



MONASH University

**The role of perceived social support in
recovery from musculoskeletal injury**

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Abstract

Musculoskeletal injuries (MSI) are the most commonly occurring injury following road traffic crashes. MSI places a significant burden on the injured person because of pain and disability, and on society due to increased healthcare costs, disability payments and loss of work productivity. Recovery from MSI varies considerably, ranging from rapid recovery to lengthy rehabilitation periods. Due to varying rates of recovery following MSI, there is a need to identify modifiable prognostic factors associated with recovery. Social support has been identified as a significant amenable factor in facilitating better health outcomes. The overall aim of the current research project is to investigate the role of perceived social support as a coping resource in supporting recovery from compensable MSI.

Social support is a meta-construct consisting of several sub-constructs including perceived support, received support, structural support and functional support. Social support is also a bi-directional interactive process between the provider and the recipient. Past research examining the relationship between social support and recovery has yielded mixed results. This was due, in part, to past research failing to account for the various elements of social support and the impact of broader issues impacting social support such as healthcare service use. In an attempt to address these issues, this research project employed a mixed methods research design, comprising of three components. By means of a systematic literature review, the first component investigated whether perceived social support in the family and workplace improved recovery following MSI. Using quantitative research design, the second component examined the impact of social support within social networks on compensable MSI outcomes by analysing cross-sectional survey data and linking this information to administrative claims and payments data. Using qualitative research design, the final component explored the impact of social support on the injured persons as well as interactions and impact of compensable MSI in the context of the family, significant others and friends.

The findings of the systematic review conducted in the first component revealed that the literature describing an association between family support or work-related support and MSI outcomes was inconclusive. In contrast, the findings from the second component demonstrated that

the structure and the sources of social support had a positive impact on post-injury physical health, pain and return to work. The strength of the associations between social support and each outcome varied across structure and sources of support. There were also significant gender differences, indicating that men and women experienced different benefits and gaps in social support. The findings also indicated that the source of social support had direct and modifying effects on healthcare service utilisation. Specifically, family support was associated with less use of allied healthcare services whilst support from friends was associated with less use of allied and mental healthcare services. Family support was also found to modify the association between socio-economic indexes for areas and mental healthcare service use. Finally, the findings from the third component identified three themes related to the perception and experiences of social support and recovery from MSI: 1) key sources and types of support received, 2) relationship development and 3) challenges of providing and receiving support.

This research project provides a greater understanding of the role of perceived social support in recovery from compensable MSI. In particular, the findings contribute to the literature by identifying which characteristics and sources of support are associated with MSI outcomes, whilst also accounting for broader issues impacting social support and recovery such as healthcare service use and the effects of bi-directional relationships on recovery from the perspective of the person with MSI and their informal social network. The findings have several primary and tertiary prevention implications: the use of social support as a prevention resource, the collection of socio-demographic information to identify those at the greatest risk of poor support, the development of informal and formal support interventions for those who lack support, and the provision of support for informal social network members engaged in the recovery process.

Publications arising from this thesis

Prang K-H, Newnam S, Berecki-Gisolf J. The impact of family and work-related social support on musculoskeletal injury outcomes: A systematic review. *Journal of Occupational Rehabilitation*. 2015; 25(1), 207-219.

Prang K-H, Berecki-Gisolf J, Newnam S. Recovery from musculoskeletal injury: The role of social support following a transport accident. *Health and Quality of Life Outcomes*. 2015;13(97):1-17.

Prang K-H, Berecki-Gisolf J, Newnam S. The influence of social support on healthcare service use following transport-related musculoskeletal injury. *BMC Health Services Research*. 2016;16(1):310-321.

Prang K-H, Newnam S, Berecki-Gisolf J. "That's what you do for people you love": A qualitative study of social support and recovery from a musculoskeletal injury. Submitted to *Disability and Rehabilitation*.

Conference presentations arising from this thesis

Prang K-H, Berecki-Gisolf J, Newnam S. Recovery from musculoskeletal injury: The role of social support following a transport accident. Poster presented at the 4th Australasian Compensation Health Research; 2014 Nov 19; Melbourne, Australia.

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Prang K-H, Berecki-Gisolf J, Newnam S. The influence of social support on healthcare service use following transport-related musculoskeletal injury. Paper presented at the 9th Health Services and Policy Research conference; 2015 Dec 7-9; Melbourne, Australia.

Prang K-H, Newnam S, Berecki-Gisolf J. "That's what you do for people you love": A qualitative study of social support and recovery from a musculoskeletal injury. Paper to be presented at the 12th World Conference on Injury Prevention and Safety Promotion; 2016 Sep 18-21; Tampere, Finland.

Thesis including published works general declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes three original articles published in peer reviewed journals and one unpublished publication. The core theme of the thesis is social support and recovery. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the candidate, working within the Monash University Accident Research Centre under the supervision of Dr. Sharon Newnam and Dr. Janneke Berecki-Gisolf.

In the case of chapters 3, 4, 5 and 6 my contribution to the work involved the following:

Thesis chapter	Publication title	Publication status*	Nature and extent (%) of students contribution
3	The impact of family and work-related social support on musculoskeletal injury outcomes: A systematic review	Published in the Journal of Occupational Rehabilitation (2015)	Principal author responsible for the concept, design, data extraction, interpretation of results and writing up the manuscript (70%)
4	Recovery from musculoskeletal injury: The role of social support following a transport accident	Published in Health and Quality of Life Outcomes Journal (2015)	Principal author responsible for the concept, design, statistical analysis, interpretation of results and writing up of the manuscript (70%)

5	The influence of social support on healthcare service use following transport transport-related musculoskeletal injury	Published in BMC Health Services Research Journal (2016)	Principal author responsible for the concept, design, statistical analysis, interpretation of results and writing up of the manuscript (70%)
6	“That’s what you do for people you love”: A qualitative study of social support and recovery from a musculoskeletal injury.	Submitted to Disability and Rehabilitation Journal (2016)	Principal author responsible for the concept, design, data collection, thematic analysis, interpretation of results and writing up of the manuscript (70%)

I have not renumbered sections of submitted or published articles in order to generate a consistent presentation within the thesis. The reference style used was as per the specifications of the Journal to which the relevant article has been submitted or published. A list of references relevant to each article is presented at the conclusion of each of these articles as per the requirements of the publisher.

Student signature: 

Date: 19/07/16

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the student and co-authors’ contributions to this work.

Main Supervisor signature: 

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Abbreviations

ANZSCO	Australian and New Zealand standard classification of occupations
CATI	Computer automated telephone interview
CES	Client experience survey
CI	Confidence interval
COS	Client outcomes survey
CRD	Compensation Research Database
GP	General Practitioner
ICT	Information communication technology
IQR	Interquartile range
IRR	Incidence rate ratio
ISCRR	Institute for Safety, Compensation and Recovery Research
KHB	Karlson, Holme and Breen
MCS	Mental component summary
MSI	Musculoskeletal injury
OR	Odds ratio
PCS	Physical component summary
RTC	Road traffic crash
RTW	Return to work
SEIFA	Socio-economic indexes for areas
SF-12 V2	Short-form-12 health survey version 2
TAC	Transport Accident Commission
WHO	World Health Organisation
WSV	Worksafe Victoria
ZINB	Zero-inflated negative binomial regression



Chapter 1 Introduction

1.1 Statement of the research problem

Injuries are the leading cause of death and disability for persons under the age of 60 (1). More than five million people worldwide die each year as a result of injuries and millions more are injured, accounting for 10% and 16% of global mortality and disability, respectively (2). The World Health Organisation (WHO) estimated that injury rates will increase by 28% between 2004 and 2030, with road traffic injuries predicted to become the third leading cause of death in 2030 (from ninth place in 2004), behind unipolar depressive disorders and ischaemic heart disease (3). In Australia in 2010, injury is estimated to account for 6.5% of the burden of disease (4). In 2009-10, injury accounted for 10,668 Australian deaths (5), and 421,065 Australian hospital admissions (6). The Australian health expenditure in 2004-05 for injury was \$3.4 billion, accounting for 7% of the total allocated health expenditure (4).

Injuries, notably musculoskeletal injuries (MSI) are the most commonly occurring injury in road traffic crashes (RTC), contributing to a large burden of disability (7). The burden is expected to further escalate due to an increase in motorisation in developing countries (8). According to the WHO's Global Burden of Disease study, the majority of admissions for various non-fatal injuries as a result of a RTC were related to MSI, with almost 50% of these fractures (9). In Victoria, Australia, during the 2014-15 fiscal year, 4,891 people were admitted to hospital and 6,761 people visited an emergency department for MSI sustained in a transport accident. The most common MSI reported in Victorian hospitals were fractures to the thorax, shoulder and upper arm, knee and lower leg, followed by dislocation, sprain and strain to the neck, shoulder and upper arm (10). Beyond immediate personal suffering, MSI can result in ongoing pain, reduced quality of life, poor mental health, work disability, increased healthcare services utilisation, and substantial economic and social costs (11-16). The effects of MSI also extend beyond the individual to family members, friends, co-workers, employers, communities and societies (17-19).

Evidence suggests that an individual's response to rehabilitation and recovery from MSI varies considerably, ranging from rapid recovery to lengthy rehabilitation periods. A person with a seemingly minor MSI may have a lengthy disability period, while another with serious pathology may be rehabilitated quickly. For example, Ottoson et al. (20) and Littleton et al. (21) reported that at six

months post-injury, 60% of people with minor MSI sustained in a RTC returned to their pre-injury level of physical health. However, significant improvement of physical health has been found to cease after six months post-injury (21). Similarly, Gopinath et al. (22) and Kenardy et al. (23) showed that persons with minor MSI sustained in a RTC continued to experience poor recovery at one to two years post-injury. Other longitudinal studies have also reported that 20-40% of people had not returned to their pre-injury level of physical health at one to three years post-injury (24-26). Severe pain, psychological suffering and persisting disability resulting from MSI have also been commonly reported (13, 27, 28).

Due to varying rates of recovery following MSI, there is a need to identify modifiable prognostic factors associated with recovery in order to develop targeted interventions. The literature indicates that MSI recovery is influenced by a wide range of biomedical (e.g. type of injury, severity of injury) and psychosocial factors (e.g. psychological distress, recovery expectations) (11, 29-31). In particular, social support has been identified as a significant psychosocial factor in the recovery of MSI (23, 32-34). Several studies have reported positive associations between social support and successful recovery outcomes among persons with MSI. For example, Kenardy et al. (23) reported that social support was positively associated with mental health among persons with minor MSI sustained in a RTC. Nijs et al. (32) and Buitenhuis et al. (33) showed that persons with whiplash injury who received social support reported better long-term functioning outcomes and had shorter duration of neck complaints than those who did not receive support. Baltov et al. (34) showed that among persons with whiplash associated disorder, better social support at work from employers and co-workers was positively associated with return to work. Studies have also reported that among a RTC population, lack of social support (i.e. social deprivation) and perceived negative support were associated with the development of post-traumatic stress disorder (35, 36).

Despite the positive advances made by researchers in examining the impact of social support on MSI outcomes, many gaps in the literature still remain. There is inconsistency in how social support is conceptualised and measured. Social support is a multi-dimensional construct and several studies failed to use a conceptual model (33, 35). The problem associated with not using a conceptual model or theoretical framework is that it is difficult to identify the behavioural mechanisms facilitating change in MSI outcomes. For example, studies commonly report on the effects of social

support, with limited or no information on the source (32, 33, 35) and functional type of support received (23, 33-35). The outcome of an atheoretical approach is that the results of these studies provide inadequate guidance for the development of targeted interventions as they do not provide information on 'who' should provide 'what' type of support and 'when' throughout the recovery process. In regards to methodological limitations, the majority of studies have primarily addressed recovery from the injured person's perspective (23, 32-36). As injury indirectly impacts family members, friends and co-workers, further research is warranted to assess the interactions and effects of all persons involved in these supportive transactions. This research project aims to address these gaps in the literature.

1.2 Transport accident compensation system in Victoria, Australia

Given the limitations in past research, the literature has shown mixed results, in particular in compensable populations. There is growing evidence that those who receive compensation for injury or disease have poorer health and vocational outcomes and slower recovery than those with matched injuries who do not receive compensation (37, 38). Furthermore, the magnitude of the disability is substantial, with a number of recent meta-reviews reporting moderate effect sizes for poor outcomes among those receiving compensation for their injuries than those with matched non-compensable injuries (39-42). Conversely, a number of studies (43, 44) and systematic reviews (45, 46) showed no evidence that access to compensation, including its related processes, is associated with poor outcomes following injury. Given the mixed evidence, there is a critical need for greater understanding of amenable prognostic factors such as social support which can impact recovery outcomes following compensable injury, particularly MSI; thus, providing a unique context in which to investigate the aims of this research project.

