



The relationship between compensation and recovery following a motor vehicle accident: A systematic review

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Key Message

This review provides the first systematic evaluation of the literature investigating the relationship between compensation, recovery and chronic pain after a motor vehicle accident (MVA) with a number of key outcomes noted below. Studies characterising recovery in relation to compensation, following a motor vehicle accident, were included in this review if they explored the outcomes of either physical functioning, psychological well-being, and/or chronic pain. Studies specifically relating to workers compensation were excluded. The search engine yielded 5,353 potential references. A further 64 references were sourced from reference lists and citations of relevant papers. The full text was retrieved for 230 publications and critically assessed for eligibility. A total of 67 references met the inclusion criteria for data extraction.

The review has produced the following key findings:

1. There is considerable evidence that compensation either does not facilitate recovery, or is associated with poorer recovery;
2. Those who seek compensation are more likely to have sustained more severe injuries, or to have been hospitalised as a result of their injury compared to those who do not seek compensation;
3. Involvement in a No-Fault compensation scheme results in better recovery outcomes than a Tort compensation scheme;
4. Apart from involving a lawyer in the compensation process, there is limited evidence about which aspects of seeking and receiving compensation mediate negative effects on recovery;
5. There is a lack of research on claimant or scheme factors that mediate positive recovery;
6. Changes to the compensation process — e.g., reducing the number of medical assessments; maintaining a consistent single point of contact; employing case managers with a medical or health background — helps to facilitate recovery from a motor vehicle accident; and
7. Of the evidence available, there is large heterogeneity between studies. Similar systematic reviews examining the effect of compensation on recovery have shown that these studies are generally of low quality.

The review proposes the following implications from the findings:

1. It is important to ensure that the compensation process is clear and simple and that clients are aware of their rights and entitlements, which may reduce the need to involve a lawyer in a No-Fault compensation scheme;
2. Decreasing the number of medical assessments and case managers involved in a single claim will improve outcomes. Maintaining a single point of contact for clients will facilitate recovery by ensuring that clients do not have to explain their accident and injuries to multiple case managers;
3. Where possible, case managers should have a health or medical background to promote understanding and empathy towards clients; and
4. There is need for research that identifies which modifiable aspects of compensation schemes (a) aid recovery; and/or (b) hinder recovery. Modifications to scheme policy and administration should focus on these factors to further improve client recovery.

Executive Summary

Motor vehicle accidents (MVAs) have been classified as a global public health crisis by the World Health Organization (WHO). Every year there are approximately 1.2 million deaths and up to 50 million injuries and disability as a result of MVAs. Financial compensation may be provided to individuals involved in MVAs to assist with costs associated with treatment, rehabilitation and disability. Despite the objective of compensation to aid recovery from injury, research typically shows that compensation is related to significantly poorer recovery and increased incidence of chronic pain.

Objectives

This review provides a systematic evaluation of the literature investigating the relationship between compensation and recovery from a MVA. Where possible, the review focuses on the impact of compensation factors, seeking compensation, type of compensation, litigation and claim settlement on recovery outcomes such as physical health, mental health and chronic pain.

Data sources

Five electronic database engines were searched (latest search date: 27 May 2013): Medline (1950-present), Embase (1980-present), CINAHL, PsychINFO, The Cochrane Library. Search terms included a combination of both medical subject headings (MeSH) and keywords, which focused on 'motor vehicle accidents', 'compensation', 'chronic pain' and 'recovery'. Search terms that related to 'chronic pain' or 'recovery' were combined with 'compensation', with the end search combined with 'motor vehicle accidents'. Reference lists of identified papers were examined, and citations were systematically tracked for any additional potentially relevant studies.

Inclusion Criteria

The focus of this review was based on peer-reviewed original research, which characterised poor recovery in relation to compensation after a MVA. MVAs were defined as any accident involving at least one motorised vehicle including an automobile, truck, bus or motorcycle and excluding vehicles that operate on rails such as trains and trams. Studies were included if injury resulted to driver, passenger, cyclist or pedestrian.

Compensation factors that were investigated included:

1. *Seeking compensation*: studies reporting the effect of initiating or receiving a compensation claim on recovery;
2. *Type of compensation*: studies exploring the difference between the two types of compensation schemes, Tort and No-Fault, on recovery;
3. *Litigation process*: studies measuring the effect of the litigation process, in terms of delays, lawyer involvement and medical assessments/examinations, on recovery; and
4. *Settlement of claim*: the impact of claim settlement, time taken to reach settlement and claim closure on recovery.

Outcomes that were reviewed included:

1. *Physical Health*: studies reporting the association between compensation and recovery of physical function;
2. *Psychological Health*: studies exploring the relationship between compensation and psychological health; and
3. *Chronic pain*: studies determining the link between compensation and experience of persistent pain.

Exclusion Criteria

This review was limited to studies that were published in English, which explored personal injury and not work-related injury. Therefore, studies that related to worker's compensation were excluded. Furthermore, studies that did not generate any original research data, such as editorials, opinions, commentaries and reviews, were also excluded from the review.

Assessment for inclusion

The references were initially systematically screened by author LI and Leah Zelencich, based on title and abstract for inclusion or exclusion according to the criteria outlined above. The full text articles were then independently assessed by two reviewers (authors LI and MG) for inclusion based on the areas of interest addressed above. Another reviewer (author NG-K) was available to resolve any potential differences.

Results

The search yielded 5,619 references and after duplicates were removed, 5,353 were available for screening. A further 64 references were sourced from the reference lists and citations of relevant papers. Full texts were retrieved for 230 publications and assessed for eligibility. A total of 67 references met the inclusion criteria for data extraction.

Conclusions

Outcomes from the review have confirmed findings from previous systematic reviews that compensation does not facilitate recovery following a MVA, with respect to physical health, psychological health and chronic pain. Furthermore, being involved in a Tort compensation scheme, as opposed to a No Fault compensation scheme, was associated with poorer recovery from a MVA. However, although previous studies have shown that those who receive compensation have worse injuries than those who do not, such factors were not controlled for in the majority of studies included.

The review highlights the need for further systematic research to examine which aspects of compensation may mediate poorer recovery from a MVA, as well as individual risk factors that may predict poor recovery following a MVA. Note that the majority of evidence identifying that compensation is associated with poor recovery is from large-scale epidemiological studies that have rarely examined individual factors. Future research is therefore required to identify the factors that are predictive of poorer recovery in order to detect high risk clients and provide appropriate support to ensure the process is beneficial to both the client and the scheme.

Finally, this review provides evidence for the positive effect of procedural changes to compensation schemes on recovery from a MVA. For example, reducing the number of medical assessments, decreasing lawyer involvement, utilising a consistent single point of contact and employing case managers, with a medical or health background, have all been shown to facilitate effective recovery.

Table of Contents

Key Messages	3
Executive summary	4
1 Introduction	8
1.1 Motor Vehicle Accidents (MVAs)	8
1.2 Personal impact	8
1.3 Compensation	9
1.4 Compensation and recovery	10
1.5 Aims and Objective	10
2 Methodology	11
2.1 Search strategy	11
2.2 Criteria for inclusion	11
2.3 Criteria for exclusion	11
2.4 Assessment for potential inclusion of studies	12
2.5 Data extraction	12
3 Results	12
3.1 Search Results	12
3.2 Physical Health	16
3.2.1 <i>Tort Compensation</i>	16
3.2.2 <i>No-Fault compensation</i>	17
3.3 Psychological Health	17
3.3.1 <i>Tort Compensation</i>	18
3.3.2 <i>No-Fault compensation</i>	18
3.4 Chronic Pain	19
3.4.1 <i>Tort Compensation</i>	19
3.4.2 <i>No-Fault compensation</i>	19
4 Discussion	20
4.1 Key findings	20
4.2 Limitations	23
4.3 Implications for future research and practice	23
5 Conclusion	23
6 References	24
7 Appendices	31
7.1 Appendix A	31
7.2 Appendix B	32

1 Introduction

1.1 Motor Vehicle Accidents

Motor vehicle accidents (MVAs) have been classified as a global public health crisis by the World Health Organization (WHO).¹ The consequences of MVAs are significant and costly to both individuals and society. MVAs are currently the eighth leading cause of death and principle cause of injury worldwide, and the leading cause of death in individuals aged 15-29.^{1;2} Every year there are approximately 1.24 million deaths and up to 50 million people injured or disabled as a result of MVAs.³ In the past five years in Victoria, there were 68,724 motor vehicle accidents that resulted in an injury, with 37% resulting in a serious injury and 2% being fatal.⁴

The impact of MVAs on the global economy is significant, with the total annual cost estimated to be more than US\$518 billion.^{3;5} The WHO has predicted that by the year 2020 these figures will increase by 65%, and 80% in less developed countries, making MVAs the second leading cause of death globally following heart disease.^{2;6} In Australia, the annual cost of MVAs on the economy is estimated to be \$27 billion.⁷ The number of drivers on Australian roads has increased from 14.1 million in 2008 to more than 15.5 million in 2013, which has also resulted in an increase in the incidence of reported MVAs.⁸ More than 3 million motorists reported being involved in MVAs in the past 5 years compared to just over 2.6 million in 2008.⁸

1.2 Personal impact

Physical injuries sustained during a MVA vary in severity. While the majority of injuries sustained from MVAs are minor, more serious injuries, including paraplegia, quadriplegia, loss of eye sight, brain damage and limb amputation result in long term or permanent disability. The most common injuries that result in hospital admission include open wounds, fractures, internal injuries, traumatic brain injury and spinal cord injury.³ In addition, a large proportion of injuries to the ankles, knees and spine can cause chronic pain syndromes, such as Whiplash-associated disorders and fibromyalgia.⁹ Various biopsychosocial factors are known to be significant predictors of developing chronic pain after motor vehicle accident,^{10;11} including factors that were present prior to the injury (e.g., education level or work status), as well as at the time of the injury (e.g., trauma, injury and pain severity; attitudes to pain and medication, stress-reactions to the trauma),^{12;13;14;15;16} and in relation to compensation itself.¹⁷

Psychological complications following a MVA are common, even for those who sustained only minor injuries. It has been estimated that approximately one quarter of all victims of road trauma display psychological problems within the first year following the accident.¹⁸ Possible psychological complications include post-traumatic stress disorder (PTSD), fear of driving or travelling, anxiety and mood disorders such as depression and/or emotional distress.

