N = 303) = 15.1, p < .001$. Participants who demonstrated symptoms of depression categorized as “mild or above” using the depression subscale of the DASS-21 were 3.4 times less likely to have returned to work at follow-up than those who reported “normal” symptom levels. Analysis of the full model showed a significant relationship between the set of predictors and RTW, $\chi^2(7, N = 303) = 23.8, p > .01$, accounting for around 12% of the variance in outcomes (Nagelkerke $R^2 = .12$).

**Study 2.4**

Despite no strong, direct relationship between ATR and RTW being demonstrated in Study 1 at T2, for purposes of comparison we assessed the mediating effects of DEP by regressing ATR on RTW (path $a$) while controlling for the effect of DEP on RTW (path $c$). Results of the full model were consistent with those at T1, showing that together, predictors distinguished between RTW outcomes, $\chi^2(9, N = 303) = 26.7, p < .01$, explaining 14% of the variance (Nagelkerke $R^2 = .14$). Furthermore, it supported the
assumption that the effect of attributions of responsibility for accidents on returning to work was contingent on the presence of depressive symptoms. When entered alongside the effect of ATR on RTW, people with symptoms of depression were 2.5 times less likely to have returned to work at follow-up than those who reported being “totally responsible.” Those who attributed responsibility for accidents to others were 3.5 times less likely to have returned to work at follow-up than those who reported being “totally responsible.” People reporting depressive symptoms at least “some of the time” exhibit depressive symptoms than people “totally responsible.”

Given the use of a different, more robust measure of depressive symptoms at T2, a subsequent analysis was conducted substituting the DASS-21 subscale with the single-item SF-12 depression variable administered at T2. Results yielded very similar results to those above. Again, ATR did not show a significant relationship with RTW (path a), ATR was significantly associated with DEP (path b), $\chi^2(2, N = 303) = 11.5, p < .01$, with those “not responsible at all” for their accident 3.2 times more likely to exhibit depressive symptoms than people “totally responsible.” People reporting depressive symptoms at least “some of the time” were 4.0 times, $\chi^2(1, N = 303) = 12.6,0, p < .001$, less likely to have returned to work (path c).

**Discussion**

The aims of the present study were to examine the relationship between attributions of responsibility for accidents, presence of depressive symptoms, and rates of return to work within a road trauma population. As hypothesized, the results show that attributions of responsibility for accidents are strongly associated with the presence of depressive symptoms among road trauma survivors. People who attributed responsibility for accidents to others were around 3 times more likely to exhibit symptoms of depression than those who reported being “totally responsible” for their accident. Furthermore, the findings supported our hypotheses in revealing that the presence of depressive symptoms mediated the relationship between attributions of responsibility and return to work status; people who reported depressive symptoms were over 3.5 times less likely to have returned to work at follow-up than those who were asymptomatic.

Classic attribution theory (e.g., Abramson et al., 1978; Bradley, 1978; Greenberg et al., 1992) may lead us to predict that people who attribute responsibility to themselves for accidents would experience greater levels of depressive symptoms and poorer outcomes. The opposite, however, appears to be true among road trauma survivors. This points to perhaps a second level of self-blame; namely characterological versus behavioral (Janoff-Bulman, 1979), that may be associated with response to accidents. While some people may attribute responsibility to themselves for accidents, they may isolate this error to a behavioral rather than characterological flaw that enables (possibly illusory) future behavioral control.

Similarly, accident circumstances may precipitate cognitive appraisals that produce adaptive or maladaptive psychological and functional recovery, consistent with cognitive theories of post-trauma adjustment (e.g., Ehlers & Clark, 2000; Foa et al., 1989). It is feasible to expect that people who were at fault in their accident could identify the behaviors (e.g., distraction, speeding, not giving way, etc.) that led to their injury. As such, they may also believe they can exert control in the future to avoid accidents or injury (Brewin, 1984), regardless of the accuracy of this assumption in practice. For people “not responsible” for their accidents, however, previous safe driving did not prevent them from having an accident and there is no certainty that operating a vehicle safely in the future can prevent harm. Future actions to avoid injury could therefore be perceived as futile in the face on an ongoing threat and leave the individual helpless; a key element associated with the presence of depression (Abramson et al., 1978; Young, Beck, & Weinberger, 1993).