Transport accident compensation schemes play an important role in the rehabilitation and care of those with transport injuries. In Victoria, Australia, payments for healthcare, income replacement and lifetime care costs for Victorian's injured in transport accidents are provided via the Transport Accident Commission (TAC). The TAC was established in the mid 1980's as the state regulator and insurer of a population based no-fault injury transport accident compensation system (47). They have direct engagement with the injured person, their healthcare providers and the injured person's

employer. As of June 2015, Victoria has a population of approximately 6 million residents (48) and annually the TAC accepts approximately 20,000 new claims for compensation. In 2014-15, the TAC provided benefits and compensation for 47,204 injured Victorian at a direct financial costs of \$1.1 billion (49).

Those injured in land-based transport accidents involving a car, motorcycle, tram, bus or train are eligible to claim compensation for treatment, income replacement, rehabilitation and long-term support services via the TAC, regardless of fault. In addition, the TAC provides compensation for injury and death occurring interstate for individuals travelling in a Victorian-registered motor vehicle. Injuries and death occurring on the road but not involving a motorised vehicle (e.g. a collision between a pedal cyclist and a pedestrian) are not eligible for compensation. Compensation benefits cover the reasonable costs of the treatment for transport-related injuries. A medical excess is applicable (\$623 for accidents between 1st July 2014 and 30th June 2015 and indexed annually according to the average weekly earnings) and there are maximum fees for most services. The TAC provides funding for the following healthcare services: ambulance services (e.g. for transport from the injury location to hospital and, where required, from one hospital to another), hospital services (e.g. treatment at a public, private or rehabilitation hospital), medical services (e.g. visits to family doctor and specialist doctor), pharmacy items (e.g. for medicine prescribed by doctor and provided by a pharmacist), therapy services (e.g. physiotherapy, chiropractic, podiatry, optometry, osteopathy, and psychology) or nursing services (e.g. home visits after discharge from hospital). In addition, the TAC provides funding for income replacement and the long-term care needs of severely injured clients, including equipment for activities of daily living, modifications to housing and attendant care (47).

In summary, one of the key aims of transport accident compensation schemes is to support those who have been injured in a transport accident by providing benefits and services to encourage recovery. This population presents a unique context to investigate the relationship between social support and recovery given the mixed evidence reported in the literature concerning the health outcomes of those who claim compensation for transport related-injury.

1.3 Research project objectives

The overall aim of the research project is to investigate the role of perceived social support as a coping resource in supporting recovery from compensable MSI. There are three broad objectives of the research project. The first aim is to identify the types and key sources of social support that are optimal for recovery. The second aim is to examine the impact of social support on injury outcomes following compensable MSI. The final aim is to assess the perceived interactions and impacts of social support over the course of the injured person's recovery.

In order to achieve these aims, an explanatory sequential mixed methods research design is used in which the intent was to first use quantitative method and then use qualitative method to help explain the quantitative results in more depth. Combining quantitative data (i.e. statistical trends) with qualitative data (i.e. stories and personal experiences) provides a better understanding of the research problem (50). This mixed methods research project comprised three components. By means of a systematic literature review, the first component (i.e. study one) investigated whether perceived social support in the family and workplace improved recovery following MSI. The second component (i.e., study two and three) examined the impact of social support within social networks on compensable MSI outcomes by analysing cross-sectional survey data and linking this information to administrative claims and payments data. Using qualitative research design, the final component (i.e. study four) explored the impact of social support on the injured persons as well as interactions and impact of injury in the context of the family, significant others and friends.

1.4 Thesis outline

This research project is presented as a thesis consisting of seven chapters. Chapter 2 describes the social support construct and introduces the conceptual frameworks for the research project including the convoy model, behavioural model of health service use and the bioecological system theory. Chapter 3 presents the results of the systematic literature review on the association between various sources of social support and MSI outcomes (i.e. study one). Chapters 4 and 5 present the results of the cross-sectional surveys and linked administrative claims data analyses exploring the impact of social support on MSI outcomes and healthcare services utilisation (i.e. study two and three). Chapter 6 presents the results of qualitative interviews exploring the perception of

social support and recovery from the injured persons' perspective, as well as the experiences of family members, significant others and friends (i.e. study four). Finally, Chapter 7 presents a general discussion and methodological considerations as well as the implications of this research project for future research and practice.

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Chapter 2 Key concepts and conceptual frameworks

Due to the large variability in the rate of recovery of individuals who sustain a musculoskeletal injury (MSI), there is a need to identify amenable prognostic factors for the development of targeted interventions. Social support has been identified as one of the amenable prognostic factors for recovery (1-4). Chapter 2 describes the key constructs and conceptual frameworks related to MSI and social support used to guide this research project.

This chapter is divided into three main sections. The first section introduces key terms and constructs related to MSI and social support. The various social support conceptual frameworks are outlined, followed by a brief review of the empirical evidence for the relationships between social support and health. This section provides the background literature to chapters 3 (i.e. study one) and 4 (i.e. study two). In the second section of this chapter, healthcare service use and the associated conceptual frameworks are described, then the relationship between social support and healthcare service use is discussed. The second section provides the background literature to chapter 5 (i.e. study three). The final section of this chapter presents systems approaches to social support research, which provides the background literature to chapter 6 (i.e. study four).

2.1 Musculoskeletal injury

2.1.1 Definition

Injury is defined as “damage to the body produced by energy exchanges that have relatively sudden discernible effects” (5, p. 69). The subset of injury that forms the basis of this thesis is MSI. MSI is defined as injury to the musculoskeletal system including muscles, tendons, ligaments, joints, blood vessels and related soft tissue. The definition also includes bone fractures, dislocations, sprains, strains, repetitive strain injury sustained from cumulative trauma, neck injury due to whiplash and musculoskeletal pain from injury (6, 7). Systemic diseases (i.e. rheumatoid arthritis, multiple sclerosis, osteoporosis, and fibromyalgia), nerve compression disorders (i.e. carpal tunnel syndrome, sciatica) and spinal cord lesions, generalised pain disorders and pain due to severe underlying conditions such as cancer are excluded.

2.2 Social support

2.2.1 Definition

A number of definitions and measurements of social support have developed since its inception in the 1970s. One of the first recorded definitions of social support was provided in 1976 by Cobbs in his presidential address to the American Psychosomatic Society. He defined social support as “information leading individuals to believe they are cared for and loved, esteemed and valued and belong to a network of communication and mutual obligation.” (8, p. 300). Cobb’s definition focuses on informational and emotional aspects of social support. In the 1980s, Shaefer et al. (9) and House et al. (10) extended this definition of social support to include the following types of support: informational, instrumental (also known as tangible), emotional and appraisal support. One notable feature of these definitions is that they emphasise the notion of perceived social support and ignore the concept of received social support. More recently, Thoits (11, p. 46) provided a more comprehensive definition of social support that refers to “emotional, informational or practical assistance from significant others, such as family members, friends, or co-workers and that support actually may be received from others or simply perceived to be available when needed.”

Defining social support is challenging. In an effort to better understand this concept, research has focused on identifying and measuring its components. In doing this, social support has been labelled as a “meta-construct” or a “multi-dimensional concept” consisting of several sub-constructs including perceived support, received support, structural support and functional support (12, 13). Perceived support refers to the belief regarding the availability of varied types of support from the social network members, whereas received support is the mobilisation and expression about the type of support received (14). Empirical studies have shown that the perception that support is available if needed has direct positive effects on health and well-being but that actually receiving support is not always beneficial (15, 16).

Social support can be divided into structural and functional support. Structural support refers to the characteristics of the network of people surrounding an individual and his/her interaction with this network (17, 18). For example, the number of contacts an individual has, the frequency of contact with various network members, density and multiplexity of relationships among network

members (i.e. number of separate social connections between any two persons) and marital status. Functional support describes the resources that are provided to the individual by his/her network's social ties (18). There are four types of functional support: informational, instrumental/tangible, appraisal and emotional support (9, 10). Informational support is related to the provision of advice or information that may help a person solve problems. Instrumental support consists of assistance with practical tasks or problems such as getting groceries, going to appointments, cooking, and cleaning. Appraisal support relates to help in decision-making, giving appropriate feedback about the person's interpretation of a situation and guidance regarding which course of action to take. Emotional support refers to the amount of love and caring, esteem and value, encouragement and sympathy available from others. These different types of social support can be provided by formal or informal sources (19). Formal sources include self-help groups, medical practitioners, supervisors, co-workers, whereas informal sources are family, parents, spouses, other relatives, friends, partners, and peer groups.

It is important to note the distinctions that exist between social support and related constructs such as social relationship, social networks and social integration. In essence, social relationships is the broad umbrella term encompassing all three concepts: social network, social integration and social support (17, 20). These concepts describe the structure, processes and functions of social relationships. Social network refers to the web of social ties that surround an individual and includes assessment of network size, density and homogeneity (20). As such, social network is the linkage between individuals that may or may not provide social support. Social integration refers to the degree to which the individual feels integrated into the community and society (21). In contrast, social support refers to the exchange of different types of support between individuals.

Another distinction needs to be made between social support and care. Care is defined as assistance given to a person who is not able to take care of themselves (e.g. elderly and dependent children) (22). Care can be divided into two categories: care with instrumental activities of daily living (e.g. help with shopping, cleaning, washing and cooking) and care in performing personal activities of daily living (e.g. personal care, bathing, feeding) (23, 24). Like social support, care can include both formal and informal care (25). Informal care is the assistance a person in need of care receives from their spouse, children, other relatives, friends or neighbours and is primarily unpaid. Formal

care is defined as the care services provided by a paid professional employed by formal organisation. Informal care and social support share similar characteristics, in particular, the provision of instrumental support. To this end, care is recognised as one element of the definition of social support. This research project focuses on multiple elements of perceived social support and its relationship with recovery from MSI.

2.2.2 Models of social support

The relationship between social support and health have been well documented (20, 26, 27). However, the pathways through which social support exerts its influence on health are not yet clearly understood. Several hypotheses such as the main effect (direct effect) (28), stress buffering effect (indirect effect) (28) and convoy model (29) have been proposed.

The main effect hypothesis argues that social support is a protective factor that has a direct effect on health status, independent of stressful life circumstances: the more social support an individual has, the higher the levels of social reinforcement which, in turn, leads to feelings of well-being (28, 30). Another explanation of how social support influences health is by protecting or buffering an individual in the presence of stressful life events (8, 28, 31). This theory suggests an indirect or mediating role of social support between the stressor and health outcomes. Based on this theory, the social network provides support to the individual to cope with the effects of stress in two ways. First, social support may change an individual's perception of a stressor as less stressful, thereby enhancing ability to cope. Second, social support may lessen the impact of stress experienced by reducing physiological and maladaptive behavioural stress responses. Empirical evidence has documented both types of effects of social support (32, 33).

A third model that describes social support is the convoy model. The convoy model was developed by Robert Khan and Toni Antonucci in 1980 (34). This model describes the social network of an individual through which social support is given and received across the lifespan (29). The social network is made up of family, friends and other individuals who serve particular roles that may differ across the life course. Generally, the convoy model has been represented as a concentric-circle diagram in which the circles are used to separate people in terms of the closeness of their relationship with an individual (Figure 2.1). That is, the level of social support reduces as one moves from circles that are closer and more stable (i.e. spouse, family) to ones that are perceived as less

stable (i.e. friends, neighbours and colleagues). To illustrate, past research has shown that spouse and family members are the most preferred support providers, followed by friends, neighbours, and then by formal organisations (35). Furthermore, the convoy model suggests that social support and social relations are shaped by personal (e.g. age, gender, and race) and situational characteristics (e.g. role expectations, life events); the combination of which influences individual health and well-being.

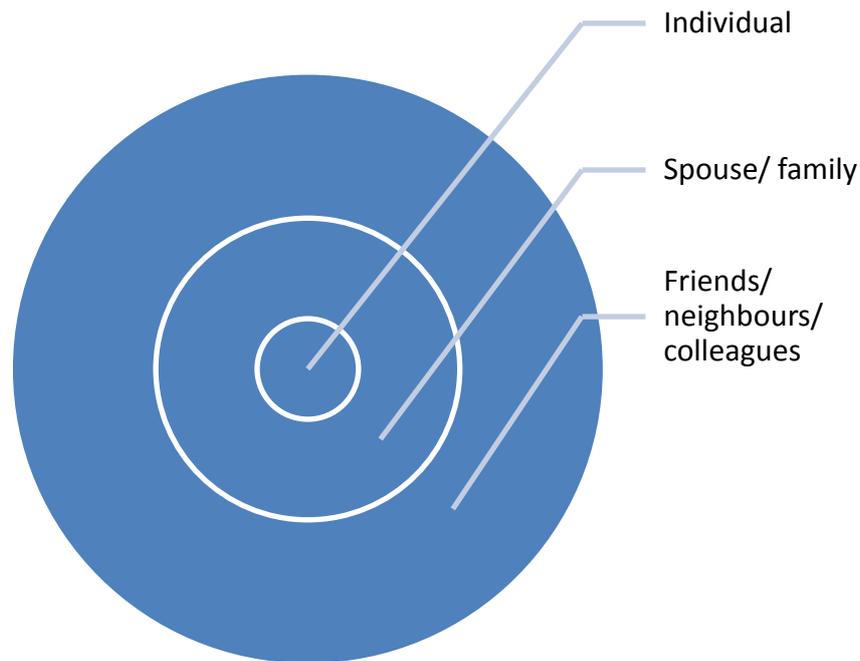


Figure 2.1 The convoy model

The convoy model is applied in chapter 4 (i.e. study two) to examine how social relations between the individual and each member of the convoy model vary across various MSI outcomes including physical health, pain and return to work (RTW). This chapter focuses on the following members of the convoy: family, friends, neighbours and workplace. Personal characteristics of the persons with MSI such as gender, age, country of birth, education, occupation and income are also considered, as well as situational characteristics related to the injury such as pre-injury health status, injury type, hospitalisation (proxy of injury severity) and time since injury. Overall, the convoy model provides a useful guiding framework for understanding the relationship between social support and health. In particular, the convoy model can be used to examine whether the provision of social support from the social network can positively or negatively impact health and well-being. The convoy model also recognises that the positive and negative effects of social support on health are

influenced by a number of personal and situational characteristics. The relationship between social support and health and the characteristics that impact this relationship will be discussed in the next section.