Recovery from MVAs can be slow, with individuals reporting long-term health problems such as musculoskeletal complications and psychological issues long after the injury would have been expected to heal.¹⁹ The repercussions of MVAs are not limited to physical and mental health problems, but also extend to lifestyle and financial issues. For example, victims of MVAs can experience various lifestyle changes including reduced physical functioning and psychological issues that can hinder daily activity, leisure activity,

employment and socialisation. Loss of income, as a result of inability to return to work, is common. This, together with out-of-pocket medical costs and other associated costs, can cause a significant financial burden on both the individual, family unit, and society.

1.3 Compensation

Compensation refers to the financial aid that may be provided to individuals involved in MVAs to assist with costs associated with treatment, rehabilitation and disability as a result of an injury. Eligibility for compensation, the process of claiming compensation, limitations of compensation coverage and the amount of compensation awarded can differ depending on the scheme type. Compensation schemes differ between countries as well as states, provinces and territories within a country. There are two main types of compensation schemes: Tort (Fault-based) compensation and No Fault compensation. No Fault compensation is currently implemented in Canada, New Zealand and some states within Australia and the United States of America. Other countries and states tend to employ some form of Tort or fault-based compensation.

A traditional Tort compensation scheme provides compensation to injured parties based on proven negligence, whereby injured parties are allowed to sue the negligent party for financial compensation including medical expenses, material damages, pain and suffering, and loss of wages.²⁰ Due to litigation being risky and costly, injured parties tend to avoid prolonged litigation, which is necessary to secure full compensation, opting to settle early for less.²¹ Variations on the Tort compensation scheme exist whereby compensation is administered based on fault, but the litigation process is removed as injured parties are awarded compensation upon proof that they were not the negligent party.

A 'No-Fault' compensation scheme eliminates the litigation process and ensures all injured parties are indemnified for medical costs and treatments regardless of fault.²⁰ Therefore, under a No-Fault scheme more MVA victims are compensated, providing immediate financial assistance and less administrative costs, as negligence does not need to be determined.²² However, under a 'No-Fault' scheme individuals cannot receive compensation for pain and suffering, or emotional distress. Further, many individuals appoint a lawyer to assist them to navigate through the compensation scheme and assist them to claim entitlements.

There are three types of No-Fault compensation schemes: Pure No-Fault, Partial No-Fault and Choice No-Fault. All MVA victims receive compensation from a compulsory third party insurer for medical expenses and loss of income under a Pure No-Fault compensation scheme. This is the same for Partial No-Fault compensation unless the losses exceed a threshold, determined by dollar amount or seriousness of injury, in which case victims are entitled to opt out of the No-Fault scheme and sue for losses under the Tort system.²⁰ A Choice No-Fault compensation scheme provides individuals with the option to choose between two types of insurance policies, a No-Fault policy or a Tort policy, upon purchase of their insurance.

1.4 Compensation and Recovery

One core aim of compensation is to play a significant role in the recovery of individuals injured in MVAs. Compensation provides financial support to injured parties, dependent on the scheme employed, to facilitate effective recovery. The majority of cases (70-80%) return to work and leisure activities soon after their accident and do not have long

claims.²³ However, the remainder of cases result in delayed settlement and excessive use of resources and funding, putting a significant strain on the compensation system.²³

Since the mid-late 20th century large-scale epidemiological studies have shown that compensation status is often associated with poor recovery.^{24; 25; 26} The association between compensation and recovery has been a significant debate over the last decade. For example, some authors have argued that compensation is only one of many variables that can predict poor recovery,^{27; 28} while others have found that it is the strongest predictor of poor recovery.^{29; 30} In 1961 the term ‘Accident or Compensation Neurosis’ was coined by Henry Miller, who found that litigants claiming compensation were more likely to recover and return to work following settlement of their claim.³¹ However, almost all subsequent studies have shown no significant improvements in physical functioning, psychological health or social functioning upon claim settlement.^{27; 32}

When investigating the effect of compensation on chronic pain, it was found that compensation has an adverse effect on pain with those seeking and/or receiving compensation reporting higher levels of pain.^{17; 33; 34; 35} However, other studies have found no relationship between compensation and chronic pain, with those involved in compensation not reporting persistent pain.^{36; 37; 38; 39; 40} The relationship between compensation and chronic pain therefore remains unclear.

With regard to MVAs, the relationship between recovery and compensation is further complicated by the differing compensation schemes. Due to the complexity of these schemes there are many factors that may affect recovery, including lawyer involvement, the litigation process, medical examinations, claim settlement, time from initiating a claim to claim settlement, being at fault, as well as individual scheme-related experiences. For example, a qualitative study by Gabbe et al. (2013) identified a number of concerns raised by a sample of clients in the Victorian Transport Accident Commission compensation scheme.⁴¹ These included lack of empathy, compassion and trust from case managers; not having a consistent single point of contact; lack of understanding; and, the complexity involved in completing forms and navigating through the process. Making changes to the compensation process in both Tort and No Fault compensation schemes, to reduce the stressful nature of seeking and receiving compensation, could significantly improve recovery in MVA victims; however, it is difficult to investigate these individual factors in large-scale epidemiological studies.

1.5 Aims and Objective

We provide a systematic review of the available evidence on the relationship between compensation and recovery following a MVA and assess the heterogeneity between the studies. We identify compensation factors that are associated with poorer outcomes, which may be modified to facilitate recovery. Where possible, we also provide evidence to indicate which aspects of compensation and scheme types are associated with improved outcomes. Finally, we identify which aspects are poorly characterised and require further investigation.

2 Methodology

2.1 Search strategy

The following electronic database engines were searched (latest search date: 27 May 2013): Medline (1950-present), Embase (1980-present), CINAHL, PsychINFO, The Cochrane Library. Details of the search strategy are presented in Appendix A.

Search terms included a combination of both medical subject headings (MeSH) and keywords, which focused on 'motor vehicle accidents', 'compensation', 'chronic pain' and 'recovery'. Search terms that related to 'chronic pain' or 'recovery' were combined with 'compensation', with the end search combined with 'motor vehicle accidents'. Reference lists of identified papers were examined, and citations were systematically tracked for any additional potentially relevant studies. The search outputs were managed using Endnote (version X6).

2.2 Criteria for inclusion

The focus of this review was based on peer-reviewed original research, which characterised recovery in relation to compensation after a MVA. MVAs were defined as any accident involving at least one motorised vehicle including an automobile, truck, bus or motorcycle and excluding vehicles that operate on rails such as trains and trams. Studies were included if injury resulted to driver, passenger, cyclist or pedestrian.

Compensation factors that were investigated included:

1. *Seeking compensation*: studies reporting the effect of initiating or receiving a compensation claim on recovery;
2. *Type of compensation*: studies exploring the difference between the two types of compensation schemes, Tort and No-Fault, on recovery. Due to the heterogeneity of the samples across studies, this review will use the term 'Tort' and 'No-Fault' as collective terms from this point on to refer to the type of compensation scheme used in each study;
3. *Litigation process*: studies measuring the effect of the litigation process, in terms of delays, lawyer involvement and medical assessments/examinations, on recovery;
4. *Settlement of claim*: the impact of claim settlement, time taken to reach settlement and claim closure on recovery.

Outcomes that were reviewed included:

1. *Physical Health*: studies reporting the association between compensation and recovery of physical function;
2. *Psychological Health*: studies exploring the relationship between compensation and psychological health; and
3. *Chronic pain*: studies determining the link between compensation and experience of persistent pain.

2.3 Criteria for exclusion

Non-English language articles and studies not generating any original research data, such as editorials, opinions, commentaries and reviews, were excluded from the review. Studies relating to worker's compensation were also excluded.

2.4 Assessment for potential inclusion of studies

The references were initially systematically screened by author LI and Leah Zelencich, based on title and abstract for inclusion or exclusion according to the criteria outlined above. The full text articles were then independently assessed by two reviewers (authors LI and MG) for inclusion based on the areas of interest addressed above. Another reviewer (author NG-K) was available to resolve any potential differences.

2.5 Data extraction

Data collected from the papers included first author name, year, title, country, aim/hypothesis, population, study design, study period, compensation type, measures used, key results and conclusions. Meta-analysis was not possible due to heterogeneity of studies.