Another possible explanation for the results observed here is the involvement of illness behaviors (Sirri et al., 2013) associated with being the victim of a car accident. In the state of Victoria, safety messaging surrounding road trauma is one of the most successful, highly funded, and widely visible public health issues, with expenditure on safety and marketing campaigns reaching AUD$50 million per annum (Victorian Transport Accident Commission, 2012). Viewed in a wider context that considers individuals’ behavior within social relations, institutions and health system structures (e.g., family, medical professionals, social and employment structures, insurers/compensation agencies; Kirmayer et al., 2004; Risor, 2006), it is plausible that high-impact, widely recognized public awareness campaigns designed to prevent future road trauma reinforces or legitimizes assessment of one’s role in an accident as either a victim or perpetrator (Breslau, 2004). In turn, this may lead to adaptive or maladaptive consequences for road trauma survivors. Certainly, much prior work has focused on the detrimental role that compensation plays in producing poorer outcomes (e.g., Cameron & Gabbe, 2009; Gabbe et al., 2007; Harris et al., 2008; Miller, 1961; Zelle et al., 2005). However, the mechanisms by which compensation is thought to affect outcomes is not well explicated. Future research may wish to expand the focus on compensation, perhaps to also include consideration of individuals as social agents operating and interacting within a broader societal context and cultures of trauma.

It is a limitation of this study that illness behaviors were not measured. A further limitation of the present study is that the directional relationship between return to work and depressive symptoms in this cross-sectional study is unclear, and may well be dynamic in nature (e.g., Jefferis et al., 2011; Paul & Moser, 2009). Further exploration of the nature of preaccident employment categories (e.g., part-time, casual, salary levels, etc.) associated with postaccident unemployment conditions is warranted. Although there is traditionally poor association observed between levels of injury and outcomes (Fields, 2000; Harris et al., 2008; Thompson, Berk, O’Donnell, Nordfjaern, & Stafford, in press), a more sophisticated understanding of injury

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**Figure 5.** Overview of the relationship at T2 between responsibility for accident (ATR), depressive symptoms (DEP), and return to work (RTW).
severity may have also demonstrated greater association between injury and RTW status. Finally, the use of separate measure of depression at each time point within this study is a limitation. A more robust measure of depressive symptoms used at Time 1 (i.e., the depression subscale of the DASS-21 as was used at Time 2), would have strengthened results by enabling the conduct of a repeated measures design.

Other excluded factors that may account for part of the variance between groups observed here relate to the presence of preexisting mental illness (Malta, Blanchard, Taylor, Hickling, & Freidenberg, 2002; O’Donnell, et al., 2008), differences in treatments or interventions sought by each group (Blanchard et al., 2003; Wagner, Zatzick, Ghesquiere, & Jurkovich, 2007), postaccident coping strategies (Dörfel, Rabe, & Karl, 2008; Victorsen, Farmer, Burnett, Ouellette, & Barocas, 2005), or involvement in common-law litigation processes (Australian Productivity Commission, 2011; Harris et al., 2008; Shuman, 1994; Spearing, Connelly, Gargett, & Sterling, 2012). It is particularly interesting, however, that even within a no-fault personal injury compensation system, and controlling for injury severity which is a gateway to accessing common-law benefits, the effect of attributions of responsibility for MVCs on outcomes appears robust. This is also consistent with previous work undertaken with this population (Thompson et al., in press).

Conclusions/Implications

These results demonstrate that following motor vehicle crashes, poor mental health recovery is likely to be a significant barrier to successfully returning to work. In particular, this barrier is also more likely to be present among people who report not being responsible for their accident. This knowledge can assist practitioners and personal injury compensation systems to ensure that not only physical workplace issues are addressed in assisting injured persons return to work, but that sufficient attention is placed on identifying and addressing underlying mental health issues that may be precluding successful occupational rehabilitation. This could be achieved through further efforts in both screening (O’Donnell, Creamer, et al., 2008) and targeted interventions (Blanchard & Hickling, 2004; O’Donnell, Bryant, Creamer, & Carty, 2008).

The methodological implications of these findings are that attributions of responsibility for accidents should be controlled for in future work that considers the mental health outcomes of injured persons and/or compensable populations. Furthermore, given their indirect association with likelihood of return to work through the mediating factor of depression, consideration of the influence of attributions of responsibility for accidents in occupational rehabilitation or return to work studies should also be made within future study designs.

The potential mechanisms through which attributions of responsibility for operate may be both cognitive and social in nature. It is imperative that future research understands the relative contribution of both social and cognitive factors impacting recovery, as interventions emanating from each perspective will require changes at either the individual (cognitive) or social (health/compensation/rehabilitation systems) level.

References

ATTRIBUTIONS, DEPRESSION, AND RETURN TO WORK


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The association between attributions of responsibility for motor vehicle accidents and patient satisfaction: a study within a no-fault injury compensation system

Jason Thompson1,2, Michael Berk1,3,4,5, Meaghan O’Donnell5,6, Lesley Stafford5,7 and Trond Nordfjaern8

Abstract
Objective: This study set out to test the relationship between attributions of responsibility for motor vehicle accidents and satisfaction with personal injury compensation systems.

Design: The study analysed survey data from 1394 people injured in a motor vehicle accident who were compensated under a no-fault personal injury compensation system. Patients’ ratings of satisfaction with the compensation system across five domains (resolves your issues, keeps you up-to-date, treats you as an individual, cares about you, and overall satisfaction) were analysed alongside patient attributions of responsibility for their accident (not responsible, partly responsible, totally responsible). Postaccident physical and mental health status, age, gender, and duration of compensation claim were controlled for in the analysis.