2.2.3 The relationship between social support and health

It is widely recognised that social support has an effect on health and well-being (20, 26, 27). Emile Durkheim's pioneer study of suicide conducted in 1951 was one of the earliest studies to demonstrate how interpersonal relationships have a role in promoting and maintaining physical and mental health (36). He observed that socially isolated people had a higher risk of committing suicide than people who were socially integrated. Since Durkheim's study, empirical studies have shown that people with no or low levels of social support have more physical and psychological health problems (37), as well as higher rates of mortality (38). Conversely, high levels of social support have been linked to lower levels of mortality (27), morbidity (39) and psychological symptomology (40).

The negative impacts of social support have also been established, whereby social support induces stress (41) and promotes poor mental health (42). For example, individuals with dense social networks may feel overwhelmed by the intrusive support that is available to them in times of stress (43, 44). For example, well intended support may be perceived by the individuals as controlling and unhelpful (45, 46). In addition, social support can foster dependency (e.g. sick role) and inappropriate behaviours (e.g. smoking and drinking) (47). For the social network, members may not always be responsive when needed or sometimes have difficulty or uncertainty about the most effective way to help under stressful circumstances (e.g. poor advice, fail at providing tangible assistance, provide little emotional support). Therefore, overly supportive acts or unresponsive acts provided by the social network may be perceived negatively by the injured person, thereby impacting their recovery.

The effect of social support on health is also dependent on personal characteristics including gender. The evidence suggests that women provide more social support to others, and are more likely to seek help and mobilise their social support network than men in times of stress (31, 48, 49). The gender effect may be due to differences in socialisation between women and men. It has been found that women's socialisation emphasises verbal expressiveness, warmth and intimacy (50).

Subsequently, women tend to have more close friends and develop more intimate personal relationships than men (51). In contrast, men's socialisation focuses on autonomy, self-reliance, independence and de-emphasises feelings (50). Men typically report larger social networks than women do; however, men are likely to cite their spouse as their only confidant, whereas women cite spouses and friends at a similar frequency (52, 53).

Despite the evidence of the effects of social support on physical and mental health, the relationship between social support and recovery from MSI is less well established. Given the extent of the problem, this area needs to be better understood. In chapter 3 (i.e. study one), a review of the literature was conducted to examine the extent to which family and work-related social support (e.g. co-workers, supervisors) has been identified as a contributing factor to the outcomes (i.e. physical, psychological, economic) of individuals who have sustained a MSI. In chapter 4 (i.e. study two), the relationships between various sources of social support (i.e. family, friends, neighbours and employers) and MSI outcomes (i.e. physical health, persistent pain and RTW) were examined. The interaction effects between social support and gender on MSI outcomes were also considered, given that women and men may differ in the way they perceive social support.

In addition to the relationship between social support and MSI outcomes in the context of the social network, this research project also considers the role of social support in the context of healthcare services. Healthcare services play an important role in the rehabilitation and recovery of injured persons; thus, may have the capacity to impact the role of social support. Understanding the mechanism by which social support influences the uptake of healthcare services is important to ensure that injured persons receive the appropriate care and treatments necessary for recovery.

2.3 Healthcare service use

Social support can indirectly affect health outcomes by either facilitating or discouraging the uptake of healthcare services. This section first defines healthcare service use as employed in chapter 5 (i.e. study three). This section then describes Andersen and Newman's behavioural model of healthcare service use (54) and Berecki-Gisolf et al. adaption of Andersen and Newman's behavioural model of healthcare service utilisation (55). The latter is the theoretical and

methodological bases of the analyses of social support and healthcare service use in chapter 5. Finally, a brief review of social support as a determinant of healthcare service use is presented.

2.3.1 Definition

Healthcare service use is defined as tasks performed by healthcare providers that are received by and provide benefit to persons with MSI. In chapter 5, this includes allied and mental healthcare services. Allied healthcare services refers to services provided by physiotherapists, chiropractors, osteopaths, acupuncturists and occupational therapists. Mental healthcare services include services provided by psychiatrists, psychologists, general practitioners (restricted to mental health treatment plan only), social workers and vocational counsellors.

2.3.2 Behavioural model of healthcare service use

In 1973, Andersen and Newman proposed a conceptual framework for evaluating conditions that either facilitate or impede healthcare service utilisation (54). This framework suggests that people's use of healthcare services is a function of three factors: 1) predispositions 2) enablers and 3) needs. Predisposing characteristics are the social-cultural characteristics of individuals that exist prior to their illness. This includes demographics (e.g. gender, age), social structure (e.g. education, occupation) and health belief factors (e.g. attitudes and values towards health and the healthcare system). Enabling resources refers to individual/personal (e.g. income, health insurance, social relationships and supports) and community factors (e.g. availability of health personnel and facilities, waiting time) which enable or impede the use of healthcare services. Lastly, needs variables reflect the health problems that generate the demand for healthcare services. Needs can be perceived by the individual and are influenced by cultural beliefs and values.

Although this model has been applied in a number of settings (56), it has two main limitations. First, it has been criticised for omitting important external environmental factors (e.g. political and economic) and health outcomes (e.g. health status and satisfaction) (57, 58). Second, this model was designed to facilitate equitable distribution of health services in the United States of America. Therefore, the applicability of the model to health service use behaviour in a compensated population such as Transport Accident Commission (TAC) clients in Victoria, Australia may be limited. To illustrate these limitations, under the Victorian compensation scheme, financial barriers to healthcare

services are removed under clauses set by the compensation system. Victorians who are injured in a transport accident should not have substantial out of pocket costs. Consequently, enabling factors such as household income would unlikely be an important driver of healthcare service use, whereas factors related to the compensation scheme may be more critical (e.g. eligibility, choice of provider, duration and intensity of healthcare service use). These factors have not yet been considered within the context of the Andersen and Newman's behavioural model of healthcare service utilisation framework.

To overcome these limitations, Berecki-Gisolf et al. proposed an adapted Andersen and Newman's behavioural model of healthcare service utilisation for a compensated population (55). In addition to the three factors proposed in the Andersen and Newman framework to explain healthcare service use, this extended framework includes four additional factors to reflect the compensable context: 1) compensation system 2) regulator (3) provider incentives and 4) individual incentives (Figure 2.2). The compensation system refers to the compensation scheme policies including eligibility for service reimbursement, service provider choices, duration and frequency of visits and reimbursement caps. The government is the regulator of the compensation scheme and its statutory obligations are listed in the Accident Compensation Act 1985. Incentives refers to potential financial gain. For healthcare providers, compensated patients may lead healthcare providers to prolong their treatments when unnecessary. For individuals, health service use may become an 'alibi' for continued work absenteeism.



Figure 2.2 Berecki-Gisolf et al. adaption of Andersen and Newman’s behavioural model of healthcare service utilisation (55)

Berecki-Gisolf et al. adaption of Andersen and Newman’s behavioural model of healthcare service utilisation is applied in chapter 5 (i.e. study three) to explain how social support affects

healthcare service utilisation. In particular, the mechanism (i.e. direct effect, mediation and effect modification) through which social support influences healthcare service use within a compensation system is examined. Chapter 5 focuses predominantly on factors including predisposing, enabling, need and the compensation system/regulator factors. Provider and individual incentive factors are not examined.

2.3.3 The relationship between social support and healthcare service use

According to Andersen and Newman's behavioural model of healthcare service utilisation, social support is considered an enabling factor that can either facilitate or discourage the uptake of healthcare services. For example, family and friends can encourage the use of healthcare service use by directing those seeking help to appropriate referral services and securing transportation to and from the appointment. Conversely, family and friends can also discourage the use of healthcare services by providing direct support; however, this could be at the risk of decreasing access to proper care, increasing carer's burden and overburdening of the social network.

Currently, research-generated knowledge of the relationship between social support and healthcare service use among persons with MSI is limited. Much of what is currently known about social support and healthcare service use has been gathered from research conducted within the general population (59-62), older persons (63) and those with mental illness (64, 65). Among these populations, studies have shown mixed results for the role of social support on healthcare service use. Sellars (59) found that social support from family and friends was unrelated to seeking healthcare services. However, three studies involving the general population found that social support can either enhance or reduce reliance on healthcare service use. Ten Have et al. (60) found that low social support from spouses, friends, relatives and children was related to a two and three-fold increase in primary and mental healthcare service use, respectively. Thoits (61) and Maulik et al. (62) found that greater social support from spouses, friends and relatives decreased the likelihood of mental healthcare service use. In addition, Maulik et al. showed that greater social support from spouses, friends and relatives was positively associated with medical service use (62). Similarly, in both an older persons and mental illness populations, Mechiorre et al. (63), McCracken et al. (64) and Kang et al. (65) found that greater social support was positively associated with healthcare service use.

Several studies have also shown that the combination of stressful life events and social support have a modifying effect on healthcare service use. Maulik et al. found that following a stressful life event, support from spouses was found to increase the use of medical services by almost 50% (66). In addition, their study showed that increased support from friends and relatives was associated with a 40-60% decrease in psychiatric service use. Conversely, Kouzis et al. revealed that the combination of low social support from a confidante and high distress resulted in a four-fold increase in medical service use (67). Given the mixed results and lack of studies conducted within a population with MSI, an understanding of the mechanisms through which social support influences healthcare service use is urgently required to ensure that injured persons have access to the appropriate treatment for their recovery.

Both the convoy model and the adapted behavioural model of healthcare service utilisation provide the basis for understanding how perceived social support can influence recovery. However, these frameworks are heavily focused at the individual-level (i.e. injured person) and do not account for the interdependencies and transactional relationships between other components in recovery from injury. As described previously, social support is an interactive process. It is influenced by the provider and recipient characteristics, characteristics of the relationship as well as the context in which social support takes place. Therefore, a systems approach is required to understand how the injured persons' experience affect interpersonal relationships and vice versa.

2.4 Systems approach

Given the limitations of the previous conceptual frameworks, a system approach allows an examination of systems and processes that impact recovery beyond the individual. This section describes the biopsychosocial model (68) and the bioecological system theory (69). The former is applied in chapter 4 (i.e. study two) as the basis for the selection of the various MSI outcome variables. The latter is the underpinning theory used in chapter 6 (i.e. study four) to explore the influence of the social support system and the communication that takes place among groups of interacting individuals (i.e. person with MSI, family members, significant others and friends) in the context of the compensation system. The biopsychosocial model provides a framework for the assessment and treatment of the MSI. Treatment must consider the influence of the interaction

between the person's various systems including the person, their health problem and their social context.

2.4.1 Biopsychosocial model

In 1977, George Engel proposed the biopsychosocial model to provide a holistic view of care and to counter the limitations of the biomedical model which focus solely on the biology of the disease to describe its aetiology, pathology and prognosis (68). The biopsychosocial model describes the interplay between a person's biological, psychological and social systems in sustaining a disease, illness or injury. The biological component of the biopsychosocial model seeks to understand how the cause of the illness stems from the functioning of the individual's body (e.g. genetic predisposition). The psychological component of the biopsychosocial model explores potential psychological causes for a health problem such as lack of self-control and negative thinking. The social part of the biopsychosocial model investigates how different social factors such as socioeconomic status, family relationship and culture influence health. This theory shifts focus away from an individual's biological factors to a consideration of the social environment. The theory suggests that psychosocial factors could facilitate, sustain or modify the course of illness once they interact with existing somatic factors (68, 70). Figure 2.3 presents a diagram of the biopsychosocial model.