3 Results

3.1 Search results

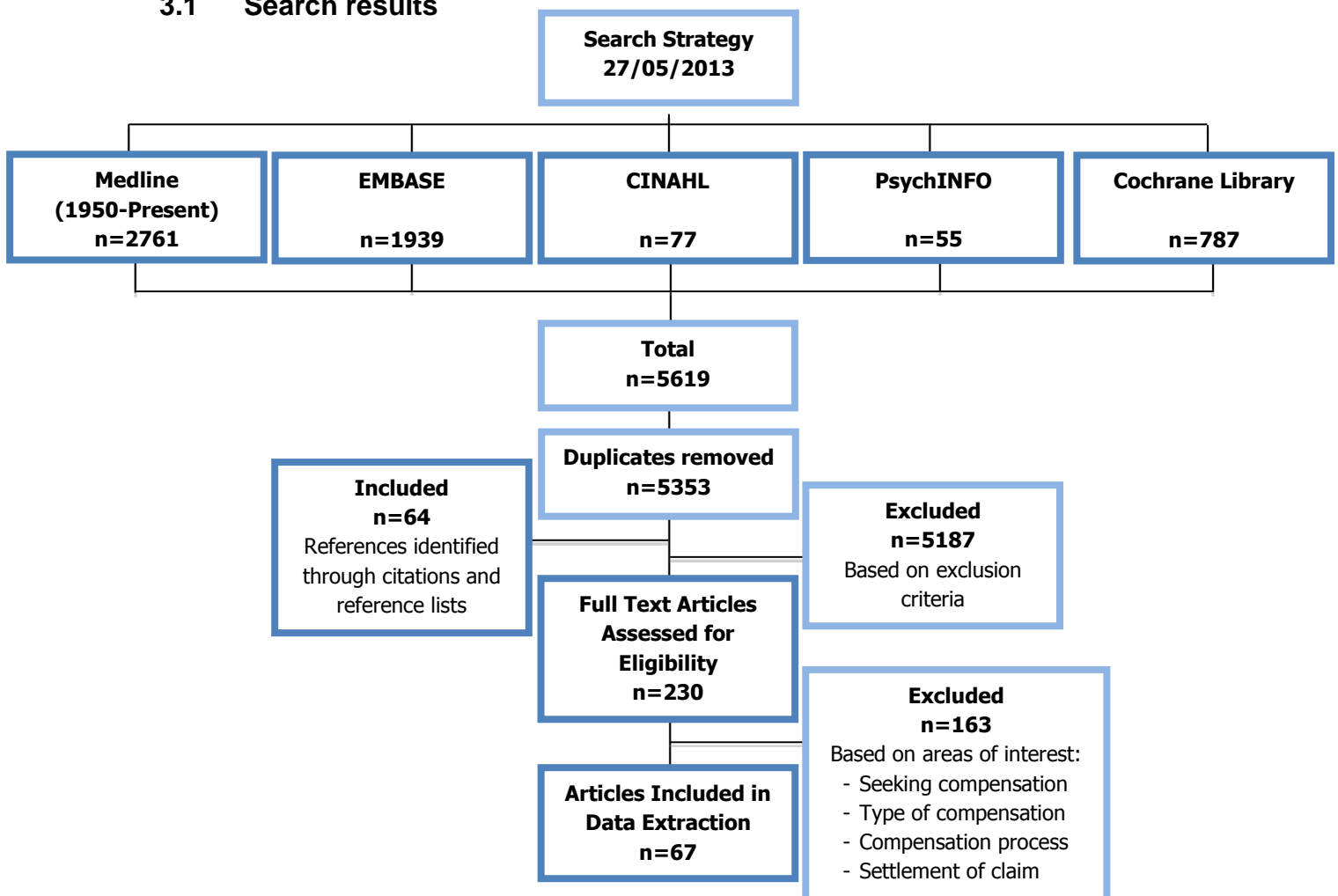


Figure 1. Search strategy

The search yielded 5,619 references and after duplicates were removed, 5,353 were available for screening. A further 64 references were sourced from the reference lists and citations of relevant papers. A total of 67 references met the inclusion criteria for data extraction.

The earliest study was published in 1956, with 25 (37.3%) published during 2000-09. The largest number of studies, 24 (35.8%), were published in Australia, followed by 16 (23.9%) in the UK and 10 (14.9%) in the USA. With regard to compensation type, 47 (70.1%) involved a Tort compensation scheme while 14 (20.9%) were under a No-Fault compensation scheme. The remaining 6 (9.0%) explored both Tort and No-Fault compensation schemes.

Table 1. Demographic characteristics of the articles included in this review.

Demographic	Category	n	%
Publication Year n=67	Before 1980	5	7.5
	1980-89	5	7.5
	1990-99	16	23.9
	2000-09	25	37.3
	2010+	16	23.9
Country n=67	Australia	24	35.8
	UK	16	23.9
	USA	10	14.9
	Canada	8	11.9
	Other	9	13.5
Study design n=67	Quantitative	54	80.6
	Mixed Methods	13	19.4
Compensation Type n=67	Tort (Fault-based)	47	70.1
	No Fault*	14	20.9
	Both	6	9.0

*Note: One study involved a No Fault compensation scheme, however all the participants in the study were suing for pain and suffering which is not covered under the No Fault scheme.

The studies were coded into three areas of interest, physical health, psychological health and chronic pain, with some covering multiple areas. The number of studies was relatively evenly spread across these areas. The largest number of studies reporting aspects of 'physical health' (71.6%), was followed by 'psychological health' (58.2%), and the least number reporting 'chronic pain' outcomes (46.3%). Refer to the Supplementary Table for further information on each of the studies included in the review.

Table 2. Percentage of articles in each of the three areas of interest.

Category	No. of articles n (%)	Reference
Physical Health	48 (71.6%)	27; 42; 43; 44; 45; 19; 37; 46; 47; 48; 49; 50; 51; 52; 53; 54; 55; 56; 57; 58; 59; 60; 61; 62; 63; 64; 65; 66; 67; 68; 69; 70; 71; 72; 73; 74; 75; 76; 77; 78; 79; 80; 81; 82; 83; 84; 85; 86
Psychological Health	39 (58.2%)	18; 19; 27; 37; 42; 44; 46; 49; 52; 54; 58; 59; 61; 64; 65; 67; 68; 70; 72; 74; 75; 77; 78; 79; 80; 82; 83; 85; 86; 87; 88; 89; 90; 91; 92; 93; 94; 95; 96
Chronic Pain	31 (46.3%)	37; 43; 44; 46; 48; 50; 54; 60; 63; 72; 73; 74; 75; 76; 77; 78; 79; 80; 84; 86; 89; 92; 94; 97; 98; 99; 100; 101; 102; 103; 104

Table 3. Impact of compensation on recover

Type	Influence	Physical Health	Psychological Health	Chronic Pain
Tort	Positive			
	Negative	19; 27; 42; 43; 44; 45; 46; 47; 48; 49; 50; 51; 52; 53; 54; 55; 56; 57; 82; 83; 84; 86	19; 42; 44; 46; 52; 54; 58; 61; 82; 83; 85; 87; 88; 89; 90; 91	43; 44; 46; 48; 50; 54; 63; 84; 86; 92; 97; 98; 99; 100;
	No effect	58; 59; 60; 61; 62; 63; 64; 65; 66; 81; 85	18; 27; 49; 59; 64; 65; 86; 92; 93	101 60; 89; 103
No Fault	Positive			102
	Negative	67; 68; 69; 70; 71; 72; 73; 74	67; 68; 70; 72; 74; 75; 94; 95; 96	37; 72; 73; 74; 75; 94
	No effect	37; 75; 76	37	76
Both	Positive			
	Negative	77; 78; 79; 80	77; 78; 79; 80	77; 78; 79; 80; 104
	No effect			

3.2 Physical health

Physical injuries as a result of a MVA vary in severity. Recovery from a physical injury can be evaluated in terms of physical functioning and disability; symptomatology; return to work; interference with daily and leisure activities; quality of life; and, healthcare utilisation. Some of the validated tools or measures used to assess these aspects of physical health included the Functional Rating Index (FRI)¹⁰⁵; Abbreviated Injury Scale (AIS)¹⁰⁶; Injury Severity Score (ISS)¹⁰⁷; Physical Component Summary Score (PCS) of the Short Form Health Survey (SF-36, SF-12)¹⁰⁸; and, the Roland Morris Disability Questionnaire (RMQ)¹⁰⁹ (see Appendix B). A total of 34 studies demonstrated negative outcomes with respect to physical health in relation to compensation. Fourteen studies found no effect of compensation on physical functioning (see Table 3). These findings are described with respect to scheme types, see below.

3.2.1 Tort compensation

Seeking compensation had a negative effect on physical health and recovery. This was evident in a number of studies that reported those who seek compensation, compared with those who did not, had greater complications as a result of injury⁴², higher encumbrance on work and leisure activities^{27; 45; 50}, lower quality of life⁵⁸, increased health care utilisation⁴⁴, poor physical outcomes^{19; 46; 49} and higher frequency of physical symptoms^{47; 48; 50; 63}. However, some studies found no difference in physical outcomes^{53; 59; 62} or functional recovery^{46; 60}.

The compensation process involved in the tort scheme has been shown to impede recovery, with those who were dissatisfied with the process reporting greater complications.⁴² In addition, consulting a lawyer was associated with increased health care utilisation^{44; 51} and poor PCS scores^{49; 52}. Making changes to the claims process, such as employing consultants with a health background, increasing time spent on each individual claim and reducing the duration of the claim process, has been shown to have a positive effect on recovery^{82; 83}. Not being at fault for the accident has been found to be associated with poorer recovery compared with those who were at fault⁷⁸, while another study found no difference in those who were at fault and those who were not at fault with respect to physical functioning⁸⁵.

The impact of settlement of claim on recovery from physical injury is not clear. For example, studies have reported that claim settlement was positively related to return to work⁵³, health care utilisation⁴⁴, symptomatology⁵⁵ and recovery^{54; 74}, with those who have settled their claim having improved health outcomes compared to those who have not. While other studies have found no evidence to support the role of settlement in recovery, with no difference being found for physical functioning^{27; 59}, symptomatology^{62; 66; 81; 84} or return to work⁶⁵ between those who have settled and those whose claim is still pending. Prolonged claim proceedings were associated with poorer physical health^{56; 57} and reduced return to work⁶⁵. However, the length of the claim process was found to have no effect on physical health at 5 years post-injury in a Tort compensation scheme⁶⁴.

3.2.2 No-Fault compensation

Compared with a Tort scheme claiming under a No Fault compensation scheme has been shown to aid recovery, with those receiving compensation under such a scheme reporting greater physical improvements than those receiving compensation under a Tort

scheme^{77; 80}. However, receiving compensation in a No-Fault scheme was still associated with poor physical functioning and recovery. For example, those who received compensation had worse physical functioning^{67; 68; 75}, were less likely to return to work^{67; 68; 70} and used health care services more frequently⁶⁹, than those who did not receive compensation. However, for one of these studies the difference in physical functioning was only significant at 6 months post injury and there were no differences between those who were compensated and those who were not at 12 months post injury⁶⁷. In addition, another study found no difference in physical functioning at either 5 or 18 months post injury between those who received compensation and those who did not⁷⁶.