Results: A multivariate analysis of covariance indicated attributions of responsibility for accidents were significantly associated with levels of patient satisfaction across all five domains under study ($F(10, 2084) = 3.7, p < 0.001, \eta^2 = 0.02$). Despite access to virtually indistinguishable services, patients who attributed responsibility for their accidents to others were significantly less satisfied with the injury compensation system than those who attributed responsibility to themselves.

Conclusions: Satisfaction with no-fault motor vehicle injury compensation services are associated with patients’ attributions of responsibility for their accident. Compensation systems and other rehabilitation services monitoring patient satisfaction should adjust for attributions of responsibility when assessing levels of patient satisfaction between time periods, services, or injured populations. Differences in levels of patient satisfaction observed between compensation or rehabilitation populations may reflect differences in attributions of responsibility for accidents rather than objective service quality.

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Injury, satisfaction, attributions, accidents, motor vehicles

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**Introduction**

Well-functioning rehabilitation and healthcare systems are frequently distinguished by their association with highly satisfied patients.\(^1^2\) Further, government financial incentives for both hospitals and injury insurers alike are often tied to patient satisfaction ratings.\(^3^4\)

In addition to being regarded as an important measure of service quality and function,\(^5\) high levels of patient satisfaction contribute to improved adherence to medical regimens,\(^6^7\) reduced likelihood of changing medical providers,\(^6\) reduced likelihood of litigation,\(^9\) and increased care-seeking from medical professionals rather than laypeople.\(^10\) Increasing patient satisfaction, therefore, appears to benefit both organisations and individuals, alike.

Attempts to improve patient satisfaction among healthcare, rehabilitation, and compensation services are often based on an assumption that satisfaction is driven by the behaviour and characteristics of services, themselves.\(^11\) Interpersonal manner of staff, perceived technical competence, accessibility and convenience, financial arrangements, continuity of care, and efficacy of service\(^12\) are all factors previously reported to influence patient satisfaction. However, subjective measures of satisfaction across these domains do not solely assess the performance of organisations; they are also reflective of patients' expectations, preferences, prior experiences, and desired levels of care.\(^12^15\)

A wide range of demographic and patient characteristics can also affect patient satisfaction,\(^14^16\) including age, gender, socioeconomic status, education,\(^1,17,18\) mental health status,\(^19^21\) pain,\(^22\) depression,\(^22,23\) and absolute health outcomes after injury or illness.\(^24\) Therefore, both the individual characteristics patients bring to rehabilitation settings and the eventual health outcomes they achieve have considerable influence over their ultimate ratings of satisfaction with services.

Theoretical understanding of patient satisfaction has advanced little in the past two decades. A recent area of development, however, relates to injury compensation research. Here, perceptions of organisational justice following injury, and the quality of patient interaction with compensation systems, have emerged as areas of interest.\(^25^31\) However, in contrast to the work mentioned above, the quality of interaction between patients and services within these studies has been viewed as a moderator of health outcomes rather than a result of them.

Within road trauma and injury populations, internal attributions of responsibility for accidents have been shown to have protective effects across posttraumatic stress disorder,\(^32^35\) depression,\(^36\) and general psychological distress.\(^37,38\) Similarly, compensable patients and those who attribute responsibility for injuries to others have shown heightened perceptions of injustice, blame, and anger.\(^29,30,39,40\)

Despite this literature suggesting that external attributions of responsibility for accidents or injuries may lead to interactions with service providers more likely to be viewed by patients as unjust, attributions of responsibility have been absent from previous assessment of factors associated with patient satisfaction.\(^13^16,22,41^43\) If patient satisfaction is indeed affected by more than just service quality and health outcomes alone,\(^25\) it is possible that attributions of responsibility may also play a significant role. Attributions of responsibility for accidents may influence levels of patient satisfaction even in circumstances where accessibility of healthcare services and support is largely indistinguishable, as is the case in no-fault injury compensation systems.

The aim of this study was, therefore, to assess whether attributions of responsibility for accidents are associated with patient satisfaction among clients who have received care within a no-fault injury compensation system.\(^44\) It was hypothesised...
that, after controlling for physical health outcomes, mental health outcomes, compensation claim duration, age, and gender, people who attributed responsibility for accidents to others would demonstrate lower levels of satisfaction with no-fault compensation services than those who attributed responsibility to themselves.