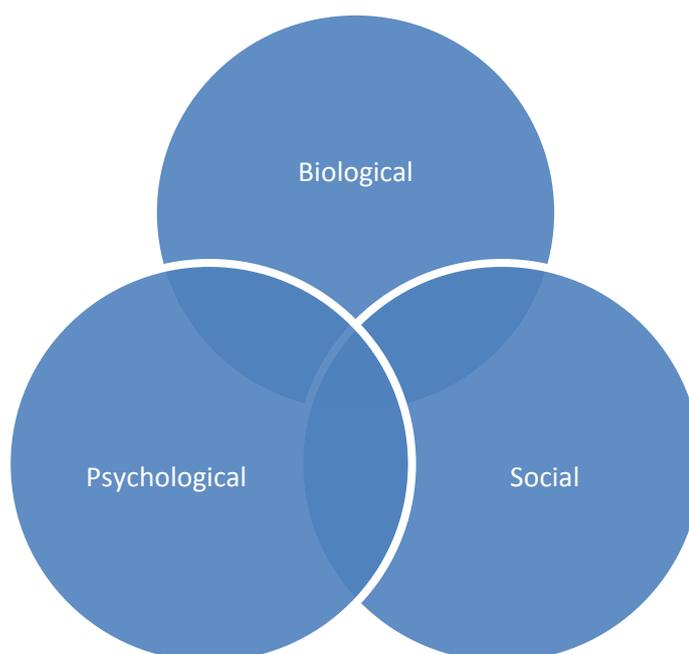


Figure 2.3 Biopsychosocial model

Since the biopsychosocial model was conceived, there has been general consensus that illness and health are the result of an interaction between biological, psychological and social factors (71). However, several limitations have been raised including difficulties with the complexity of outlining linkages or prioritising among its subsystems and failing to address the broader social causes of illness and disease (72). For example, the model does not explain or provide guidance for testing the interactions or causal influences; that is, the model does not allow quantification or estimation of the amount of variance accounted for by each of the components. Furthermore, the model is person-centred and does not take into account the interactions between systems (73). Thus, the biopsychosocial model is limited in that it does not provide a coherent model for understanding recovery within the broader social context. That is, as treatment for recovery involves complex interacting systems, it is essential to collect and assess information at all relevant levels. Based on this limitation, a more integrative approach to the biopsychosocial model is needed. System theories, such as the bioecological system theory, offers an alternative approach that diverts from the individual and focuses on the complex interactions between systems. Consistent with this thinking, the bioecological system theory allows assessment of the interactions and impact of injury between the injured persons and their social network.

2.4.2 Bioecological system theory

General system theory was first proposed by Ludwig Von Bertalanffy in the 1940s (74). System theory views human behaviour or events occurring and existing within several interconnected systems. A system consists of small interdependent parts that, when combined, make up an organised whole. Systems can include any formal or informal grouping of people or facets of organisation, including couples, families, schools, communities, society, and governments. In addition, complex systems can comprise many sub-systems. A change in one part will affect other parts, whether intended or not. Thus, relationships are no longer viewed as linear but as circular as each system influences the others. For example, the injured person's recovery can positively (e.g. strengthen relationship) or negatively (e.g. burdensome) impact his/her social network and vice versa.

Ecological system is a system theory developed by Urie Bronfenbrenner in the 1970s to explain human development, with a strong focus on the environment (75). He defined human

development as the interaction between an individual and the environment. Bronfenbrenner proposed four different levels of environment: the microsystem, the mesosystem, the exosystem, and the macrosystem. Each system or layer of the environment can be represented as a series of concentric circles (Figure 2.4). The first level of the ecological system is the microsystem. The microsystem is the system closest to the person and the one which represents direct contact with components such as the home, school, and workplace. A microsystem typically includes family and friends. Relationships in a microsystem are bi-directional; that is, members in the microsystem can influence the behaviour of the person and vice versa. The next level of ecological system theory is the mesosystem. The mesosystem represents the interactions between the different parts of a person's microsystem. For example, the interactions between home and workplace are interconnected and assert influence upon one another. Outside the mesosystem is the exosystem. The exosystem refers to the social setting that affects the person but does not directly involve the person as an active participant. For example, mass media, community health and welfare services. The final level of ecological system theory is the macrosystem. The macrosystem encompasses the cultural environment in which the person lives. Examples include the economy, cultural values, and political systems. Together, these environmental layers create a context surrounding the person as they develop.

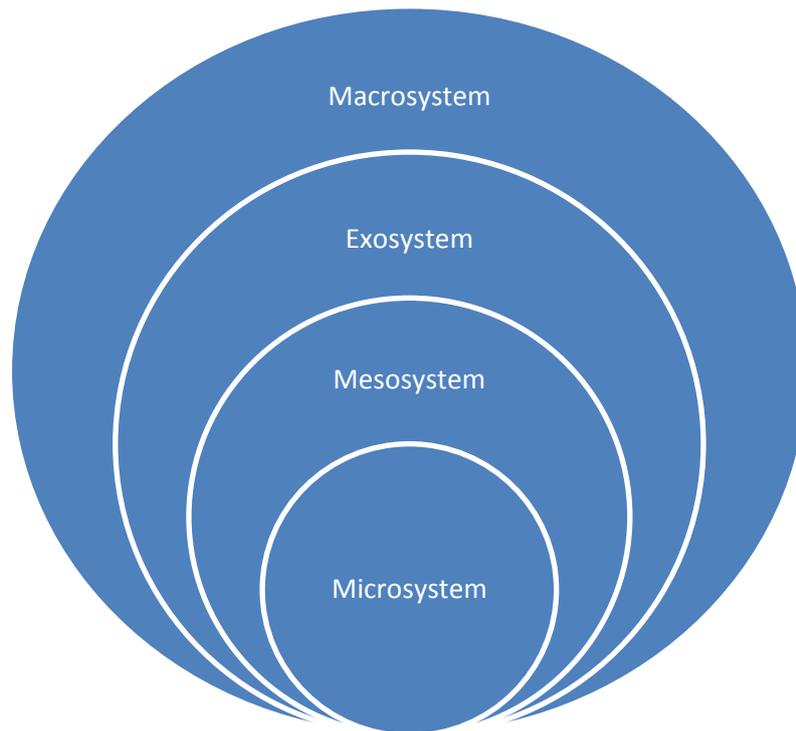


Figure 2.4 Ecological system theory

Given the lack of individual focus in the ecological system theory, in the 1990s, Bronfenbrenner revised his theory to include the role the person plays in his or her own development. He referred to this theory as bioecological system theory (69). The bioecological system theory proposed that human development is the interactions that occur between an individual (their biological being) and the interconnected systems surrounding them (their ecology). Furthermore, he suggested that human development is a product of four critical dimensions: process, person, context and time (PPCT model). Process describes the reciprocal interactions between an individual and their immediate external environment. Person refers to the individual's personal characteristics and includes three types: demand (i.e. age, gender and physical appearance), resource (i.e. experiences, skills and intelligence) and force (i.e. temperament, motivation and persistence). Context involves four interrelated systems: microsystem, mesosystem, exosystem and macrosystem (as described in his original model above). Time refers to change or consistency over time in the characteristics of the person and the environment in which that person lives. Time consists of three factors: micro-time (i.e. the occurrence during the course of activity or interaction), meso-time (i.e. the extent to which activities and interactions occur with some consistency in the developing person's

environment) and macro-time (i.e. variation in the development processes according to historical event).

The biopsychosocial model is applied in chapter 4 (i.e. study two) as the basis for the selection of the various MSI outcome variables. Bronfenbrenner's bioecological system is applied in chapter 6 (i.e. study four) to describe how individuals are functioning at a biopsychosocial level and to describe the interdependencies and transactional relationships between the systems. This study focuses on one particular aspect of the microsystem, the familial relationships, in the context of the macrosystem, the compensation system. In particular, how MSI affects interpersonal relationships and vice versa.

This chapter discussed the complexities of conceptualising social support and past research that has examined the relationship between elements of social support and health outcomes. Past research has provided inconclusive evidence for the relationship between social support and recovery. This is partly due to the inconsistencies in conceptualising social support but also because of the impact of broader issues impacting social support, such as healthcare service use and the effects of bi-directional relationships on health outcomes. In an attempt to address these issues, this research reflects on a number of conceptual frameworks including the convoy model, the adapted behavioural model of healthcare service utilisation and bioecological system theory. A single conceptual framework cannot meaningfully explain the various social support elements and processes that impact recovery, but together they provide a broader understanding of how perceived social support influences recovery from MSI whilst also accounting for the broader issues. The results from this research project will inform recommendations for intervention approaches that target the injured person and other critical parties in the social network in recovery from MSI.

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Chapter 3 Systematic review

Chapter 3 presents the results of the first component of the research project (i.e. study one). The aim of the systematic review was to identify the extent to which informal (e.g. family, friends) and formal (e.g. co-workers, supervisors) social support has been identified as a factor contributing to outcomes (i.e. physical, psychological and economic) of individuals who have sustained a musculoskeletal injury (MSI). The findings of the systematic review describing the association between the various sources of social support and MSI outcomes are presented in a journal article entitled “The impact of family and work-related social support on musculoskeletal injury outcomes: A systematic review”. It has been published in the Journal of Occupational Rehabilitation and is currently available via the following web link:

<http://link.springer.com/article/10.1007/s10926-014-9523-8/fulltext.html>

Prang K-H, Newnam S, Berecki-Gisolf J. The impact of family and work-related social support on musculoskeletal injury outcomes: A systematic review. Journal of Occupational Rehabilitation. 2015; 25(1), 207-219.

Monash University

Declaration for Thesis Chapter 3

Prang K-H, Newnam S, Berecki-Gisolf J. The impact of family and work-related social support on musculoskeletal injury outcomes: A systematic review. Journal of Occupational Rehabilitation. 2015; 25(1), 207-219

Declaration by candidate

In the case of Chapter 3 (i.e. paper one), the nature and extent of my contribution to the work involved the following:

Nature of contribution	Extent of contribution (%)
Principal author responsible for the concept, design, data extraction, interpretation of results and writing up the manuscript	70

The following co-authors contributed to the work:

Name	Nature of contribution	Extent of contribution (%)
Dr. Sharon Newnam	Contributed to the concept and design of the study, and critically reviewed the manuscript	15
Dr. Janneke Berecki-Gisolf	Contributed to the concept and design of the study, and critically reviewed the manuscript	15

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work*.

Candidate's

Signature:



Date 19/07/16

Main Supervisor's

Signature:



Date 19/07/16

The Impact of Family and Work-Related Social Support on Musculoskeletal Injury Outcomes: A Systematic Review

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Abstract *Purpose* Social support has been identified as a key factor in facilitating better health outcomes following injury. However, there is limited research on the role of social support in recovery from musculoskeletal injury (MSI), the leading cause of morbidity and disability in the world. The aim of this study is to review the extent to which family and work-related social support (e.g. co-workers, supervisors) has been identified as a factor in the outcomes (physical, psychological, economic) of individuals with MSI. *Methods* Eight online databases were searched for observational studies reporting findings on family and work-related social support in populations with MSI. Data extraction, quality assessment and a systematic critical synthesis were carried out on included studies. *Results* Fourteen relevant articles were identified. The majority of the studies focused on social support from co-workers or supervisors ($n = 11$), while three studies focused on social support from the family. Overall, the evidence for the relation between work-related support and MSI outcomes was inconclusive. Similarly, there was limited and inconclusive evidence to demonstrate a relationship between family support and MSI outcomes. *Conclusions* The results of this review are inconclusive. Further research is needed to understand the role of social support in rehabilitation efforts following MSI. Recommendations for future research are provided.

Keywords Systematic review · Musculoskeletal injury · Social support

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Introduction

Musculoskeletal injury (MSI) is a common problem and a major source of disability [1–3]. In Victoria, Australia, during the 2011/12 fiscal year, MSI accounted for 58,430 hospital admissions and 117,240 visits to emergency departments [4]. MSI cost several billions of dollars each year in increased healthcare costs, disability payments and loss of work productivity [5]. It is also expected that the burden will continue to increase with an ageing population and an increase in road traffic accidents [6, 7]. Therefore, research is needed to identify factors that support recovery.

There is a plethora of literature that identifies the impact of MSI at the level of the injured person. This research identifies that MSI causes chronic pain, functional impairment and disability [8, 9]. Beyond the injured individual, some research has identified the impact of MSI on the community and broader society [10], including the injured person's family, work colleagues and employers. Families are affected with disruptions to home life following MSI [11], with family members taking on an informal caregiver role to support the injured person [12]. Work colleagues and employers are also affected as having an injured colleague can strain work relationships and increase workload [13, 14].

Whilst the societal impact of MSI is substantial, the majority of the socioeconomic problem is accounted by a relatively small number of individuals with MSI that evolves to chronicity [15, 16]. Past research has shown that psychosocial factors play a significant role in the transition from an acute to a chronic condition [17–19]. Identifying psychosocial variables that can prevent chronicity and influence better health outcomes in the recovery process is essential. One psychosocial factor that has been found to be associated with recovery is social support [20–22]. This

literature suggests that the availability of someone to provide help or emotional support may protect the injured person from some of the negative consequences of stress resulting from an injury (the buffering model) [23].