Lodging a common law claim for pain and suffering was related to health outcomes, with those who lodged a claim using health care services more frequently than those who did not⁷¹. Involving a lawyer in the claims process was found to be related to poorer physical functioning, higher frequency of symptoms and delayed return to work^{73; 104}. Furthermore, the number of medical assessments was also associated with claimant's health, whereby having undergone more medical assessments for the purpose of the compensation claim was associated with increased health care utilisation in general⁷². However, while this relationship was statistically significant, the effect size was very small and it was not found to be clinically relevant⁷².

Claim settlement had a positive effect on recovery 6 months after injury, with those who had settled their claim reporting higher physical functioning, in relation to work, school or house making, than those whose claims were still pending⁶⁷. However, this effect appeared to dissipate over time with no difference in physical functioning between those who had settled their claim and those who had not at 12 months post injury⁶⁷ or when controlling for time since injury³⁷. Claim closure or settlement was associated with increased return to work¹⁰⁷ and improved physical functioning^{74; 79}; however, the causal direction of this relationship is not clear. For example, clients or case managers could close a claim because the individual has regained physical functioning, independence and capacity to work, rather than the interpretation that once individuals are no longer within a compensation scheme they experience an improvement in their health.

3.3 Psychological health

Psychological complications following a MVA are very common. Some of the main psychological issues experienced by victims of MVAs include depression, anxiety, post-traumatic stress and psychosocial complications. The main validated tools used to measure these psychological outcomes include Post-Traumatic Stress Disorder (PTSD) Symptom Scale (PSS)¹¹⁰, Clinician Administered Post-Traumatic Stress Disorder (PTSD) Scale (CAPS)¹¹¹, Beck Depression Inventory (BDI)¹¹², State-Trait Anxiety Inventory (STAI)¹¹³, Impact of Event Scale (IES)¹¹⁴, Mental Component Summary Score (MCS) of the Short Form Health Survey (SF-36, SF-12)¹⁰⁸; and, the Hospital Anxiety and Depression Scale (HADS)¹¹⁵ (see Appendix B). A total of 29 studies demonstrated negative outcomes with respect to psychological health in relation to compensation, and 10 studies found no effect of compensation on psychological functioning (see Table 3). These findings are described with respect to scheme types, below.

3.3.1 Tort compensation

Seeking compensation through the Tort system has been found to have a negative effect on psychological outcomes¹⁹, with those who sought compensation having

psychosocial complications in relation to change in family roles⁴², post traumatic stress^{61; 87; 88; 89; 91} anxiety⁴⁶, depression⁸⁹ and increased use of health care services⁴⁴. However, some studies reported no association between compensation and psychological outcomes within the Tort system^{27 18; 59; 90; 92; 93}.

Claiming compensation, under a Tort scheme, compared to a No-Fault scheme, has been found to result in significantly poorer psychological health^{74; 77; 80}. However, one study reported that even though Tort claimants used more healthcare services than No-Fault claimants this had no relevance with regard to clinical outcome⁷². Consulting a lawyer was associated with poorer psychological health^{46; 52} and increased healthcare utilisation⁴⁴. Under the Tort scheme, those who were not at fault for their MVA had greater psychological issues than those at fault⁸⁵. Changes to the claim process, including employing case managers with a health background, increasing time spent on each individual claim and reducing the duration of the claim process, have been shown to aid psychological recovery in the claimant. In particular, there was a reduced prevalence of depression in those who received compensation through the modified process compared with those who received compensation through the original process⁸².

Psychological health was affected by claim settlement^{49; 54}, with those who had settled their claim having a lower frequency of PTSD^{87; 88} and decreased healthcare utilisation⁴⁴ compared with those who had not settled their claim. One study found no evidence to support the role of settlement in psychological recovery, reporting no difference in psychological outcomes between those who have settled and those whose claim is still pending²⁷. In addition there appeared to be no difference between those who settled early and those who settled later due to a prolonged compensation process^{59; 64}.

3.3.2 No-Fault compensation

Receiving compensation has been found to be negatively associated with psychological health, with those receiving compensation having a higher frequency of PTSD^{67; 70; 95; 96}, depression^{67; 70}, poor psychological health according to MCS^{68; 75} and anxiety⁷⁰ compared to those who do not receive compensation.

Claimants have been found to recover faster from psychological issues under a No Fault scheme, where compensation for pain and suffering is not available, compared to those claiming under a Tort scheme^{78; 80}. Claimants under the No Fault scheme had lower levels of depressive symptoms⁸⁰ and settled their claim faster than those under the Tort scheme^{72; 80}.

Claim settlement did not appear to be a factor in psychological recovery within the no fault scheme, with studies finding no significant difference in PTSD symptoms^{61; 89}, depression⁶¹ or anxiety⁶¹ between those whose claim was still pending and those who had settled their claim. However, one study reported that those who were still involved in the compensation process were more psychologically distressed than those who had reached a settlement³⁷. In addition, claim settlement was found to be associated with psychological wellbeing, whereby individuals with depressive symptoms had longer claim duration than those with no depressive symptoms^{74; 79}.

3.4 Chronic pain

Chronic pain syndromes, such as whiplash disorder and other associated neck and back disorders, are extremely common in victims of MVAs due to the sudden jerking of the body during impact. The validated tools used by the studies in this review to assess chronic

pain, and recovery from pain, include Neck Disability Index (NDI)¹¹⁶; McGill Pain Questionnaire (MPQ)¹¹⁷; Quebec Task Force Clinical Classification of Whiplash-Associated Disorders (WAD)²³; Visual or Linear Analogue Scale¹¹⁸; and the Patient-Specific Functional Scale (PSFS)¹¹⁹ (see Appendix B). A total of 21 studies demonstrated negative outcomes with respect to chronic pain in relation to compensation, one study found a positive relationship between chronic pain and recovery, and nine studies found no effect of compensation on chronic pain (see Table 3). These findings are described with respect to scheme types, see below.

3.4.1 Tort compensation

Seeking compensation was identified as a predictor of chronic pain at 1 and 3 years post-injury^{92; 97}. Those who sought compensation were more likely to have higher intensity and frequency of neck pain^{50; 63; 86; 98; 99; 104}, increase in pain-related symptoms^{48; 50; 86}, increased healthcare utilisation⁴⁴ and delayed return to work⁵⁰, compared with those who did not seek compensation. However, some studies found no significant difference in recovery from neck pain⁶⁰ or return to work⁶³ between those who sought compensation and those who did not. Furthermore, one previous study addressed reverse causality bias, and found that those who sought compensation had a greater recovery from neck pain than those who did not seek compensation⁹⁹. With regard to back pain, there was no relationship between seeking compensation and pain severity⁸⁹.

Receiving compensation under a Tort scheme resulted in slower recovery, with those in the Tort scheme reporting more intense neck pain, pain-related symptoms and percent of body in pain than those in a No Fault scheme^{77; 78; 80}. Consulting a lawyer during the compensation process was shown to be a significant predictor of neck pain^{101; 104} and increased healthcare utilisation⁴⁴. Claim settlement appeared to be a predictor of overall health recovery, with those who had pending claims having a slower recovery⁵⁴ and increased healthcare utilisation⁴⁴ compared to those who had finalised their claims. However, other studies reported that claim settlement had no impact on treatment outcome with regard to radio frequency cervical medial neurotomy¹⁰⁰, with one study showing majority of participants reported decreased pain prior to settlement of their claims compared to after receiving compensation¹⁰³ and another showing continuation of residual pain symptoms after settlement⁸⁶. Furthermore, those who had settled had worse outcomes⁸⁶, being more likely to have residual pain⁹⁷, than those who had not settled.

3.4.2 No-Fault compensation

Seeking compensation has been found to be negatively associated with recovery from chronic pain, with those who sought compensation having more severe neck pain than those who did not seek compensation⁷⁵. On the contrary, one study reported that seeking compensation was not significantly related to persistent neck pain⁷⁶. Furthermore, compensation did not have an effect on the outcome of treatment, mainly by psychotherapy or tricyclic antidepressants, for pain, although those who received compensation had a greater chance of improvement compared to those who did not¹⁰².

Involvement of a lawyer⁷³ when suing for pain and suffering, and increased medical assessments⁷² as part of the compensation process, were predictors of chronic pain. The effect of claim settlement on the outcome of chronic pain under a No Fault compensation scheme was examined in one study. Claim settlement appeared to have a positive effect on pain outcome, with those whose claim was still ongoing reporting higher severity, frequency

and occurrence of pain compared to those who had finalised their claim³⁷. On the contrary, claim settlement has been found to be influenced by pain severity, with reduction in pain severity associated with faster claim closure^{74; 79}.

4 Discussion

4.1 Key findings

On the whole, the results of this review demonstrate that seeking and receiving compensation does not facilitate recovery from a MVA. This conclusion is consistent with previous systematic reviews that have shown that compensation is related to recovery from surgery.¹²⁰ The majority of studies have found a negative relationship, or no relationship, between compensation and physical health, psychological health or chronic pain following a MVA. This review highlights that being involved in a Tort compensation scheme impedes recovery from a MVA compared with a No-Fault compensation scheme.

4.1.1 Overview of studies

The number of MVAs has been significantly rising over the last three decades, with figures expected to continue to rise well into the next decade making MVAs the second leading cause of death globally.¹²¹ With the rise in the incidence of MVAs, there is an ongoing financial burden on the economy and compensation schemes, incurring worldwide costs of over \$500 billion dollars annually.^{3; 5} In particular, compensation claims that extend beyond the acute period of recovery are particularly costly to the individual (e.g., with respect to quality of life, work and independence), society and to compensation schemes. This has led to a steady increase in research investigating the role of compensation in recovery over the past 30 years. In order to reduce the burden on compensation schemes, there is an urgent need to promote recovery by identifying which factors that are associated with poor recovery. Equally, it is also important to identify factors that support successful recovery.