Method

Data were extracted from a de-identified patient outcomes survey data set of persons injured in a motor vehicle accident and compensated by the Victorian Transport Accident Commission. People insured by the Victorian Transport Accident Commission have access to ambulance cover, hospital treatment, medical services, allied health services, occupational rehabilitation, pharmaceuticals, loss of earnings payments for time off work, and a wide range of other assistance, including lump-sum payments for ongoing disability. In addition, persons considered ‘not-at-fault’ in their accident who suffer serious injuries have recourse to additional lump-sum payments through the pursuit of common-law (tort) cases if they are deemed to have suffered serious injuries resulting in significant permanent incapacity.

The physical and mental health rehabilitation services available to both ‘at-fault’ and ‘not-at-fault’ clients through the Victorian Transport Accident Commission is virtually identical and arguably the most generous in Australia. Where differences do exist between services available to ‘at-fault’ and ‘not-at-fault’ parties (i.e. reduced access to compensation for drink-drivers), they favour ‘not-at-fault’ person. The system operates similarly to other no-fault injury schemes in New Zealand, Canada, and the United States.

Participants

Participants were clients of the compensation system that had been injured in a motor vehicle accident and received payment for medical services within the previous 25 months. Participants were excluded from the study if they had suffered catastrophic injuries as deemed by the system, were dependents of deceased accident victims, had previously indicated to the system that they did not want to participate in research programmes or communicate with representatives of the compensation system, were multiple family members of other persons in the sample populations, were persons whose accident anniversary occurred two weeks either side of the potential interview period, or were employees of the compensation system.

Procedures

A hard-copy letter of invitation to participate in the research was mailed to a sample of 3500 persons who met criteria for study inclusion as described above. The letter described the purpose of the research, that they may be contacted by telephone to participate, the voluntariness of participation, and time commitment requested. At this stage, potential participants had a two-week period in which they could contact the compensation system’s client research division to withdraw participation consent, or request a specific interview day and time.

A contracted research company then conducted the survey via Computer Assisted Telephone Interview under the supervision of compensation system representatives. Participants were free to withdraw consent at any stage through the initial contact or interview process. Interviews were conducted over a four-week period between the hours of 10 am and 8 pm. The average interview length was 25 minutes. Data collection from the potential pool of participants ceased when sufficient rates of participation as desired by the compensation scheme (N = 1394) had been met. The overall response rate for persons contacted via telephone and eligible for participation was 70%.

Ethics approval for this research was granted by the human research and ethics committees of Deakin University (2012-234) and the equivalent body within the Transport Accident Commission.

Measures

The full survey contained a wide range of measures relating to postaccident recovery and participants’...
experience with the compensation system. Those relevant to the current study are listed below.

Satisfaction with the compensation system was measured using five variables rated on a scale from 1 to 10. Participants were asked: ‘How satisfied are you on a scale of 1 to 10 with 1 being the least satisfied and 10 being the most satisfied with the way the system; ‘resolves your issues’; ‘keeps you up to date’; ‘treats you as an individual’, and; ‘cares about you’. Finally, participants were asked to respond to the question; ‘Overall, how satisfied are you with the system on a scale of 1 to 10 with 1 being least satisfied and 10 being the most satisfied you could possibly be?’

To assess attributions of responsibility for their accident, participants were asked whether they believed they were ‘totally responsible’, ‘partially responsible’, or ‘not responsible at all’ for their motor vehicle accident.

The Short-Form Health Survey-12, Version 2 (SF-12, V2) was used to measure mental and physical health outcomes at the time of interview. Based on physical health composite (PCS) and mental health composite scores (MCS) produced by the SF-12 V2, participants were then divided into equally distributed quartiles (low, medium low, medium high, high) across each domain.

Demographic information was collected for each respondent, including gender, age, and claim duration. Claim duration is a compensation administration variable that closely approximates time elapsed since accident.

Statistical analysis

To determine the association between attributions of responsibility for accidents and satisfaction with compensation services, a multivariate analysis of covariance was undertaken with five dependent variables (resolves your issues, keeps you up to date, treats you as an individual, cares about you, and overall satisfaction), and the three independent variables of responsibility for accident (not responsible, partly responsible, totally responsible), MCS score quartiles, and PCS score quartiles. To adjust for the influence of age, gender, and claim duration, these factors were entered as covariates into the model. Planned posthoc tests (Fischer’s Least Squared Difference (LSD)) were then undertaken to assess differences between groups on levels of satisfaction with the compensation system.

Results

After list-wise screening for missing data across all participant records (N=1394), 297 participants were excluded, leaving a total of 1097 available for analysis. Assessment of differences between included and excluded participants (see Tables 1) showed no significant differences between groups on variables under study; with the exception that those excluded from analysis were, on average, marginally older (μ=46.5 years, σ=16.7) than included participants (μ=42.3 years, σ=14.9) (p<0.05). Assessment of demographic differences across responsibility for accident groups demonstrated that ‘not responsible’ participants were proportionately more likely to be females and were also slightly older (μ=44.2 years, σ=14.3) than either partially (μ=39.3 years, σ=14.9) or totally responsible (μ=38.9 years, σ=15.5) participants (see Table 2).