Social support is defined as information leading individuals to believe they are cared for and loved, esteemed and valued and belong to a network of communication and mutual obligation [24]. Social support consists of two domains: structural and functional support. Structural support refers to the characteristics of the network of people surrounding an individual and his/her interaction with this network (e.g. number of contacts/network size, frequency of contact, membership of community groups, and marital status). Functional support describes the aid and encouragement that is provided to the individual by the social network. Types of functional support include informational (e.g. guidance/feedback that can provide a solution to a problem), tangible/instrumental (e.g. transportation to a clinic, personal care), appraisal (e.g. affirmation/information relevant to self-evaluation) and emotional support (e.g. caring, love and empathy) [25, 26].

The relationship between social support and recovery from injury has been mixed. The majority of research has identified that family and work-related support are positively related to health and well-being [27, 28]. Among individuals with chronic pain, social support from family and friends has been found to reduce pain intensity, reliance on medication, and encourage return to work [27]. Similarly, social support from supervisors and colleagues can help the injured person return to work successfully [29, 30], improve functional outcomes [31] and reduce sickness absence [32]. In the literature, negative influences of social support is also stressed, whereby social support promotes poor mental health [33], fosters dependency and maintains inappropriate behaviours [34]. These findings can be explained by the operant conditioning model whereby certain behaviours such as the sick role are reinforced and maintained by positive social consequences (e.g. high level of social attention from others) [35].

Although there are some published systematic reviews exploring the effects of social support on MSI recovery, most of these reviews are based on a general or non-specific musculoskeletal pain population [36–38] and examine single body regions such as the back [37, 38]. MSI involves many different types of injuries such as sprains, strains, fractures and, as such, it is important to assess how these injuries are impacted by social support. It is possible that associations between social support and MSI may be common across all MSI types. In addition, existing reviews primarily focus on physical and economic outcomes such as pain, disability and return to work [36, 37, 39] with few examining psychological outcomes [38, 40]. The literature

is limited in that it has not covered a broad scope of the burden of MSI. A number of reviews also do not provide detailed information on the source and type of social support as they focus on a large number of prognostic factors [36, 39, 40]. Not identifying the source and type of social support provides inadequate guidance in the development of targeted intervention. Finally, existing reviews show inconsistent findings with some reviews suggesting that social support predicts better outcomes [36, 37, 39] and others showing inconsistent evidence [38] or no associations [40].

In summary, there is some information on the role of social support in supporting recovery from musculoskeletal pain but to our knowledge, a comprehensive overview of social support and the range of MSI outcomes do not yet exist. Given that social support is potentially a factor amenable to change, a summary of the current literature is required. Identifying elements of social support that improve recovery in this population can provide recommendations for psychosocial interventions. Therefore, a systematic review of the literature was conducted to examine the extent to which family and work-related social support (e.g. co-workers, supervisors) has been identified as a factor in the outcomes (physical, psychological, economic) of individuals who have sustained a MSI.

Methods

Search Strategy

The following computerised databases were searched for articles published from their receptive inception dates to 25th January 2013, inclusive: Medline, PsychINFO, EMBASE, CINAHL, IBSS, AMED, CENTRAL and Econlit. The search strategy is outlined in Fig. 1. Search terms were mapped to MESH terms or subject headings and synonyms were grouped together using Boolean operators. Search terms used to identify the study population included ‘musculoskeletal injury’ and ‘musculoskeletal pain’. Terms used to identify social support included ‘social networks’, ‘social interactions’ and ‘social relationships’. A detailed description of the search strategies are provided in Appendix 1. Results of the database searches were downloaded into Endnote X5 and duplicate papers were then excluded. One author (KP) initially screened all titles and abstracts for potentially relevant titles and abstracts. Full text articles were screened for relevance by two authors (KP and SN). All disagreements were discussed at a consensus meeting and if disagreements were not resolved, a third author (JBG) made the final decision. The reference lists of all relevant articles were screened for additional publications.

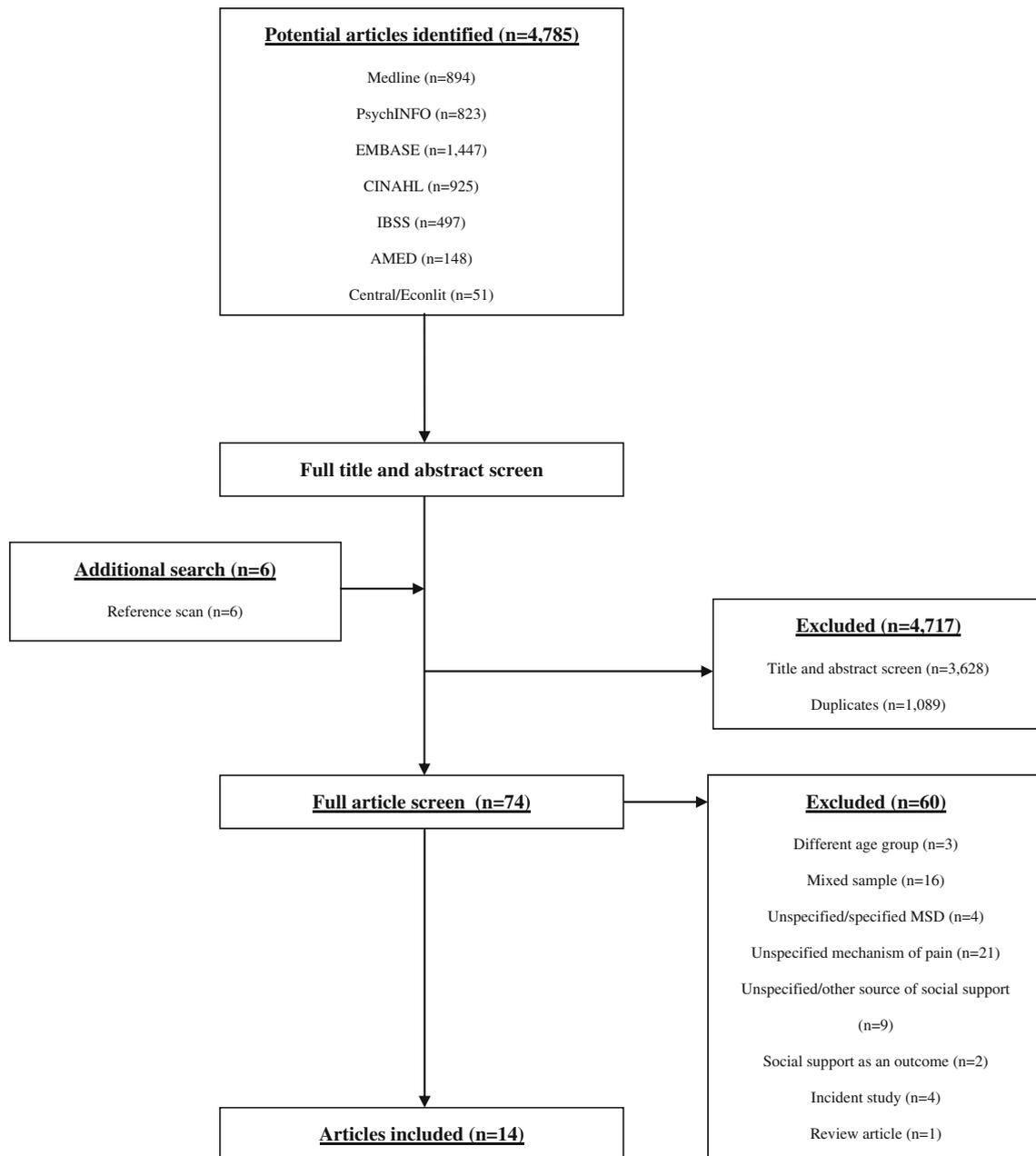


Fig. 1 Flow diagram for retrieval of articles

Inclusion and Exclusion Criteria

Articles were included if: (1) the sample consisted of subjects suffering from MSI (e.g. soft tissues, sprains, strains, fractures, dislocations) to the back, neck (including whiplash), upper and/or lower extremities, or overuse injury (e.g. repetitive strain injury, repetitive motion injury), or musculoskeletal pain resulting from an injury; (2) all subjects were 18–65 years of age; (3) the design was observational (i.e. prospective or retrospective cohort study, cross-sectional study or case–control

study); (4) the study was specific in its measurement of support: family and work-related social support (i.e. supervisors and co-workers); (5) the study reported an association between social support (prognosis factor) and included at least one of the following outcome variables: physical (e.g. physical function, health status, mobility, disability), psychological (e.g. quality of life, mental health, anxiety, depression, post-traumatic stress disorder) or economic (e.g. return to work, loss of earnings, days off work); (6) published in English and available as full text articles.

Articles were excluded if: (1) the sample focused on acute trauma to the skin (e.g. wounds, lacerations, abrasion, blisters, contusions, burns), severe injury (e.g. amputations, brain injury, spinal cord injury), nerve compression disorders (e.g. carpal tunnel syndrome), degenerative and systemic diseases (e.g. rheumatoid arthritis, lupus, multiple sclerosis, osteoporosis), generalised pain disorders, pain due to severe underlying conditions (e.g. cancer, spinal cord lesions), musculoskeletal pain not due to an injury; (2) Randomised controlled trials or qualitative studies; (3) the study measured the association between social support (risk factor) and incidence of MSI; (4) the study included medical and allied health support or (5) did not specify the source of social support.

Quality Assessment

The methodological quality of the included studies was assessed with the Downs and Black's checklist [41]. The checklist consists of 27 questions addressing study reporting, external validity, internal validity (bias, confounding) and power. The quality index of the checklist has high criterion validity ($r = 0.90$), high internal consistency ($KR-20 = 0.89$), test–retest ($r = 0.88$) and inter-rater ($r = 0.75$) reliability. Ten questions pertaining to randomised controlled trials were removed from the checklist as the focus of our systematic review was on observational studies. The last question on power was modified from a scale of 0–5 to a scale of 0 (no) to 1 (yes) where a score of 1 was given if a power or sample size calculation was present, or based on how narrow the confidence intervals were. A score of 0 was given if there was no power or sample size calculation, or explanation on whether the number of subjects was appropriate or based on how wide the confidence intervals were.

The final checklist consisted of a total of 17 questions (Appendix 2), with each question coded as either 'yes', 'no', 'undetermined' or 'not applicable'. If sufficient information was available and bias was considered unlikely, the item was rated as 'yes'. If information was available and bias was considered likely the item was rated as 'no'. When information was not given or the information given was unclear, the item was reported as 'undetermined'. Criteria that were coded as 'yes' received one point and zero points were allocated for 'no' or 'undetermined' responses. A summation of 'yes' contributed to the overall quality of score, with a higher score indicating higher methodological quality. High quality level studies were categorised as 85–100 %, moderate quality studies as 60–84 % and low quality as less than 59 % [42]. Two authors (KP, SN) rated each article independently using the quality assessment criteria checklist. All disagreements were discussed at a consensus meeting, and if

Table 1 Level of evidence for social support

Level of evidence	Criteria
Strong	Consistent findings in at least two high quality studies
Moderate	Consistent findings in one high quality study and one or more moderate quality studies or multiple low quality studies
Weak	Consistent findings in one or more moderate or low quality studies
Inconclusive	Inconsistent findings irrespective of study quality, insufficient findings (only one low quality study)

disagreements were not resolved, a third author (JBG) provided the final judgment.

Levels of Evidence

Due to the heterogeneity in study design, populations sampled, exposure and outcome measurements, MSI assessments, statistical methods, it was not possible to statistically pool the results, and therefore, a best evidence synthesis was conducted [43]. Best evidence synthesis aimed to establish the strength of an association based on quality (methodological), quantity (number of study) and consistency (consistent result across studies). It is recommended that only high quality studies be included in best evidence synthesis to minimise bias in conclusions drawn; however due to a lack of validated and standardised methods to assess study quality and level of evidence, no studies were excluded. The strength of the evidence for sources of social support was determined using a rating system similar to that used in previous similar systematic reviews [40, 44]. Table 1 displays the criteria for level of evidence.

Data Extraction

The following study information was extracted from the studies: author, country, study population, sample size, study design, follow up time for prospective cohort study, social support source, type and assessment, outcome measures, statistical analysis, and findings. Regarding back pain, we categorised the phases of recruitment as 12 weeks or less for acute pain and 12 weeks or more for chronic pain [40]. Samples recruited at both phases were considered a mixed sample. Findings were categorised as positive if strong level of social support was associated with a good outcome or weak level of social support was associated with a bad outcome (i.e. the relationship between social support and outcomes is in the same direction). If strong level of social support was associated with a bad outcome or weak level of social support was

Table 2 Quality assessment

First author	Scoring criteria for quality assessment																	Score (%)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Bonde	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	82
Butler	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	76
Crook	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	88
Fransen	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	94
Gheldof	Y	Y	N	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	76
Holtedahl	Y	Y	N	Y	Y	NA	Y	N	Y	NA	Y	Y	N	Y	Y	NA	Y	79
Kemmlert	Y	Y	N	N	N	Y	N	Y	Y	Y	N	N	N	Y	N	Y	Y	53
Krause	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100
Lee	Y	Y	Y	Y	Y	NA	N	N	Y	NA	Y	Y	Y	Y	N	NA	Y	79
Lehmann	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	UD	N	Y	N	76
Reme	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	UD	N	Y	Y	76
Schultz	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	UD	Y	Y	Y	76
Schultz	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	UD	Y	Y	Y	82
Soucy	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	94
Overall total (%)	86	100	57	79	71	92	71	57	93	100	93	93	71	71	71	100	79	

Y yes, N no, NA not applicable, UD undetermined

associated with a good outcome, we considered the relationship to be negative (i.e. the relationship between social support and outcomes is in different direction). If social support (regardless of level) did not impact outcomes, this was coded as no association. Full data extraction can be found in Table 3.