The majority of studies included in this review are based on a Tort compensation scheme. No Fault compensation is a recent type of compensation implemented in Canada, New Zealand and some states in the US and Australia. The No Fault compensation studies included in this review were published after 1990, reflecting the growing interest in outcomes within these schemes. There has been much debate with regard to the benefits of Tort and No Fault compensation schemes.¹²² The inadequacy of Tort schemes to provide financial recompense to victims of road trauma prompted the development of No Fault schemes, which do not require proof of fault and causation. However, it has been argued that a No Fault compensation scheme fails to provide a sense of just to victims of road trauma as it does not punish reckless and negligent drivers, is considered to encourage risky behaviour, eliminates the possibility of receiving compensation for pain and suffering and significantly reduces the amount of compensation received.^{123; 124}

4.1.2 Tort vs. No-Fault compensation

This review found that Tort compensation was associated with poorer recovery on all three outcome measures physical health, psychological health and chronic pain, following an MVA. Such findings were typically attributed to the stressful nature of seeking Tort compensation. Claimants are required to prove that they were not at fault for the accident and sue the “at fault” party for damages, with the possibility of a lengthy litigation process

and no guarantee of award of compensation. In contrast, No Fault compensation eliminates the stressful litigation process and provides assured compensation. Furthermore, those who were not at fault had poorer psychological recovery compared to those who were at fault^{85; 91}. The discrepancy in psychological health between those who were not at fault and those who were may be attributed to feelings of injustice.¹²⁵ This is evident in studies showing that patients who feel that their current situation is unfair and/or blame someone else for their condition find it harder to move on and recover from the incident.¹²⁵ In addition, claimants in a Tort compensation scheme have a slower recovery from psychological issues which could be due to having to re-live the event and prove their disability or injury when suing for pain and suffering.^{78; 80} Further systematic research is required to disentangle the pros and cons of Tort and No Fault compensation in order to identify how the respective schemes might promote recovery following an MVA. Furthermore, research should identify the aspects of each compensation scheme that are potentially modifiable and promote recovery in clients or reduce the negative effects of compensation on recovery. This is likely to yield the highest impact in the long term.

4.1.3 Seeking compensation

While the aim of compensation is to provide financial assistance, as part of a process to assist the victim in receiving appropriate medical treatment to aid recovery, interestingly only two studies displayed a positive outcome in relation to the receipt of compensation.^{99; 102} Both seeking and receiving compensation was found to have a negative effect on physical health, psychological health and chronic pain following an MVA. Several factors were found to affect the association between compensation and recovery including the process and requirements of obtaining compensation, lawyer involvement, medical assessments and length of proceedings.

4.1.4 Compensation process

The process and requirements involved in obtaining compensation has been shown to impact negatively on recovery from a MVA regardless of the type of compensation scheme. Almost all studies showed that the involvement of a lawyer and the number of medical assessments required proving extent of injury were associated with poorer recovery of the victim. However, it was found that altering the compensation process can improve recovery. For example, increasing the knowledge and level of understanding of case managers, by employing consultants with a medical or healthcare background, and increasing consultation time with the claimant, generated improvement in recovery outcomes.^{82; 83} This finding was supported by a recent study investigating client perceptions with regard to compensation. The authors reported that clients placed significant importance on: empathy, compassion and trust from case managers; having a single point of contact; and simplifying the compensation process and requirements in order to make the process of claiming compensation easier to navigate and understand.⁴¹ In particular, having to undergo fewer medical assessments was resulted in the perception of increased trust from the compensation scheme, increased client satisfaction, and appeared to facilitate recovery.⁴¹ Making changes to the compensation process in both Tort and No Fault compensation schemes to reduce the stressful nature of seeking and receiving compensation could greatly improve recovery in MVA victims, particularly those who are more susceptible to stress, for example clients with PTSD or mood disturbance.¹²⁶

4.1.5 Litigation

Involvement of a lawyer has been found, in the majority of studies, to be associated with poorer recovery. Lawyers are a necessary part of the process for claiming compensation in Tort-based schemes, as victims are required to sue the negligent party for compensation. However, under a No-Fault scheme many clients seek the advice of a lawyer to assist with navigating through the compensation process, and to gain awareness of their entitlements. Modifying the compensation process to make the process clear and simple, and provision of adequate information on entitlements could reduce the need for lawyer involvement, and in turn facilitate recovery.

4.1.6 Claim settlement

The relationship between settlement and recovery following a MVA was more difficult to appraise within the literature. For example, just over half of the studies reported a negative relationship between settlement and recovery, and the remainder reported a positive relationship or no association. Such differences between studies may be attributed to the time elapsed since settlement. Considering the impact of the compensation process on recovery, one may expect that those who have settled their claim (in Tort compensation scheme) and those who were awarded compensation (in No-Fault scheme) would have better outcomes than those whose compensation was still pending. However, this effect may possibly dissipate over time. Moreover, the amount of compensation, particularly within a Tort scheme, could mediate the association between settlement and recovery whereby satisfaction with the amount received may facilitate recovery, while not receiving the amount of money sought may lead to a greater sense of injustice. The direction of the relationship between settlement and recovery is not clear, and likely differs between schemes. For example, it has been found that claim settlement is predicted by improvement in recovery outcomes indicating that recovery may affect settlement of claim.^{78; 79}

4.1.7 Other factors

The relationship between compensation and recovery from a MVA may be influenced by other factors such as patient demographics including gender and age^{80; 104}, medical history^{70; 104}, pre-injury psychological status^{70; 127}, injury severity^{58; 104}, financial situation and occupation⁷⁰, life stage^{80; 104} and many more. However, the majority of the evidence identifying that compensation is associated with poor recovery are large-scale epidemiological studies that rarely examine these individual factors. Future research is required to identify the factors that are predictive of poorer recovery in order to detect high risk clients and provide appropriate support to ensure the process is beneficial to both the client and the scheme.

4.2 Limitations

There are a number of important factors relating to heterogeneity of across studies that need to be considered when interpreting the results from this review. These include the process involved in seeking and receiving compensation; whether the population was strictly MVA; type of injuries incurred; type and severity of crash; time elapsed since accident; and, the tools used to assess outcomes. In addition, a number of the studies did not set out to

explore the effect of compensation on recovery but rather included compensation factors within larger models examining predictors of recovery.

While the results of this review provide an important new synthesis of knowledge to identify the relationship between compensation and recovery from MVA, there are certain limitations that should be considered. For example, while the results in most of these studies were statistically significant, they were not all clinically relevant (differences of 0.1 on a VAS may have been statistically significant but did not result in any clinical differences). Therefore, while an effect on recovery may be reported, this did not always manifest in a meaningful effect on health or pain. In addition, the majority of studies reported a relationship between compensation and recovery; however the direction of this relationship, or causation, is not always clear.

4.3 Implications for future research and practice

Further studies are required to explore predictive factors that identify the profile of individuals who are at greater risk of poor outcomes due to compensation scheme factors. Results from this research could be used to create screening procedures that can identify high risk clients and tailor case management approaches that facilitate their recovery. Further research is also required to identify modifiable factors of compensation schemes that are associated with poorer recovery in order to modify these factors to increase recovery and satisfaction with the compensation process. Furthermore, while the research mainly focuses on the negative aspects of the compensation process it would be of value to identify the aspects of the compensation process that currently aids recovery in order to further promote these aspects.

5 Conclusions

This review has confirmed findings from previous systematic reviews. There is general support that in different health settings (e.g., recovery from surgery), individuals who are injured in a MVA who claim and/or receive compensation typically have poorer outcomes with respect to physical health, psychological health and chronic pain, compared to groups who either do not seek compensation or are not eligible for compensation. Furthermore, being involved in a No Fault compensation scheme, as opposed to a Tort-based compensation scheme, was associated with better outcomes following MVA. Based on the current review, there is no further need for research to demonstrate a general predictive association between compensation and recovery. The review also highlights clearly a need for further research to examine *which aspects* of compensation may generate both improved, as well as poorer recovery, from a MVA, and to identify individual risk factors that may predict poor recovery following a MVA. Finally, the review provides evidence for the positive effect of procedural changes to compensation schemes on recovery from a MVA. Reducing the number of medical assessments, decreasing lawyer involvement, utilising a consistent single point of contact and employing case managers with a medical or health background have been shown to facilitate recovery. We recommend that such procedural changes could be implemented almost immediately so as to maximize effective recovery.