Included participants had incurred a range of injuries ranging in severity from musculoskeletal injuries (26%) (e.g. soft tissue sprains, strains, whiplash), orthopaedic injuries (41%) (e.g. fractures, dislocations), ‘severe’ injuries (21%) (e.g. amputations, mild brain injury, head injury, degloving, internal, spinal injuries), and ‘other’ injuries (12%) (e.g. lacerations, abrasions, concussion).

Observing Pillai’s trace criteria, results demonstrated a significant multivariate effect for attributions of responsibility for accident across the combined satisfaction-related variables (F (10, 2084) = 3.7, p<0.001, η²=0.02) indicating that attributions of responsibility were independently associated with satisfaction with the compensation system. Between-subject effects demonstrated significant associations between attributions of responsibility and all satisfaction-related variables under study, including: overall satisfaction with the system (F (2, 1095) = 14.90, p<0.001, η²=0.03); rating of how the system resolves issues (F (2,
Table 1. Descriptive statistics associated with age, gender, and duration of claim for included and excluded participants.

<table>
<thead>
<tr>
<th></th>
<th>Included cases (N=1097)</th>
<th>Excluded cases (N=297)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%  n Mean  SD</td>
<td>%  n Mean  SD</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>62.7  688  42.3b  14.9</td>
<td>58.2  173</td>
</tr>
<tr>
<td>Female</td>
<td>37.3  409  46.5a  16.7</td>
<td>41.8  124</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–12 months</td>
<td>29.1  319</td>
<td>26.6  79</td>
</tr>
<tr>
<td>13–24 months</td>
<td>32.2  353</td>
<td>24.6  73</td>
</tr>
<tr>
<td>25–36 months</td>
<td>19.1  209</td>
<td>25.3  75</td>
</tr>
<tr>
<td>37+ months</td>
<td>19.7  216</td>
<td>23.6  70</td>
</tr>
</tbody>
</table>

Values in the same row not sharing the same subscript are significantly different at $p<0.05$ level.

1095) $= 11.41, p<0.001, \eta^2=0.02$); rating of how the system keeps the patient up to date ($F (2, 1095) = 7.07, p<0.01, \eta^2=0.01$); rating of whether the patient believes the system treats them as an individual ($F (2, 1095) = 8.54, p<0.001, \eta^2=0.02$); and rating of whether the system cares about them ($F (2, 1095) = 8.97, p<0.001, \eta^2=0.02$).

A series of posthoc tests (Fisher’s LSD) revealed the direction of effect between levels of attributions of responsibility and satisfaction (see Table 3). Persons who attributed responsibility for their accident reported lower ratings of overall satisfaction, resolution of issues, being kept up to date, being treated as an individual, and ratings of whether patients believed the system cares about them in comparison to those who reported being totally responsible for their accident ($p<0.001$). Linear trends were observed between level of responsibility and estimates of individual elements of patient satisfaction, indicating that satisfaction with the compensation system increased with increasing internal attributions of responsibility for accidents.

Significant multivariate effects were also observed for SF-12 V2 PCS ($F (15, 2877) = 1.7, p<0.05, \eta^2=0.01$) and SF-12 V2 MCS quartile groups ($F (15, 2877) = 1.7, p<0.05, \eta^2=0.01$), indicating that both mental and physical health status were positively associated with levels of satisfaction after controlling for age, gender, and duration of claim. Duration of claim was the only covariate to record a multivariate effect ($F (5, 1042) = 7.0, p<0.001, \eta^2=0.03$) with descriptive data showing that shorter claim durations were associated with higher levels of satisfaction. No significant multivariate interaction effects were observed between independent variables.

**Discussion**

Results supported our hypothesis in that, after controlling for mental and physical health status, age, gender, and duration of claim, people who attributed responsibility for their motor vehicle accident to others were significantly less satisfied with the support they received. We believe that is particularly interesting given that the differences observed between levels of responsibility on patient satisfaction are independent of health outcomes and occurred within a no-fault scheme specifically designed to reduce disadvantages associated with fault-based compensation and rehabilitation resources available to all participants under study were virtually identical. It is therefore curious that persons who attributed responsibility for accidents to others remained less satisfied with the injury compensation system than those who attributed responsibility either partially or completely to themselves. This finding is novel because, to the authors’ knowledge, no previous investigation has considered the role of attributions of responsibility for accidents or injury on perceptions of satisfaction with injury compensation or other health services.

The compensation and rehabilitation resources available to all participants under study were virtually identical. It is therefore curious that persons who attributed responsibility for accidents to others remained less satisfied with the support they received. We believe that is particularly interesting given that the differences observed between levels of responsibility on patient satisfaction are independent of health outcomes and occurred within a no-fault scheme specifically designed to reduce disadvantages associated with fault-based
systems. Although unmeasured in this study, these results add weight to themes relating to perceptions of injustice, blame, and anger among patients\(^{29,30,36,39,40}\) that may contribute to decreased levels of satisfaction among not-responsible persons.