Results

Selection of Studies

The search strategy retrieved 4,785 articles from eight databases. Seventy-four full text articles were screened for relevance by two authors (KP and SN), with an 82 % rate of agreement. Of these, 14 suitable articles were included within the review. The search strategy is outlined in Fig. 1. We noted that two articles [45, 46] were based on the same sample. We did not exclude either of the publications as different outcomes were described. Furthermore, one of the articles focused solely on psychosocial factors whereas the other also adjusted for biological factors which led to different conclusions.

Quality Assessment

Four studies were rated as high quality [29, 47, 48], nine as moderate quality [45, 46, 49–56] and one as low quality [57] (Table 2).

Study Descriptions

Of the studies included in this review, 12 were cohort designs including one retrospective cohort study, with the follow-up period ranging from 3 to 36 months. Within these studies, the sample size ranged from 55 to 1,831. In addition, there were two cross-sectional studies with a sample size of 171 and 174. Most of the studies focussed on MSI (n = 8), including two studies on back injury and two studies on back injury and pain, followed by back pain (n = 5) and shoulder tendonitis (n = 1). The physical, economic, and psychological outcomes examined most often in these studies were recovery of functions (n = 4), return to work (n = 8), and depression (n = 1).

The majority of the studies examined social support (n = 11) from co-workers (n = 4), supervisors or co-workers (n = 4), while three studies did not specify the source of social support in the workplace. One study examined social support from the family and two studies examined both social support from the family, supervisors and co-workers. Social support was mostly assessed by the Karasek’s job content questionnaires (n = 5) and the Duke-UNC functional social support (n = 2). The questionnaires measured a wide range of social support functions such as socio-emotional (e.g. care about wellbeing, expressions of love and affection), instrumental/tangible (e.g. helpful in getting a job done), informational (e.g. offering useful advice/guidance), social interactions (e.g. availability of other person to do fun things with you) and

Table 3 Data extraction for included studies

Authors	Country	Study population	Sample size	Study design	Follow up (months)	Social support source	Social support type	Social support assessment	Outcome measures	Statistical analysis	Findings
Bonde et al. [49]	Denmark	Shoulder tendinitis	167 at baseline, 113 at follow-up	Prospective cohort	36	Co-workers	Socio-emotional and instrumental	Karasek's job content questionnaire (Whitehall II version)	1. Shoulder tendinitis criteria 2. Psychological 3. Economic	Kaplan–Meier survival function, logistic regression	Positive
Butler et al. [50]	USA	Back pain (acute phase)	1,831 at baseline, 959 at 1 month, 585 at 6 months, 332 at 12 months	Prospective cohort	12	Co-workers	Satisfaction	Self-developed 1 item measure	3. Return to work	Kaplan–Meier survival function, logistic regression	Positive
Crook et al. [56]	Canada	Soft tissue injury	148 at baseline and follow-up	Prospective cohort	21	Co-workers or supervisors	Getting along	Self-developed 1 item measure	3. Return to work	Proportional hazards regression model with time dependent covariates	No association
Fransen et al. [47]	New Zealand	Back pain (acute phase)	854 at baseline and follow-up	Prospective cohort	3	Co-workers	Adaptability, partnership, growth, affection and resolve (satisfaction)	Work APGAR (modified)	3. Claiming compensation	Multiple and logistic regression	No association
Gheldof et al. [51]	Belgium and the Netherlands	Back pain (mixed phase)	1,294 at baseline, 812 at follow up	Prospective cohort	18	Co-workers or supervisors	Socio-emotional and instrumental	Karasek's job content questionnaire	1. Development of short-term low back pain, failure of recovery from short term low back pain, development of long term low back pain, failure of recovery from long term low back pain	Multiple and logistic regression	Co-workers and development of long term low back pain = positive (protects); supervisors and co-workers on other outcomes = no association
Holteidahl et al. [52]	Norway	Musculo-skeletal injury	174	Cross-sectional	NA	Co-workers	Not specified	Not specified	1, 2. SF36	<i>t</i> test, Mann–Whitney, logistic regression	Positive

Table 3 continued

Authors	Country	Study population	Sample size	Study design	Follow up (months)	Social support source	Social support type	Social support assessment	Outcome measures	Statistical analysis	Findings
Kemmlert et al. [57]	Sweden	Injury	195 at baseline, 181 at follow-up	Prospective cohort	36	General social support and work (not specified)	Not specified	Self-developed 8 items measure	1. Self-report	Chi square tests	Positive
Krause et al. [29]	USA	Back injury	433	Retrospective cohort study	36	Co-workers or supervisors	Socio-emotional and instrumental	Karasek's job content questionnaire	3. Compensated work days, return to work	Cox regression	Co-workers = no association; supervisors = positive
Lee et al. [53]	Canada	Back, upper and lower extremity injury	171	Cross-sectional	NA	Family	Emotional/informational, tangible, affectionate, positive social interaction	Medical outcomes study (MOS) family and social support index	1. Depression	Structural equation modelling	Positive
Lehmann et al. [54]	USA	Back injury	60 at baseline, 55 at follow-up	Prospective cohort	6	Co-workers or supervisors	Satisfaction	Job satisfaction scale	1, 2, 3. Return to work, surgery, job terminated, litigation, workers' compensation, suffered subsequent accident, injury or other	Correlations	No association
Reme et al. [55]	USA	Back pain (acute phase)	496 at baseline, 359 at follow up	Prospective cohort	3	Workplace support (did not specify)	Valuation of employees' contribution and care about employees' well-being	Survey of perceived organizational support (SPOS)	1. Pain, disability 3. Return to work	k means cluster, ANOVA, logistic regression	Return to work = positive
Schultz et al. [45]	Canada	Back injury and back pain (mixed phase)	Back injury: 192 at baseline, 159 at follow up, back pain: 61 at baseline, 56 at follow up	Prospective cohort	3	Family, co-workers or supervisors	Socio-emotional and instrumental, affective and confidant support	Duke-UNC functional social support questionnaire, Karasek's job content questionnaire	3. Return to work	Logistic regression	No association

Table 3 continued

Authors	Country	Study population	Sample size	Study design	Follow up (months)	Social support source	Social support type	Social support assessment	Outcome measures	Statistical analysis	Findings
Schultz et al. [46]	Canada	Back injury and back pain (mixed phase)	Back injury: 192 at baseline, 159 at follow up, back pain: 61 at baseline, 56 at follow up	Prospective cohort	3	Family, co-workers or supervisors	Socio-emotional and instrumental, affective and confidant support	Duke-UNC functional social support questionnaire, Karasek's job content questionnaire	1, 3. Return to work, duration of disability, costs of health care and wage loss compensation	Logistic regression	Co-workers & return to work = negative; family or supervisors on other outcomes = no association
Soucy et al. [48]	Canada	Back pain (acute phase)	437 at baseline, 292 at follow up, sample restricted to 258	Prospective cohort	6	Workplace support (did not specify)	Opportunity to interact at work	Johnson and Hall questionnaire	3. Return to work	Multivariate logistic regression	Negative

satisfaction (e.g. level of satisfaction with work relationships including colleagues or supervisors) (Table 3).

Level of Evidence

Level of evidence (Table 1) was evaluated to assess the strength of the association between work-related, family social support and outcomes.

Associations Between Work-Related Social Support and Outcomes

Co-worker Support

Four studies of moderate quality [49–52] out of the 14 studies reported positive associations of co-worker support on outcomes. These studies have shown that satisfaction with co-worker and high socio-emotional and instrumental support from co-worker was associated with recovery from MSI [49], return to work [50], better general and mental health [52], and protection against the development of long term back pain [51]. A moderate quality study conducted by Schulz et al. [46] found a weak negative relationship, where injured people with low socio-emotional, instrumental, affective and confidant support from co-worker were more likely to return to work following MSI than injured people with high co-worker support. Three high quality studies [29, 47, 56] and two moderate quality studies [45, 54] did not report any associations of co-worker support on outcomes. Overall, the level of evidence is inconclusive as a number of studies reported both positive and negative associations, as well as no association between co-worker support and outcomes.

Supervisor Support

One high quality study reported a positive association whereby low socio-emotional and instrumental support from supervisor was associated with lower return to work rate following MSI [29]. One high quality study [56] and four studies of moderate quality [45, 46, 51, 54] did not report any associations between supervisor support and outcomes. There is inconclusive evidence to confirm an association between supervisor support and outcomes.

Workplace Support

Regarding workplace support where the source was not specified, one moderate quality study and one lower quality study reported a positive association between emotional workplace support and return to work [55], and physical health [57] following MSI. One high quality study reported a negative association on return to work; that is, people

with social support were less likely to return to work following MSI [48]. These findings suggest the level of evidence is inconclusive.

Association Between Family Social Support and Outcomes

Three analyses from two studies, all of moderate qualities, examined the association between family support and outcomes. Lee et al. [53] found that emotional, informational, tangible, affectionate support and positive social interaction from family members was associated with a decrease in depression. In contrast, Schultz et al. [45, 46] found no association between family support, return to work, disability, and costs of healthcare following MSI. Overall, the level of evidence for family support on outcomes is inconclusive.

Discussion

The aim of this study was to conduct a systematic review of the literature to examine the extent to which family and work-related social support has been identified as a factor in the outcomes of individuals who have sustained a MSI. Overall, the results provided inconclusive evidence to support the role of co-worker, supervisor and family support in recovery from MSI. The review is consistent with the findings reported by Campbell et al. [38] which found inconclusive evidence of an association between family/friends support and recovery among a spinal pain population. However, the results differ from past published systematic reviews conducted in the area of social support and musculoskeletal disorder/pain [36, 37, 39, 40]. The inconsistency with previous systematic reviews could be attributed to the different inclusion criteria and the conceptualisation of social support as previous reviews did not specify the source of support.

The overall level of evidence for co-workers and supervisors support, along with family support was inconclusive. There are a number of possible explanations for the inconclusive results of this study. First, recruitment times and follow-up periods varied greatly (between 3–36 months) which may have impacted outcomes. Some of the studies recruited their sample within 2 weeks of injury [29, 54, 55, 57], whereas others were recruited months post-injury [45, 48, 52, 56]. This has consequences in terms of comparing acute and chronic MSI. For example, when a person first sustains an injury, support from family and friends may be strong but, over time, this support may diminish. Several studies in this review with samples

recruited at a later phase of MSI did not find an association between social support and outcomes [45, 56]. Support for those transitioning from acute to chronic phases may differ from support at the acute stages. Therefore, it is important for studies to assess outcomes at multiple time points as social support may vary over time. The type of support required may also be different at different stages of recovery.

Second, it is possible that employment factors such as industry type, organisational culture and structure, and tenure with current employer may impact how the injured person perceived work-related social support. Unfortunately, these factors were rarely collected in the studies. Research in the manual labour sector has shown that social support from co-workers improves coping [58]. Tubach suggested that when co-workers provides tangible support (i.e. take on additional work load to help the injured person), this moderates the relationship between mechanical load and musculoskeletal symptoms, thereby reducing physical stress for the injured person, and enabling them to continue working [58]. Mechanisms through which social support operate across industry types may vary. In order to design effective interventions, it will be crucial to understand the various pathways in which social support works and their impact on health outcomes.

Other research has shown that the perceptions of different groups within an organisation can impede social support [13]. The culture of the organisation and how management (managers and supervisors) treat the injured person can dictate how co-workers will react. That is, management creates the culture in which social support is perceived as valued in the organisation. Given that all studies included in this review focused on the injured person's perspective, it will be essential for future studies to assess how the injury affects co-workers and supervisors and, in turn, how this can influence responses toward the injured person which will ultimately impact how social support is perceived.

In regards to workplace tenure, it is possible that a person with a longer tenure may have stronger relationships with co-workers than someone who is relatively new to the organisation [58, 59]. In support, one study in this review which collected information on tenure demonstrated that having a tenure of more than 1 year improves return to work rates by 32 %, after adjusting for social support [29]. Therefore, social support may also vary depending on employment tenure and must be controlled for in the research design.

Third, this review showed that social support has been measured using various tools. Many of the studies utilised a standardised questionnaire such as the Karasek's job con-

tent which measured socio-emotional and instrumental support provided by supervisors and co-workers [29, 45, 46, 49, 51]. Other studies used non-standardised measures (i.e. one question to assess overall social support) and, therefore, provided limited or no information on the construct of support [50, 56]. Consensus on a standardised social support scale which measures several constructs of support would contribute to a more accurate understanding of the type of support required to help people recover from MSI.