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7.1 Appendix A: Search strategy

	AND//	AND//	OR//
Motor Vehicle Accidents	Compensation	Chronic Pain	Recovery
Accident Crash Wreck Smash Collision Motor Vehicle Automobile Transport Traffic Car Motorcycle Motor Car Auto <i>MeSH Terms</i> Accidents, Traffic Traffic Accident Transportation Accidents Motor Traffic Accidents <i>Keywords</i> Motor* Vehicle*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Automobile*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Transport*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Traffic*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Car*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Motorcycle*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Motor* Car*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Auto*: Accident*/ Crash*/ Wreck*/ Smash*/ Collision* Auto* (near) Crash*/ Accident* Motor* (near) Crash*/ Accident* Transport*(near) Crash*/ Accident* Traffic*(near) Crash*/ Accident*	Compensate Payment Redress Reimbursement Damages Remuneration Restitution Indemnity Reparation Recompense Settlement <i>MeSH Terms</i> Compensation Compensation and Redress Economics Health Care Economics Damages, Legal <i>Keywords</i> Compensat* Pay* Redress* Reimburse* Damage* Remunerat* Restitut* Indemni* Repar* Recompens* Settlement* Legal* Pay* Legal* Damage* Legal* Settlement* Claim* Pay* Claim* Damage* Claim* Settlement*	Chronic Incessant Ceaseless Constant Continual Enduring Persistent Unabating Unyielding <i>MeSH Terms</i> Chronic Pain Pain <i>Keywords</i> Chronic Pain* Incessant Pain* Ceaseless Pain* Constant* Pain* Continu* Pain* Endur* Pain* Persist* Pain* Unabat* Pain* Unyielding Pain* Nocicept* Catastr* Neuropath* Fear Avoid* Mental illness Psych* illness Mental disease* Psych* disease* Mental disorder* Psych* disorder* PTSD Anxi* Depress* Chronic (near) Pain* Persist* (near) Pain* Constant* (near) Pain* Continu* (near) Pain* Endur* (near) Pain*	Recovery Recovery of Function Rehabilitation Convalescence Improvement Recuperation <i>MeSH Terms</i> Recovery of Function Convalescence Recovery Functional Status Rehabilitation <i>Keywords</i> Recover* Recover* Function* Recover* Health* Rehabil* Convalescen* Improve* Function* Improve* Health* Vocation* Rehabil* Vocation* Outcome* Health Care Use* Healthcare Use* Health Care Utili* Healthcare Utili* Recuperat* (near) Health*/ Function* Recover* (near) Function*/ Health* Improve* (near) Function*/ Health* Vocation* (near) Return*/ Outcome* Work* (near) Return*/ Outcome* Health Care (near) Use*/ Utili* Healthcare (near) Use*/ Utili*

7.2 Appendix B: Supplementary Table

Ref	First Author	Year	Country	Validated Outcome Measure/s	Study Period	Scheme	Outcome/s			Compensation Factors			
							Physical	Psych	Chronic Pain	Seeking	Type	Litigation	Settlement
18	Mayou, R.	1993	UK	EPI, BDI, STAI, AIS, ISS	1 year	Tort		Y (0)		Involvement in compensation did not predict any aspect of psychological outcome			
19	Mayou, R.	2001	UK	SF-36, HADS, ISS, AIS, PSS	1 year	Tort	Y (-)	Y (-)		Seeking compensation was associated significantly with worse physical, psychological and social outcomes, but claimants also had suffered more severe injury and loss; Physical recovery at 3 months was predicted by involvement in compensation			
27	Bryant, B.	1997	UK	PSE, CAPS, STAI, BDI, QOL; CAGE	1 year (if claim unresolved up to 6 years)	Tort	Y (-)	Y (0)		Claimants did not differ from non-claimants in their background demographics, psychological and social characteristics; Claimants were more angry and dissatisfied than non-claimants; Claimants reported more effects on work and leisure at 1yr- This was statistically significant however inspection of data suggests that this was due to greater severity of injury and subsequent disability; No difference between claimants and non-claimants in any aspect of psychological outcome.			Compensation settlement did not result in improved physical, mental or social functioning
37	Swartzman, L.C.	1996	Canada	CES-D	N/A	No Fault (suing)	Y (0)	Y (0)	Y (-)				Current litigants were not more psychologically distressed (as measured by depression, negative affect and positive affect) or functionally impaired (as measured by employment status, hours worked per week and number/frequency of activities engaged) than post-litigants (MANOVAs

7.2 Appendix B: Supplementary Table

										group (mean difference 1.7); FRI was significantly worse in compensation group (mean difference 11.2); Pain intensity was worse in compensation group (mean difference 0.4).			
47	Represas, C.	2008	Spain		3-6 months	Tort	Y (-)			Time taken (days) for symptoms to disappear: 43.7 for those not compensated (liable) and 92.1 for those compensated (non-liable). Statistically significant relationship between longer period of symptoms and compensation (non-liability).			
48	Grushka, M.	2007	USA		3 years	Tort	Y (-)		Y (-)	G1: MVA-related (65% seeking compensation) G2: Non-trauma related (no compensation) Litigants reported earache (72.2%) and joint noises (97.1%) more frequently than non-litigants (42.1%, 65% respectively); Clinical diagnosis of TMJ was significantly more prevalent in the litigant (62.2%) group than non-litigant (35.0%) group at initial visit.			
49	Harris, I.A.	2008	Australia	SF-36	1-5 years	Tort	Y (-)	Y (0)		Lower PCS scores (poorer physical health) was associated with pursuit of a claim (significant).	Lower PCS scores (poorer physical health) was associated with consulting a lawyer (significant).	Lower PCS scores (poorer physical health) was associated with having an unsettled claim (not significant); Lower MCS scores (poorer mental health) was associated with having an unsettled claim (significant).	
50	Giroto, D.	2011	Croatia	Quebec Task Force Injury Grade	12 weeks	Tort	Y (-)		Y (-)	Compensation group had longer average medical leave (12.5 weeks) compared to the non-compensation group (7.5 weeks). Compensation group reported more residual symptoms, stiff/painful neck			

7.2 Appendix B: Supplementary Table

										(92.5%), neurological deficit (54%) and headache/dizziness (55.5%), compared to the non-compensation group, stiff/painful neck (67.5%), neurological deficit (39%) and headache/dizziness (32.5%)		
51	Grimmer-Somers, K.	2012	Australia			Tort	Y (-)					Legal representation was associated with increased physiotherapy consumption- Approximately 80% of those who consumed more than 53 treatments had legal representation compared to 30% of those who consumed only 1-7 treatments having legal representation.
52	Harris, I.A.	2008	Australia	SF-36	6 months	Tort	Y (-)	Y (-)		Seeking compensation was not associated with general health in patients at 6 months (multivariate analysis). Strong negative association between claiming compensation and both physical (PCS) and mental (MCS) health (univariate analysis).		Strong negative association between the use of a lawyer and both physical (PCS) and mental (MCS) health – No conclusion could be drawn about causality.
53	Balla, J.I. et al.	1970	Australia		4 years	Tort	Y (-)					Majority (69.5%) were dissatisfied, only 25 (30.5%) considered the settlement satisfactory; Low correlation between early settlement and return to work; 11/82 patients returned to work only after settlement, for these patients legal matters played a significant role in symptoms; Settlement of legal matters had little or no influence on majority of patients (86.6%) and symptoms persisted unaltered after settlement.
54	Rebbeck, T.	2006	Australia	FRI, SF-36, CWOM, Index of Relative Socioeconomic Disadvantage	2 years	Tort	Y (-)	Y (-)	Y (-)			Status of claim (open or closed) was a significant predictor of recovery, with those who had opened or

7.2 Appendix B: Supplementary Table

													re-opened claims having a slower recovery than those with finalised claims (multiple linear regression)
55	Gotten, N.	1956	USA		1-2 years after settlement	Tort	Y (-)						Settlement of claim definitely influenced symptomatology advantageously; 41% lost as much as 3 months of work prior to settlement compared to 7% after settlement (Noted that comparison is open to criticism)
56	Hohl, M.	1974	USA		>5 years	Tort	Y (-)						83% of claims that were settled in 6 months were asymptomatic at follow-up compared to 38% of those whose claims were settled after 18 months; Patients who were symptomatic at follow-up had received significantly larger settlements (average \$5,248) than those who were asymptomatic (average \$1,568).
57	Gargan, M.F.	1990	UK		8-12 years	Tort	Y (-)						After 8-10 years only 12% of patients had fully recovered, 48% were left with mild symptoms, 28% complained of intrusive symptoms and 12% suffered from severe problems; Patients that suffered from severe problems averaged 28 months before settlement compared to 15 months for those with less severe symptoms.
58	Elbers, N.A.	2012	The Netherlands	OJS; EQ-5D	<2 years	Tort	Y (0)	Y (-)		Note: All compensable sample. Quality of life was 6.3 on average, which is lower than the 8.34 average of general Dutch population		Participants appreciated their interaction with lawyers significantly more than their interaction with insurance companies; Length of hospital stay was positively associated with procedural justice i.e. those with mild injuries perceived the compensation process to	

7.2 Appendix B: Supplementary Table

												be less fair than those with more severe injuries; Procedural fairness was positively correlated with quality of life i.e. those who perceived the compensation process to be fair had a greater quality of life; Length of time involved in the compensation process was not significantly associated with procedural justice i.e. delay did not affect perception of justice..	
59	Mayou, R.	1996	UK	EPI, BDI, STAI, PSE	1 year	Tort	Y (0)	Y (0)		There were no differences in physical or psychological outcome at either 3 or 12 months between claimants and non-claimants.			There were no differences in physical or psychological outcome at either 3 or 12 months between those who settled early and those who settled late.
60	Pennie, B.	1991	UK	VAPS	<5 months	Tort	Y (0)		Y (0)	18 patients claiming compensation and 2 of those not claiming compensation had failed to recover by 5 months. No statistically significant difference in recovery between claimants and non-claimants.			
61	Bryant, R.A.	1995	Australia	CSQ, IES, ISS	1 year	Tort	Y (0)	Y (-)		Compensation was the best predictor of IES-Intrusion scores accounting for 41% of the variance (stepwise multiple regression).			
62	Schutt, C.H.	1968	USA		26 months	Tort	Y (0)			No difference in presence of symptoms at 6-26 months after the accident between those involved in litigation (75%) and those who are not (82%).			No difference in presence of symptoms at 6-26 months after the accident between those who are no longer involved in litigation (71%) and those whose litigation is still pending (75%).
63	Joslin, C.C.	2004	UK	NDI		Tort	Y (0)		Y (-)	NDI score was significantly higher for compensated group (27/100) compared to non-compensated (not seeking or settled) (14/100); No statistical difference in time off work between compensated and non-compensated.			NDI score was significantly higher for compensated group (27/100) compared to non-compensated (not seeking or settled) (14/100); No statistical difference in time off work between compensated and non-compensated.