These findings are important from both an applied and theoretical perspective for the conceptualisation and study of patient satisfaction among injury compensation and rehabilitation service providers. From an applied perspective, they highlight that factors associated with satisfaction among clients of no-fault injury compensation systems are not wholly under the control of the service provider. Organisations and clinicians seeking to measure the quality and function of the services they deliver are met by a casemix that may vary in relation to the degree in which it attributes responsibility for injury or illness to themselves or others. It is plausible that two services delivering identical care to separate groups of patients for whom the genesis of their ailment is either internally or externally attributable could encounter considerable differences in their mean ratings of patient satisfaction. Without adjusting for casemix between the two services, satisfaction results may not provide an accurate reflection of actual differences in service quality. Similarly, compensation or health services that monitor satisfaction over time, but do not adjust for casemix, may misconstrue the true nature of satisfaction among patients.

### Table 2. Descriptive statistics associated with age, gender, and duration of claim for all participants within each attribution of responsibility group.

<table>
<thead>
<tr>
<th></th>
<th>Totally responsible</th>
<th>Partially responsible</th>
<th>Not responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>Mean</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>143(c)</td>
<td>73.0</td>
<td>38.9</td>
</tr>
<tr>
<td>Female</td>
<td>53(c)</td>
<td>27.0</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–12 months</td>
<td>59(c)</td>
<td>30.1</td>
<td>63</td>
</tr>
<tr>
<td>13–24 months</td>
<td>65(c)</td>
<td>33.2</td>
<td>67</td>
</tr>
<tr>
<td>25–36 months</td>
<td>42(c)</td>
<td>21.4</td>
<td>49</td>
</tr>
<tr>
<td>37+ months</td>
<td>30(c)</td>
<td>15.3</td>
<td>38</td>
</tr>
</tbody>
</table>

Values in the same row not sharing the same subscript are significantly different at \(p < 0.05\) level.

### Table 3. Estimates of satisfaction elements associated with levels of attributions of responsibility for accidents after adjusting for age, gender, time since accident, injury severity group, and mental and physical health component scores from the SF-12 V2.

<table>
<thead>
<tr>
<th></th>
<th>Totally responsible</th>
<th>Partially responsible</th>
<th>Not responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>System resolves your issues</td>
<td>Mean 8.03(c)</td>
<td>7.66(c)</td>
<td>7.08(a,b)</td>
</tr>
<tr>
<td></td>
<td>SE 0.20</td>
<td>0.18</td>
<td>0.10</td>
</tr>
<tr>
<td>System keeps you up-to-date</td>
<td>Mean 7.84(b,c)</td>
<td>7.18(a)</td>
<td>6.94(a)</td>
</tr>
<tr>
<td></td>
<td>SE 0.22</td>
<td>0.19</td>
<td>0.10</td>
</tr>
<tr>
<td>System treats you as an individual</td>
<td>Mean 8.10(c)</td>
<td>7.69(c)</td>
<td>7.20(a,b)</td>
</tr>
<tr>
<td></td>
<td>SE 0.21</td>
<td>0.19</td>
<td>0.10</td>
</tr>
<tr>
<td>System cares about you</td>
<td>Mean 7.74(b,c)</td>
<td>7.08(c)</td>
<td>6.68(a)</td>
</tr>
<tr>
<td></td>
<td>SE 0.23</td>
<td>0.21</td>
<td>0.11</td>
</tr>
<tr>
<td>Overall satisfaction with system</td>
<td>Mean 8.21(b,c)</td>
<td>7.46(a,c)</td>
<td>6.98(a,b)</td>
</tr>
<tr>
<td></td>
<td>SE 0.21</td>
<td>0.19</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Values in the same row not sharing the same subscript are significantly different at \(p < 0.05\) level. SE denotes Standard Error.
of observed changes in satisfaction ratings between time periods.

Adjusting for attribution, case mix may be particularly important in injury compensation services where the changing popularity of transport modes over time (e.g. cars, cycling, walking, motorcycles) produces differences in the circumstances under which ‘average’ compensable injuries occur. For example, between 2008 and 2013 there was a 31% increase in motorcycle registrations within Australia, a more rapid increase than of any other vehicle type. A large proportion of motorcyclists are involved in single-vehicle ‘run-off road’ accidents and hence, may more likely attribute responsibility for accidents to themselves. If recent trends of increased mode share by motorcyclists translates into increased proportional representation of motorcyclists within injured populations, it could conceivably affect levels of satisfaction within compensation systems, leading them to be higher than they might otherwise have been.