It is also important to note that the Karasek's job content questionnaire is based on the Karasek's demand control model which suggests that social support moderates the relationship between demand at work and control over decisions [60, 61]. Many of the studies which utilised the Karasek's job content questionnaire failed to perform the appropriate analysis technique. Future research will need to consider the component of social support beyond main effect but also as a moderator by using more sophisticated statistical modelling such as structural equation modelling (SEM) (e.g. path analysis).

Although this review provides a comprehensive overview of the role of social support on MSI outcomes, there are limitations. First, MSI is interpreted differently in the literature. Although, we defined sprains, strains and soft tissues as MSI, other authors may considered these as non-specific pain which may or may not have been the result of an injury. Therefore we may have missed studies where the authors did not describe the mechanism of the non-specific pain as injury-related. We have excluded pain where the mechanism was not an injury as social support may influence outcomes differently when the mechanism of the pain is unknown. Research has shown that pain-related support varies in disorders with a lack of organic pathology, compared to disorders in which physical findings clearly validate pain reports [62]. The absence of organic pathology may increase others (e.g., family members) uncertainty about the cause of the pain and therefore influence how they respond to the injured person, thus impacting the perception of social support. Second, while the search was comprehensive and included a wide range of electronic databases, it did not include studies in languages other than English and grey literature. Therefore, important findings may have been missed. Third, although some risk of bias can be drawn from the quality scores, we agree with the view of the Cochrane Collaboration [63] that a summary quality score is a subjective judgement, may not be informative, and potentially misleading as it ascribed equal weight to each of the nominated criteria. However, as there is a lack of consensus in the choice of

assessment tools for assessing quality of observational studies in epidemiology [64, 65], the Downs and Black's checklist is deemed to be appropriate despite assigning a total score to each study. We acknowledge that the quality of the studies should be interpreted with caution. Fourth, all the studies included in this review were conducted in western culture countries where independence is valued over interdependence in social relationships [66]. Therefore, the findings from this review may not be generalisable to non-westernised countries given variations in social values.

This study conducted a systematic review of the literature to examine the extent to which family and work-related social support has been identified as a factor in the outcomes of individuals who have sustained a MSI. There was limited and inconclusive evidence to demonstrate a relationship between family support, work-related support and MSI outcomes. Understanding the role of social support is important for planning rehabilitation efforts and, in particular, developing interventions to strengthen the role of social support following MSI. This study demonstrates that there is limited research in this area to form the basis of effective intervention approaches. However, the limited, albeit inconclusive results, do warrant support for future investigation. This review has highlighted a need for future prospective longitudinal studies to measure social support at multiple time points post-MSI and collect information on employment factors. In addition, a consensus on the use of a validated measure of social support is required.

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Ethical standard No animal or human studies were carried out by the authors for this article.

Conflict of interest The authors declare that they have no conflict of interest.

Appendix 1

See Table 4.

Appendix 2

See Table 5.

Table 4 Medline and Embase search strategy

Medline

- 1 exp “Wounds and Injuries”/ or injur*
- 2 exp Musculoskeletal System/ or (musculoskeletal adj1 (system or complaint* or symptom* or condition* or health or problem* or discomfort or ill health or ache or sprain or strain or soft tissue* or injur*))
- 3 (musculoskeletal disorder or cumulative trauma disorder or repetitive motion injur* or repetitive strain injur*)
- 4 (whiplash or whiplash injur* or whiplash associated disorder*)
- 5 (neck adj1 (ache or complaint* or sprain or strain or injur*))
- 6 acute pain/ or exp musculoskeletal pain/ or back pain/ or low back pain/ or chronic pain/ or neck pain/
- 7 (pain adj1 (acute or chronic or low back or back or musculoskeletal or neck))
- 8 pain
- 9 exp lower extremity/ or exp upper extremity/ or neck/
- 10 Social Support/ or Social Isolation/
- 11 (social adj1 (interaction* or relationship* or network* or support* or isolation))
- 12 (support adj1 (social or system* or emotional or informational or instrumental or appraisal or tangible or family or home or spousal or partner or peer* or friend* or employment or employment based or employer or work* or organisational or co-worker* or coworker* or colleague* or supervisor* or superior* or manager* or management))
- 13 (interpersonal relation* or friendship* or work* relation*)
- 14 1 and 2
- 15 8 and 9
- 16 3 or 4 or 5 or 6 or 7 or 14 or 15
- 17 10 or 11 or 12 or 13
- 18 16 and 17
- 19 limit 18 to (English language and humans)

Embase

- 1 ‘musculoskeletal injury’/exp OR ‘musculoskeletal injury’
- 2 ‘musculoskeletal disorder’ OR ‘cumulative trauma disorder’ OR ‘repetitive motion injury’ OR ‘repetitive strain injury’
- 3 musculoskeletal NEAR/1 (‘complaint’ OR ‘symptom’ OR ‘condition’ OR ‘health’ OR ‘problem’ OR ‘discomfort’ OR ‘ill health’)
- 4 ‘whiplash injury’/de OR ‘whiplash injury’ OR ‘whiplash associated disorder’
- 5 ‘musculoskeletal pain’/de OR ‘chronic pain’/de OR ‘chronic pain’ OR ‘acute pain’ OR ‘body part’/exp AND ‘pain’
- 6 ‘social support’/de OR ‘social isolation’/de OR ‘social interaction’/de OR ‘social network’/de OR ‘family interaction’/de OR ‘friendship’/de OR ‘social support’ OR ‘social isolation’ OR ‘social interaction’ OR ‘social network’ OR ‘family interaction’ OR ‘friendship’
- 7 ‘interpersonal relation’ OR ‘interpersonal relationship’ OR ‘work relation’ OR ‘work relationship’ OR ‘social relation’ OR ‘social relationship’

- 8 support NEAR/1 (‘system’ OR ‘emotional’ OR ‘informational’ OR ‘instrumental’ OR ‘appraisal’ OR ‘tangible’ OR ‘family’ OR ‘home’ OR ‘spousal’ OR ‘partner’ OR ‘peer’ OR ‘friend’ OR ‘employment’ OR ‘employment based’ OR ‘employer’ OR ‘work’ OR ‘organisational’ OR ‘organizational’ OR ‘co worker’ OR ‘coworker’ OR ‘colleague’ OR ‘supervisor’ OR ‘superior’ OR ‘manager’ OR ‘management’)
- 9 #1 OR #2 OR #3 OR #4 OR #5
- 10 #6 OR #7 OR #8
- 11 #9 AND #10
- 12 [humans]/lim AND [English]/lim
- 13 #11 AND #12

Table 5 Checklist for measuring study quality

Criteria	Score
<i>Reporting</i>	
1. Is the hypothesis/aim/objective of the study clearly described?	Y/N
2. Are the main outcomes to be measured clearly described in the Introduction or Methods section?	Y/N
3. Are the characteristics of the patients included in the study clearly described?	Y/N
4. Are the main findings of the study clearly described?	Y/N
5. Does the study provide estimates of the random variability in the data for the main outcomes?	Y/N
6. Have the characteristics of patients lost to follow-up been described?	Y/N
7. Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?	Y/N
<i>External validity</i>	
8. Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	Y/N/ UD
9. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	Y/N/ UD
10. In cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls?	Y/N/ UD
11. Were the statistical tests used to assess the main outcomes appropriate?	Y/N/ UD
12. Were the main outcomes measures used accurate (valid and reliable)?	Y/N/ UD
13. Were the assessments of social support assessed by reliable and valid measures?	Y/N/ UD
<i>Internal validity—confounding (selection bias)</i>	

Table 5 continued

Criteria	Score
14. Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?	Y/N/ UD
15. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?	Y/N/ UD
16. Were losses of patients to follow-up taken into account?	Y/N/ UD
<i>Power</i>	
17. Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5 %?	Y/N/ UD

Y yes, N no, UD undetermined

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Chapter 4 Social support and MSI outcomes

Study one in chapter 3 identified that the current published evidence of relationships between work-related support and musculoskeletal injury (MSI) outcomes, and family support and MSI outcomes is inconclusive. Given the inconclusive evidence in the systematic review, the purpose of the second component of the research project was to provide primary evidence examining the impact of social support on MSI outcomes. Chapter 4 presents the results of the second component of the research project (i.e. study two). Using a quantitative research design, the aim of the second study was to determine the impact of social support within the social network (i.e. family, friends, neighbours and employer support) on injury outcomes (i.e. physical health, pain and return to work) following compensable MSI. The findings from the cross-sectional survey data are presented in a journal article entitled “Recovery from musculoskeletal injury: The role of social support following a transport accident”. It has been published in the journal Health and Quality of Life Outcomes and is currently available via the following web link:

<http://hqlo.biomedcentral.com/articles/10.1186/s12955-015-0291-8>

Prang K-H, Berecki-Gisolf J, Newnam S. Recovery from musculoskeletal injury: The role of social support following a transport accident. Health and Quality of Life Outcomes. 2015;13(97):1-17

Monash University

Declaration for Thesis Chapter 4

Prang K-H, Berecki-Gisolf J, Newnam S. Recovery from musculoskeletal injury: The role of social support following a transport accident. Health and Quality of Life Outcomes. 2015;13(97):1-17.

Declaration by candidate

In the case of Chapter 4 (i.e. paper two), the nature and extent of my contribution to the work involved the following:

Nature of contribution	Extent of contribution (%)
Principal author responsible for the concept, design, statistical analysis, interpretation of results and writing up of the manuscript	70

The following co-authors contributed to the work:

Name	Nature of contribution	Extent of contribution (%)
Dr. Janneke Berecki-Gisolf	Contributed to the concept and design of the study, and critically reviewed the manuscript	15
Dr. Sharon Newnam	Contributed to the concept and design of the study, and critically reviewed the manuscript	15

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work*.

Candidate's

Signature:



Date 19/07/16

Main Supervisor's

Signature:



Date 19/07/16

RESEARCH ARTICLE

Open Access



Recovery from musculoskeletal injury: the role of social support following a transport accident

Khic-Houy Prang^{*}, Janneke Berecki-Gisolf and Sharon Newnam

Abstract

Background: Social support can be an important coping resource for persons recovering from injury. In this study, we examined the effects of family structure and sources of social support on physical health, persistent pain and return to work (RTW) outcomes following musculoskeletal injury (MSI) sustained in a transport accident.

Methods: Secondary analysis of Transport Accident Commission (TAC) cross-sectional surveys held in 2010 and 2011 was conducted. In total 1649 persons with MSI were identified and included. Family structure was determined by marital status and number of children. Sources of social support were measured as perceived help from family, friends, neighbours and employers. Physical health was measured with the Physical Component Summary (PCS) score of the Short-Form-12 Health Survey Version 2. Persistent pain was defined as self-reported persistent pain experienced in the last 3 months, and RTW was defined as being back at work for ≥ 3 months at time of interview. Multiple linear and logistic regressions were used for the analyses.

Results: Family and friends' support was associated with better physical health among persons with >1 day hospital stay. Being married or in a de facto relationship was associated with greater PCS score among non-hospitalised persons. Being widowed/separated/divorced was associated with more self-reported persistent pain (odds ratio 1.62 [95 % confidence intervals 1.11–2.37]). Support from family (0.40 [0.24–0.68]), friends (0.29 [0.17–0.47]) and neighbours (0.59 [0.41–0.84]) was associated with less persistent pain. Among women, support from family (0.09 [0.01–0.78]) was negatively associated with RTW, whereas support from friends (3.03 [1.15–8.02]) was positively associated with RTW. These associations were not observed among men. For both men (5.62 [2.77–11.38]) and women (7.22 [2.58–20.20]), support from employers was positively associated with RTW.

Conclusion: Family structure and sources of social support had a positive impact on physical health, persistent pain and RTW following MSI. This study highlights the importance of identifying people who have limited access to a social support network. Those with limited access to social support after a transport accident could potentially benefit from the provision of formal sources of practical and psychological support.

Keywords: Social support, Musculoskeletal injury, Injury outcomes

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Background

Musculoskeletal injuries (MSI) are the most common type of injury sustained [1] and source of morbidity following a transport accident [2]. The Global Burden of Disease study showed that the majority of admissions for various non-fatal injuries as a result of a transport accident are MSI. Almost 50 % of non-fatal injuries sustained were fractures [3]. During the 2012/13 fiscal year, in Victoria, Australia, 4031 people were admitted to hospital and 4787 people visited an emergency department for MSI sustained in a transport accident. The most common MSI reported in Victorian hospitals were fractures to the thorax, shoulder and upper arm, knee and lower leg, followed by dislocation, sprain and strain to the neck, shoulder and upper arm [4].

Recovery from MSI sustained in a transport accident varies considerably from rapid and complete recovery to substantial delayed recovery with symptoms persisting for several years. For example, studies conducted by Ottoson and colleagues [5] and Littleton and colleagues [6] found that 60 % of people return to their pre-injury level of physical health at 6 months following minor MSI sustained in transport accident. Littleton and colleagues also found that after 6 months significant improvement of physical health ceased [6]. Similarly, other longitudinal studies reported that at 1 to 3 years post-injury, 20–40 % of people continued to experience poor recovery and had not returned to their pre-injury level of physical health [7–9]. Severe pain and psychiatric problems resulting from MSI have also been reported in the literature [10]. Due to varying rates of recovery following injury, there is a need to identify risk factors associated with poor outcomes.