7.2 Appendix B: Supplementary Table

64	Mayou, R.	1997	UK	PSE	5 years	Tort	Y (0)	Y (0)				There were trends for prolonged compensation proceedings to be associated with poor physical health, social outcome and/or PTSD at 5 years (not significant). At 5 years, settled: 6% had PTSD, 17% social difficulty and 6% health problems; not settled: 40% had PTSD, 100% had social difficulty and 80% had health problems; dropped suit: 17% had PTSD, 67% had social difficulty, and 33% had health problems. – Not significant.	
65	Cornes, P.	1992	UK	Severity of Disability Scale ratings, AIS	2-4 years	Tort	Y (+)						Time to settlement and amount of award were not significantly associated with employment outcome (return to work or not return to work) at settlement of claim (univariate analysis). However, logistic regression analysis revealed that having a longer period between accident and settlement (time to settlement) was the most important determinate of favourable employment outcome (return to work).
66	Fee, C.R.A.	1988	Ireland		2-4 years	Tort	Y (0)						The symptom rate at one year after settlement is 2.3 times higher than the symptom rate in non-litigants; The symptom rates among cases settled early and later are not significantly different.
67	Blanchard, E.B.	1998	USA	AIS; CAPS, SCID-NP; SCID-II; BDI, STAI, IES; LIFE-base	1 year	No Fault	Y (-)	Y (-)			<i>Initial assessment:</i> Non-litigants had significantly lower PTS symptoms than the two litigant groups (pending and settled). <i>PTS:</i> litigants (pending) were more psychologically		<i>Initial assessment:</i> Those who had settled were more severely injured than non-litigants or those whose litigation was still pending; <i>PTS:</i> Litigants (settled) were not significantly different

7.2 Appendix B: Supplementary Table

										<p>distressed than non-litigants; Scores for all groups declined over time. <i>Distress:</i> Non-litigants were significantly lower for state anxiety, trait anxiety and IES compared to the two litigant groups. Litigants (pending) were significantly more depressed (BDI) than those who had settled or non-litigants. <i>Role functioning:</i> No significant effect of litigation status on average relationships with family. Non-litigants had significantly better relations with friends at 12 months than those whose litigation was still pending. At initial assessment those who had not settled their case within 12 months (pending) were performing significantly poorer than non-litigants. At 12 months no difference in functioning between the 3 groups. Non-litigants were significantly more involved in recreation at initial assessment compared to litigant groups. At 12 months difference between non-litigants and litigants (pending) was still significant. <i>Return to work:</i> Those whose litigation was still pending were less likely to have returned to work at 12 months.</p>			<p>from litigants (pending) or non-litigants with regard to psychological distress; Scores for all groups declined over time. <i>Distress:</i> Litigants (settled) were not significantly different with regard to depression (BDI) than litigants (pending). <i>Role functioning:</i> No significant effect of settlement on average relationships with family. At initial assessment those who had not settled their case within 12 months (pending) were performing significantly poorer than litigants who had settled. At 12 months no difference in functioning between the 3 groups. No significant difference between those who had settled and those who were still pending for involvement in recreation. <i>Return to work:</i> Those whose litigation was still pending were less likely to have returned to work at 12 months.</p>
68	Gabbe, B.J.	2007	Australia	AIS; ISS; SF-12	1 year	No Fault	Y (-)	Y (-)		<p>Compensable patients had lower physical (PCS) and mental scores (MCS) than non-compensable patients; Compensable patients (56%) were more likely than non-compensable patients (35%) to report moderate to severe physical disability as</p>			

7.2 Appendix B: Supplementary Table

										12 months; Compensable patients (57%) reported moderate-severe mental disability (PCS) compared to non-compensable patients (20%). Compensable patients (67%) were less likely to return to work/study by 12 months than non-compensable patients (84%).		
69	Kolbinson, D.A.	1998	Canada			No Fault	Y (-)					Insurance claim status (settled or not settled) was a significant predictor of the number of treatment visits (multiple regression analyses) i.e. settlement of insurance claim was an indicator of poorer prognosis.
70	O'Donnell, M.	2010	Australia	WHO-QOL-Bref, WHODAS II, Acute Stress disorders Interview, Composite International Diagnostic Interview, VAS, HADS, CAPS	2 years	No Fault	Y (-)	Y (-)		Compensable patients were significantly more likely than non-compensable patients to have PTSD, depression and anxiety at 24 months after injury. Compensable patients were less likely to have returned to their pre-injury number of work hours. After removing privately insured patients from the non-compensable group the only significant difference that remained was that those who were compensable were more anxious than those who were not.		
71	Collie, A.	2013	Australia	GCS	5 years	No Fault	Y (-)					The group with the least persistent health care usage were less likely to be employed at the time of injury and to lodge a common law claim for additional damages; The group with the highest and most persistent health care usage were more likely to have a GCS score of 3 than other groups.

7.2 Appendix B: Supplementary Table

72	Elbers, N.A.	2013	The Netherlands	N/A	5 years	No Fault	Y (-)	Y (-)	Y (-)		Tort claimants used more health care services than No-Fault claimants: 27.29 mean visits to health care professionals for No-Fault compared to 204.62 mean visits for Tort - Not clinically relevant (small effect size, standardised beta less than .10).	Claimants who had a higher number of medical assessments used more health care services than those who had fewer assessments – No conclusion could be drawn about causality. Significant negative relationship between legal disputes and health care utilisation i.e. having a lawyer or being involved in a common law claim was not beneficial to claimant's health – Not clinically relevant.	
73	Gun, R.T.	2005	Australia	SF-36; NPOS, VAPS	1 year	No Fault	Y (-)		Y (-)			Consulting a lawyer was associated with a worse outcome for all 5 outcome measures (NPOS, VAPS, treatment, return to work, settlement of claim). Consulting a lawyer was associated with: a 7-point lessening in improvement in NPOS, 11-fold greater chance of still receiving treatment, 5-fold lesser chance of returning to work and 9-fold lesser chance of claim settlement at the end of 1 year compared with not consulting a lawyer.	
74	Cassidy, D.J.	2003	Canada	VAS ; SF-36 (PCS); CES-D	1 year	Both	Y (-)	Y (-)	Y (-)		Tort: 10% improvement in pain increased rate of claim closure by 30%; No-Fault: 10% improvement in pain increased rate of claim closure by 34%; Tort: presence of depression reduced claim closure by 30%; No-Fault: depression reduced claim closure by 38%.		Claim closure is associated with improvements in health; Tort: 10% improvement in physical functioning increased claim closure by 15%; No-Fault: 10% improvement in physical functioning increased claim closure by 22%.
75	Yang, Z.	2010	Australia	SF-12, NRS for pain	1 year	No Fault	Y (0)	Y (-)	Y (-)	Those who received compensation were more likely to have moderate to severe pain at 12 months post-injury (1.00 OR)			

7.2 Appendix B: Supplementary Table

										compared to those who were non-compensable (0.45 OR); Those who received compensation were also more likely to have a MCS-12 score <40 (1.00 OR) compared to those who were non-compensable (0.17 OR).			
76	Ameratunga, S.	2010	New Zealand	SF-36; ISS; IES; Whooley Instrument for depression	18 months	No Fault	Y (0)		Y (0)	Whether patients were seeking compensation or not was not significantly associated with persistent neck pain/stiffness at 5 or 18 months (13.6% and 12.7% respectively).			
77	Cassidy, D.J.	2004	Canada	SF-36	1 year	Both	Y (-)	Y (-)	Y (-)		28.7% of Tort claimants retained a lawyer compared to 7.6% of No-Fault; 15.7% of Tort claimants were at fault compared to 23.8% of No-Fault; Tort claimants reported more intense headaches (mean score= 45.2 compared to 35.6), neck pain (mean score= 54.2 compared to 48.6) and % of body in pain (mean %= 29.0 compared to 26.1) compared to No-Fault claimants (All significant)	Claim closure was highly associated with improvements in health status; 10% improvement in physical health increased claim closure rate by 59%; 10% improvement in mental health increased claim closure rate by 45%; Delayed claim closure was associated with insurance scheme type and fault for the collision.	
78	Cote, P.	2003	Canada	Saskatchewan Health and Back Pain Survey; Chronic Pain Questionnaire; CES-D; PMI	1 year	Both	Y (-)	Y (-)	Y (-)		Incidence of whiplash claims decreased by 28% with introduction of No-Fault; pain intensity and spread was more important in delaying recovery under tort; not being at fault slowed recovery under the tort system.	Faster claim closure (as a marker for recovery) is associated with: better physical functioning, less depressive symptoms and decreased neck pain.	
79	Cote, P.	2000	Canada	VAS; SF-36; CES-D	1 year	Both	Y (-)	Y (-)	Y (-)		The median time-to-claim closure was 415 days under Tort compensation and 220 days under No-Fault compensation.	<i>Tort:</i> Increase of 10 points on a 100 point scale in physical functioning is associated with 17% higher rate of claim-closure throughout the study period; Presence of depressive symptoms (CES-D <16) is	

7.2 Appendix B: Supplementary Table

											lead to 13-24% (Tort) and 18% (No-Fault) increase in claim closure; Presence of depression lead to 37% (Tort) and 36% (No-Fault) decrease in claim closure		associated with delayed closure under the Tort system; After the 6 weeks an improvement of 10mm on a 100mm VAS for neck pain increased claim closure by 13-24%; A 10pt increase on a 100pt physical functioning scale increased claim closure by 17%; Presence of depression/depressive symptoms decreased claim closure by 37%. <i>No-Fault:</i> Pain /numbness in arm, broken bones and memory problems were associated with delayed closure under No-Fault system; An improvement of 10mm on a 100mm VAS for neck pain increased claim closure by 18%; A 10pt increase on a 100pt physical functioning scale increased claim closure by 10-35%; Presence of depression/depressive symptoms decreased claim closure by 36%.
81	Hodgson, S.P.	1989	UK		10-15 yrs	Tort	Y (0)						Of the 10 patients with Whiplash injury who were symptom free: 8 recovered before compensation was settled, 2 got better after settlement; Of the 16 patients with Whiplash injury who are not symptom free: 11 are unchanged, 2 improved since settlement, 3 were worse since settlement. Long-term outcome seems to be determined before settlement of compensation.
82	Schaafsma, F.	2012	Australia	MAIS; HADS, SF-12	7 months	Tort	Y (-)	Y (-)				Both groups improved on SF-12 and HADS scores	