Limitations of the results presented here relate to the degree to which findings are transferrable to populations other than those injured in motor vehicle accidents (e.g. workplace accidents, sporting injuries, physical assaults) and whether patients’ views of the compensation system are also consistent with opinions of medical care quality across other services received by the patient (e.g. ambulance or emergency services, allied health, hospital care). Future research may wish to explore these areas.

Attributions of responsibility for accidents are independently associated with satisfaction with no-fault compensation systems among people injured in motor vehicle accidents. This effect is independent of mental and physical health outcomes, age, gender, and claim duration. Even within no-fault compensation systems where access to benefits and resources to assist one’s rehabilitation are indistinguishable or may even favour ‘not-at-fault’ parties, persons who attribute responsibility for accidents to others demonstrate lower levels of patient satisfaction than those who attribute responsibility either partially or wholly to themselves. Compensation systems, rehabilitation providers, or other health services attempting to monitor patient satisfaction may wish to adjust for attribution case mix when assessing results over time or when attempting to compare performance between services or injured populations. Future research should control for the effect of attributions of responsibility for accident or injury when assessing satisfaction or quality of interactions between patients and compensation systems.

Clinical messages

- Patients injured in motor vehicle accidents who do not consider themselves responsible for their accident may demonstrate lower levels of satisfaction with compensation or rehabilitation services.
- Differences in patient satisfaction ratings between injured populations or compensation systems may reflect differences in attributions of responsibility for accidents or injuries rather than differences in objective service quality.

Acknowledgements

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Conflict of interest

The authors declare that there is no conflict of interest.

Funding

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References


Appendix I. ADDITIONAL MISSING DATA ANALYSES
| **Table i.** Descriptive statistics associated with missing and non-missing data for study 1. |
|-----------------------------------------------|--------|---|--------|---|---|
| **** | Missing (n=99) | **** | **Non-missing (n=934)** | **** | **** |
| **Gender** | **%** | **Mean** | **%** | **Mean** |
| Male | 53.6% | 55.7% | | |
| Female | 46.4% | 44.3% | | |
| **Age** | | 49* | 43 | |
| **Personal responsibility for accident** | **%** | **Mean** | **%** | **Mean** |
| Totally responsible | 20.0% | 15.0% | | |
| Partially responsible | 19.1% | 22.7% | | |
| Not responsible at all | 60.9% | 62.3% | | |
| **Highest level of education completed** | **%** | **Mean** | **%** | **Mean** |
| Did not complete primary school | 0.5% | 1.0% | | |
| Completed primary school | 2.8% | 1.9% | | |
| Year 10/4th form or below | 19.3% | 13.1% | | |
| Year 11 or equivalent | 4.7% | 5.7% | | |
| Year 12/6th form or equivalent | 9.4% | 13.7% | | |
| Trade/apprenticeship qualification | 15.6% | 14.8% | | |
| Other TAFE/Technical certificate or diploma | 18.9% | 18.2% | | |
| Undergraduate certificate or diploma | 5.2% | 6.8% | | |
| Undergraduate - Bachelor's Degree | 13.2% | 15.2% | | |
| Postgraduate - Honours/Masters/Doctorate | 10.4% | 9.6% | | |
| **Injury Group** | **%** | **Mean** | **%** | **Mean** |
| Musculoskeletal | 21.0% | 26.1% | | |
| Orthopaedic | 41.2% | 40.5% | | |
| Other Injuries | 13.3% | 12.3% | | |
| Other Severe | 24.5% | 21.1% | | |
| **Vulnerable road user** | | | | |
| Yes | 41.8% | 42.4% | | |
| No | 58.2% | 57.6% | | |
| **Claim duration** | **%** | **Mean** | **%** | **Mean** |
| 0-12 months | 24.6% | 23.3% | | |
| 13-24 months | 33.0% | 34.9% | | |
| 25-36 months | 19.5% | 22.9% | | |
| 37+ months | 22.9% | 18.9% | | |
| **Working at time of accident** | | | | |
| Yes | 80.2% | 77.7% | | |
| No | 19.8% | 22.3% | | |

*Note. Differences between column means are present at the $p<.05$ level.*
Table ii. Descriptive statistics associated with missing and non-missing data for study 2.