7.2 Appendix B: Supplementary Table

												<p>between baseline and 7 months post-injury, Although there was a significant difference for the SF-12 Role Functioning between the two groups, with the group who had a modified compensation process improving more than the control group at 7 months;</p> <p>The group who had a modified compensation process had a lower number reporting depression (<8) compared to the control group;</p> <p>There was a higher number of participants in the control group who had not returned to their usual activities at 1 month or 7 months;</p> <p>A significantly higher number in the intervention group were employed at 7 months.</p>
83	Cameron, I.D.	2008	Australia	FRI, SF-36, CWOM;	3 years	Tort	Y (-)	Y (-)			<p>Those who injured after legislative change had significantly less disability at 2 years after injury (31.8% and 30.1%) than those who were injured before legislative change (38%);</p> <p>Those who injured after legislative change had a higher number of recovered (FRI <25) patients (52% and 49%) than those who were injured before legislative change (37%);</p> <p>Mean pain intensity: 1.5 (before legislative change), 1.3 (2 years after legislative change), 1.2 (4 years after legislative change);</p> <p>Physical component score</p>	

7.2 Appendix B: Supplementary Table

											(PCS) was higher in those who were injured after legislative change (mean 43.4) than those who were injured before legislative change (mean 39.6); No significant difference in mental component score (MCS) between groups; Those who were injured after legislative change had more favourable outcomes in 4 out of 5 items of CWOM.		
84	Norris, S.H.	1983	UK		6 months	Tort	Y (-)		Y (-)	G1: Symptoms (56% seeking compensation) G2: Symptoms and reduced range of movement (67% seeking compensation) G3: Symptoms, reduced range of movement and neurological loss (100% seeking compensation). Seeking compensation was related to severity of injury.		No statistical difference between groups in improvement of symptoms after settlement; 50% of patients in G1 had improved compared to 25% in G3 (not significant); All patients in G3 had residual neck pain compared to 57% in G1(not significant); G1 were more likely to recover after settlement of claim than either G2 or G3.	
85	Littleton, S.M.	2012	Australia	AIS; ISS, SF-36, FRI, HADS	<4 weeks	Tort	Y (0)	Y (-)			Those who were at fault and not at fault for their accident had similar physical profiles; Mean MCS score was significantly lower for not at fault group (31.4) compared to at fault group (37.3).		
86	Bunketorp, L.	2002	Sweden	NDI, VAS	17 years	Tort	Y (-)	Y (0)	Y (-)	42% of WAD with residual symptoms had been involved in compensation claims compared to 14% of WAD who had recovered; Claimants reported significantly higher intensity of spontaneous neck pain, radiating pain and headache compared to non-claimants.		All patients with residual WAD seeking compensation continued to have residual WAD after settlement.	
87	Ehlers, A	1998	UK	PSS	1 year	Tort		Y (-)		Planned or initiated compensation at 3 months was related to PTSD at 3		At 1 year, 28.9% of those who had not settled their claim had PTSD compared	

7.2 Appendix B: Supplementary Table

										months and 1 year; Not seeking compensation: 16.4% had PTSD at 3 months, and 8.1% at 1 year; Seeking compensation: 31.3% had PTSD at 3 months, and 24.6% at 1 year.			to 10.4% of those who had settled their claim.
88	Mayou, R.A.	2002	UK	PSS	3 years	Tort		Y (-)		Planned or initiated compensation claims at 3 months were related to PTSD at 3 years			Unsettled claims at 1 and 3 years were related to PTSD at 3 years.
89	Mendelson, G.	1987	Australia	EPI, STAI, Hostility and Direction of Hostility Q; Zung Self-Rating Depression Scale; Illness Behaviour Questionnaire; VAS, McGill Pain Questionnaire		Tort		Y (-)	Y (0)	No difference between compensation status and back pain on any measures of pain severity (VAS or pain rating index); Compensation group (48.40) had significantly higher mean score on the depression scale compared to non-compensation group (43.57); There was also a trend for the compensation group to have higher scores on the neuroticism and state- anxiety scales but this was not significant; Score for the Illness Behaviour Questionnaire showed that the compensation group (3.65) had higher mean scores on the affective disturbance scale only compared to the non-compensation group (2.97).			
90	Burstein, A.	1986	USA	IES		Tort		Y (-)		All participants had PTSD: Impact of Event Scale score was 49.8 for compensation group (MVA) and 48.0 for non-compensation group (sudden loss); Only significant difference was item 7: 'I stayed away from reminders of trauma' which was significantly higher in compensation group;			
91	Benight, C.C.	2008	USA	IES-R; MVA-CSE; PDEQ; SCID-IV	3 months	Tort		Y (-)				<i>Correlation analyses:</i> Post traumatic distress at 3	

7.2 Appendix B: Supplementary Table

												months post-MVA was correlated with involvement in litigation (not significant); <i>Regression analyses:</i> Posttraumatic distress at 1 week post-MVA and involvement in litigation were significant predictors of posttraumatic distress at 3 months.	
92	Mayou, R.	2002	UK	SF-36, PSS, HADS	3 years	Tort		Y (0)	Y (-)	Claiming compensation at 3 months predicted pain at 1 year for those with whiplash and bone injury (significant); Being a claimant predicted pain at 1 year for those with other soft-tissue injury (not significant); Claiming compensation was not significantly associated with psychological consequences.			
93	Culpan, R.	1973	Australia			Tort		Y (0)		No significant difference in psychiatric diagnostic spectrum between compensated and non-compensated groups.			50% of the compensated group were thought to be unconsciously motivated by the possibility of financial compensation and failed to improve or became worse up until time of settlement.
94	Sterling, M.	2010	Australia	NDI, PDS	1 year	No Fault		Y (-)	Y (-)	<i>NDI trajectory:</i> mild (0-28%), moderate (30-48%), chronic/severe (>50%); Submitting a compensation claim was significantly associated with worsening effect for NDI symptom severity trajectories excluding chronic/severe. <i>PDS trajectory:</i> resilient (1-10), recovering (11-20), chronic moderate-severe (>21). Submitting a compensation claim was significantly associated with worsening effect for all PDS symptom severity trajectories.			
95	Bryant, R.A.	2003	Australia	ASDI, PTSD module of CIDI, IES, STAI, BDI	2 year	No Fault		Y (-)		No difference in psychopathology measures,			No difference in psychopathology measures,

7.2 Appendix B: Supplementary Table

										diagnostic status, return to work or psychological treatment status at initial assessment or 6 month assessment between those who were involved in compensation and those who never initiated compensation; At 2 year assessment, fewer patients who had never initiated compensation had PTSD compared to those who were involved in compensation.			diagnostic status, return to work or psychological treatment status at initial, 6 month or 2 year assessments between those who had settled their claim and those whose compensation was still pending.
96	Blanchard, E.B.	1996	USA	CAPS; SCID; SCID-II; LIFE-base; AIS	4 months	No Fault			Y (-)	Initiating litigation was the strongest predictor of PTSD and PTSS; Litigation correlates only slightly with degree of injury, therefore injury severity does not predict litigation in all cases.			
97	Pobereskin, L.H.	2005	UK	VAS	2 year	Tort			Y (-)	The most important predictor of pain at 1 year was initial VAS scores and compensation.			At 2 years, individuals who had settled were more likely to have neck pain at least once a week (70%) than those who had not settled (56.7%).
98	Soward, A.	2013	USA		6 weeks	Tort			Y (-)	Moderate/severe neck pain was reported in 64% of litigants and 28% of non-litigants 6 weeks after MVC			
99	Spearing, N.M.	2012	Australia	VAS	2 years	Tort			Y (-)	Claimants have significantly higher neck pain scores than non-claimants at all assessment points (0, 6, 12, 24 months); Once reverse causality bias is addressed and other observable factors are controlled for, the neck pain score is significantly lower at 24 months among claimants compared to non-claimants.			
100	Sapir, D.A.	2001	USA	VAS	1 year	Tort			Y (-)	VAS score was slightly lower among non-litigants than litigants at 1 year; Litigant group had a tendency for greater return of pain (not significant when using chi-square)			Resolution of litigation did not affect treatment outcome.

7.2 Appendix B: Supplementary Table

101	Harris, I.A.	2011	Australia	SF-36, NDI	6 months	Tort			Y (-)			Use of a lawyer was a significant predictor of neck pain, resulting in a change of +0.94 in mean neck pain score (multiple regression analysis).	
102	Abbott, P.	1990	Australia		10 years	No Fault			Y (+)	12 patients who did not claim: 6 improved, 4 remained the same, 1 worsened and 1 declined treatment. 28 patients with pending claim: 16 improved, 4 remained the same, 2 worsened and 6 declined treatment.		78% were involved in legal proceedings for compensation.	11% had been settled in favour of patient; 23% failed to obtain compensation; 67% were still in progress; 5/6 patients whose claim failed did not improve.
103	Parmar, H.V.	1993	UK		>3 years	Tort			Y (0)				Majority of patients were free of pain before settlement of their claims, only 4 out of 100 improved soon after receiving compensation.
104	Dufton, J.A.	2006	Canada	VAS; CBIQ	Discharge from rehab (<2 years)	Both			Y (-)			Lawyer retention at some point prior to discharge and working at initial entry to clinic was the strongest predictor of a negative outcome (<10% change in questionnaire score). This effect was stronger for patients with less intense pain (according to VAS) on initial visit.	