<table>
<thead>
<tr>
<th></th>
<th>Missing (n = 114)</th>
<th>Non-missing (n = 1280)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>75.3%</td>
<td>65.2%</td>
</tr>
<tr>
<td>Female</td>
<td>24.7%</td>
<td>34.8%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>42</td>
<td>41</td>
</tr>
<tr>
<td><strong>Personal responsibility for accident</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totally responsible for the accident</td>
<td>44.4%*</td>
<td>17.5%</td>
</tr>
<tr>
<td>Partially responsible for the accident</td>
<td>22.2%</td>
<td>20.7%</td>
</tr>
<tr>
<td>Not responsible at all</td>
<td>33.3%</td>
<td>61.8%</td>
</tr>
<tr>
<td><strong>Highest level of education completed</strong></td>
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<td></td>
</tr>
<tr>
<td>Did not complete primary school</td>
<td>1.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Completed primary school</td>
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<td>1.3%</td>
</tr>
<tr>
<td>Year 10/4th form or below</td>
<td>17.1%</td>
<td>17.0%</td>
</tr>
<tr>
<td>Year 11 or equivalent</td>
<td>11.0%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Year 12/6th form or equivalent</td>
<td>15.9%</td>
<td>13.8%</td>
</tr>
<tr>
<td>Trade/apprenticeship qualification</td>
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<td>13.9%</td>
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<td>Other TAFE/Technical certificate or diploma</td>
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<td>16.1%</td>
</tr>
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<td>Undergraduate certificate or diploma</td>
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<td>7.9%</td>
</tr>
<tr>
<td>Undergraduate - Bachelor's Degree</td>
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<td>15.3%</td>
</tr>
<tr>
<td>Postgraduate - Honours/Masters/Doctorate</td>
<td>4.9%</td>
<td>6.8%</td>
</tr>
<tr>
<td>Other</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td><strong>Injury Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>15.3%</td>
<td>21.7%</td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>49.4%</td>
<td>46.6%</td>
</tr>
<tr>
<td>Other Injuries</td>
<td>11.8%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Other Severe</td>
<td>23.5%</td>
<td>20.2%</td>
</tr>
<tr>
<td><strong>Claim Duration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-12 months</td>
<td>27.2%</td>
<td>28.7%</td>
</tr>
<tr>
<td>13-24 months</td>
<td>26.3%</td>
<td>30.9%</td>
</tr>
<tr>
<td>25-36 months</td>
<td>28.9%*</td>
<td>19.6%</td>
</tr>
<tr>
<td>37+ months</td>
<td>17.5%</td>
<td>20.8%</td>
</tr>
</tbody>
</table>

*Note. Differences between column proportions are present at the p<.05 level.
Table iii. Descriptive statistics associated with missing and non-missing data for study 3.

<table>
<thead>
<tr>
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<th>Non-Missing (n= 1097)</th>
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<tbody>
<tr>
<td></td>
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<td>Mean</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>62.7%</td>
<td>58.2%</td>
</tr>
<tr>
<td>Female</td>
<td>37.3%</td>
<td>41.8%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>42.3*</td>
<td>46.5</td>
</tr>
<tr>
<td><strong>Involvement in accident</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A driver of a vehicle</td>
<td>41.5%</td>
<td>46.4%</td>
</tr>
<tr>
<td>A passenger in a vehicle</td>
<td>11.4%</td>
<td>11.0%</td>
</tr>
<tr>
<td>A motor cycle rider</td>
<td>28.7%</td>
<td>23.0%</td>
</tr>
<tr>
<td>A motor cycle passenger</td>
<td>0.6%</td>
<td>0.3%</td>
</tr>
<tr>
<td>A pedestrian</td>
<td>8.9%</td>
<td>12.7%</td>
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<tr>
<td>A cyclist</td>
<td>7.5%</td>
<td>4.5%</td>
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<tr>
<td>A passenger using public transport</td>
<td>1.2%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Other</td>
<td>0.1%</td>
<td>0.3%</td>
</tr>
<tr>
<td><strong>Personal responsibility for accident</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totally responsible for the accident</td>
<td>17.9%</td>
<td>13.2%</td>
</tr>
<tr>
<td>Not responsible at all</td>
<td>62.4%</td>
<td>69.0%</td>
</tr>
<tr>
<td><strong>Claim Duration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-12months</td>
<td>29.1%</td>
<td>26.6%</td>
</tr>
<tr>
<td>13-24months</td>
<td>32.2%</td>
<td>24.6%</td>
</tr>
<tr>
<td>25-36months</td>
<td>19.1%</td>
<td>25.3%</td>
</tr>
<tr>
<td>37+months</td>
<td>19.7%</td>
<td>23.6%</td>
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<tr>
<td><strong>SF-12v2 Physical Index</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>43.2</td>
<td>43.7</td>
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<tr>
<td><strong>SF-12v2 Mental Index</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>44.5</td>
<td>42.9</td>
</tr>
<tr>
<td><strong>Resolves your issues</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.3*</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Keeps you up-to-date</strong></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>7.1</td>
<td>6.7</td>
</tr>
<tr>
<td><strong>Treats you as an individual</strong></td>
<td></td>
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<tr>
<td></td>
<td>7.4</td>
<td>7.1</td>
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<tr>
<td><strong>Cares about you</strong></td>
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<td></td>
<td>6.9</td>
<td>6.6</td>
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<tr>
<td><strong>Overall satisfaction with TAC</strong></td>
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<td>7.1</td>
</tr>
</tbody>
</table>

*Note. Differences between column proportions are present at the \( p<.05 \) level.