Variability in health outcomes post-MSI is influenced by a number of behavioural and psychosocial factors [11, 12], including social support [13]. Social support is defined as information leading individuals to believe they are cared for and loved, esteemed and valued and belong to a network of communication and mutual obligation [14]. Much literature has shown that social support is associated with promoting good physical and mental health [15, 16], reducing and preventing illness [17], and moderating life stress [18]. Conversely, the absence of social support (i.e., social deprivation) or poor social support can result in substantial health risk including an increase in psychiatric morbidity [19] and mortality [20].

In regards to the the relationship between social support and MSI outcomes, the evidence has been mixed. There is evidence that social support is associated with better functional outcomes [21], lower pain intensity [22], and return to work (RTW) [23]. Lack of social support or perceived negative support has also been associated with the development of post-traumatic stress disorder [19, 24]. In contrast, a recent systematic review

found inconclusive evidence of an association between social support and MSI outcomes [25].

It is possible that the inconclusive evidence from the systematic review could be attributed to limitations in the methodology and conceptual design of previous research studies. In regards to the methodological limitations, previous studies have focused on only one health outcome [19, 24, 26]. Comparing results across a range of injury outcomes within the same population can provide more robust evidence regarding the differential impact of social support on injury outcomes. In addition, samples have included all injuries sustained in a transport accident regardless of injury types and severity [19, 24, 27]. It is possible that different types of social support may be required depending on the type and severity of the injury. These methodological limitations will be addressed in this study by exploring various outcomes among a sample with MSI.

Past research has also been limited in its conceptual development. Studies have focused on a single dimension of social support without specifying the source of social support [19, 21, 22, 26]. Social support is a multi-dimensional construct and both the structural and functional aspects of support should be measured. The majority of the literature suggests that social support facilitates recovery [21–23], but it is also possible that poor recovery leads to a deterioration of social support networks (reverse causality). To date, the causal pathway is generally assumed to run unidirectionally from social support to health. To address these conceptual limitations, we explore elements of the convoy model [28] to better understand the impact of social support on recovery from MSI. This model will allow us to more fully understand how social relations between the individual and each member of the convoy model vary across injury outcomes.

The convoy model

According to the convoy model, social support varies in terms of structural support, functional support and adequacy [28]. Structural support refers to the characteristics of the network of people surrounding an individual over the life course and his/her interaction with this network (e.g., network size, marital status). Functional support describes the aid and encouragement that is provided to the individual by the social network. Types of functional support include informational (e.g., providing guidance), tangible (e.g., help getting tasks done), appraisal (e.g., help evaluating a situation) and emotional support (e.g., feelings of being loved) [28–30]. Adequacy is defined as the level to which the individual finds the support they are providing or receiving adequate. Furthermore, the convoy model suggests that social support and social relations are shaped by personal (e.g., age,

gender) and situational characteristics (e.g., life events); the combination of which influences individual health and well-being [28].

Social support can originate from a variety of sources including informal (e.g., spouse, family, friends) or formal sources (e.g., healthcare professionals). According to the convoy model, individuals are also surrounded by close social relationships at various stages of the life span [28]. Generally, the convoy model has been represented as a concentric-circle diagram in which the circles are used to separate people in terms of the closeness of their relationship with an individual.

This model provides a framework for exploring the role of social support in recovery from MSI. The convoy model proposes that the structural, functional and adequacy aspects of social support is influenced by a person's traits and demands of the context; yet to our knowledge these assumptions, particularly in relation to recovery from MSI are yet to be established in the research literature. The aim of the present study is to determine the impact of social support within the social network (family, friends, neighbours and employer support) on injury outcomes (physical health, persistent pain and RTW) following compensable MSI. In particular, this study will examine the family structure and sources (family, friends, neighbours, and workplace) of social support that have the greatest impact on recovery.

Methods

Study design

The study involved secondary analysis of de-identified cross-sectional surveys conducted among compensated transport accident victims in Victoria, Australia 2010 and 2011.

Transport injury compensation system

In the state of Victoria, Australia, those injured in land-based transport accidents involving a car, motorcycle, tram, bus or train are eligible to claim compensation for treatment, income replacement, rehabilitation and long-term support services via the Transport Accident Commission (TAC), regardless of fault. In addition, the TAC provides compensation for injury and death occurring interstate for individuals travelling in a Victorian-registered motor vehicle in other Australian states. Injuries and death occurring on the road but not involving a motorised vehicle (e.g., a collision between a pedal cyclist and a pedestrian) are not eligible for compensation (www.tac.vic.gov.au).

Data source

The TAC conducts an annual Client Outcomes Survey (COS) measuring the health and vocational status of its clients. The survey was designed to inform the TAC

about the impact of its claims management practices and the design of the compensation scheme on the health and vocational outcomes of its clients. The survey includes standardised measures of vocational and health status prior to injury, current vocational status, current health status, including physical and mental health, persistent pain, mobility and functional independence, access to and satisfaction with healthcare and satisfaction with the TAC.

The sample was randomly selected from the population of TAC in the Recovery branch. Clients in the Recovery branch generally have more severe injuries, complex recoveries and require longer-term support. In 2010 and 2011, 6559 and 7739 clients records were provided by the TAC to a third party social research organisation, respectively. The large sample provided was to ensure sufficient sample to fill all required quotas and allow for the opt-out process. Approach letters and TAC research program brochures introducing the survey were mailed to clients. Clients could then either opt-in or opt-out of the study by calling the contact number included in the letter. Clients who took no action were included in the study. The required sample size for 2010 and 2011 were 1290 and 1165 clients, respectively. Subgroups quotas were set by the TAC against teams, life of claim (~4 months to 6 years) as well as active and inactive claims. Active claims were defined as a payment received from the TAC within the last 6 months prior to being surveyed. Inactive claims were defined as no active payments made in the last 6 months, but at least one payment made within 7 to 24 months prior to being surveyed. Once a subgroup quota has been achieved, the third party social research organisation no longer interviewed individual for that particular subgroup. If quota groups appeared to have lower response numbers than expected, efforts were made to target clients in these groups. Data was collected via computer automated telephone interview (CATI) conducted by a third-party social research organisation. The questionnaire takes approximately 25 minutes to administer.

Study participants

In 2010 and 2011, 5266 participants were approached to participate in the study. Of these, 2476 participants completed the survey, including 1649 (67 %) participants with MSI. The survey participation rates for 2010 and 2011 were 44 % and 46 %, respectively. The study comprised of 60 % active claims and 40 % inactive claims. The sample comprised of minor to moderate injuries such as soft tissue, complex orthopaedic/multi-trauma including mild and moderate brain injury. Catastrophic injuries such as spinal cord injury, severe traumatic brain injury, amputees and burns were excluded. In this study, the sample was limited to participants with MSI

including sprains/strains, soft tissues, fractures and dislocations.

Measures

The measures used in this study are part of the standard COS.

Demographics and injury-related characteristics

Demographic characteristics included gender (female vs. male), age, country of birth (Australia vs. others), education (university level vs. less than university level), residential location (Melbourne vs. rest of Victoria), employment status at time of accident (yes vs. no), occupation and income (less than \$50,000 vs. more than \$50,000). Age was defined as the age of the participant at the time of the interview. Among those working at the time of the accident, occupation was grouped into 8 groups: managers, professionals, technicians and trade workers, community/personal service workers, clerical/administration workers, sales workers, machine operators/drivers and labourers [31]. Injury-related characteristics included pre-injury health status (excellent, very good, good, fair, poor), injury type (soft tissue including whiplash, sprain and strain, fracture, dislocation) and hospitalisation (>1 day hospital stay vs. not hospitalised) which was used as a proxy for injury severity [32, 33]. Time since injury was derived from the date of the interview and the accident date.

Social support

Family structure included marital status and number of dependent children. Marital status was grouped into married/de facto relationship, widowed/separated/divorced and never married. As expected, preliminary analysis showed an association between marital status and number of dependent children; thus a family structure composite variable was created. The family composition was categorised into 6 groups: married/de facto relationship with children, married/de facto relationship with no children, widowed/separated/divorced with children, widowed/separated/divorced with no children, never married with children, never married with no children. Sources of social support included accessing help from family, friends, neighbours and employers. For family, friends and neighbours items, participants rated their level of agreement using a 4-point scale that ranged from 1 *yes, definitely* to 4 *no, not at all* to the following question; *'Can you get help from family members/friends/neighbours if you need it?'* For the employer's item, participants also rated their level of agreement using a 4-point scale that ranged from 1 *very supportive* to 4 *not at all supportive* to the following question; *'Thinking about the time you had off work following your accident, in general how supportive was your employer?'*

Physical health

Physical health was assessed by the Short-Form-12 Health Survey Version 2 (SF-12 V2). The SF-12 V2 is a validated international tool that consists of twelve questions [34]. The Physical Component Summary (PCS) of the SF-12 V2 focuses mainly on limitations in physical functioning, role limitations due to physical health problems, bodily pain, and general health. The PCS scores were derived using Australian weights based on the Australian population norms [35]. Higher scores on the PCS indicated more positive physical health.

Persistent pain

Persistent pain was used as an indicator of recovery and was defined as pain that lasted for at least 3 months, as a result of the injury (at the time of the survey). Participants responded yes/no to the following question; *'Has this pain last more than 3 months?'* However, this does not mean that participant had to be in pain every day over the last 3 months; rather, they experienced pain on most days during this time, whether it be continual or not.

Return to work (RTW)

RTW outcome was also an indicator of recovery. RTW was defined as those who had time off work as a result of their accident but who had been back at work for 3 months or more and those who had returned to work initially but who had ceased working for reasons unrelated to their accident. RTW was coded as yes/no and was derived from the following questions: *'Did you have a paid job of any kind at the time of the accident?'*, *'Did you take any time off work as a result of your accident?'*, *'How long have you been back at work in this job?'*, *'Thinking about those jobs, did you work at any of them for three months or more?'*, and *'Of the jobs you had for three months or more, did you leave (either/any) of them for a reason related to your accident?'*

Statistical analyses

Descriptive statistics including frequency distributions and measures of central tendency was undertaken to examine the distribution of key variables. Inferential statistics including chi-squares, t-tests and anovas testing were conducted to examine differences among key variables for each outcome. For SF12 V2, 173 participants (10.5 % of the study population) had missing values for at least 1 item. Those who had more than 4 items with missing values ($n = 12$) were excluded. Chi-square tests were conducted to test for differences between those with missing SF12 V2 values and those without missing SF12 V2 values. With the exception of gender, ($p = .01$) and age, ($p < .001$), there were no differences in the key personal characteristics or injury-related variables

between those with missing values and those without missing values. Those without missing values were most likely to be male and younger than those with missing values. Therefore, missing data for the SF12 V2 questions were replaced by mean substitution [34].

Multiple linear regression models were used to determine the association between social support and physical health outcome (PCS). Multiple logistic regression models were used to estimate adjusted odds ratios (OR) with 95 % confidence intervals (CI) in relation to persistent pain and RTW outcomes. These models fit were evaluated with the Hosmer-Lemeshow goodness-of-fit tests. If necessary, non-significant variables were removed from the model when they interfered with the model fit. For each of the outcomes, 6 models were developed according to the variables of interest: family structure and sources of social support. For family structure, separate analyses were conducted for 1) marital status, 2) children and 3) family composition, while controlling for the effects of demographics and injury-related variables. For sources of social support, separate analyses were performed for 4) family, 5) friends and 6) neighbours' support, while adjusting for the effects of family composition, demographics and injury-related variables. For the sources of social support variables, the 'not often' category was used as the reference group instead of the 'no, not at all' category as participants who rated not receiving any support may not be a homogenous group (e.g., participants who did not require any help, or did not have family living in the area). As a statistical association between physical health and social support was expected, regardless of the injury (i.e., being married is generally associated with better health outcomes [36]), these models were stratified by hospitalisation (hospitalised vs. non-hospitalised groups). If the association between health and social support were to be unrelated to the injury, one would expect the association to be similar in the hospitalised and non-hospitalised groups. Alternatively, if the association is stronger among hospitalised participants (i.e., more severely injured group), this would provide evidence to support an association between social support and injury outcomes. For persistent pain and RTW outcomes, the models were restricted to participants that were at least 3 months post-injury ($n = 1026$) and those who were employed at the time of accident ($n = 955$), respectively. Additional analysis was also conducted to explore the effects of employer support on RTW. In addition, in all models, interactions effects between social support and gender were explored as women and men may differ in the way they perceived social support [37, 38]. An interaction term with a p-value of less than .1 was considered sufficient to justify gender stratification.

Additional analyses of social support and time since injury were conducted to address the possibility of poor injury recovery leading to a deterioration of the social support network (reverse causality). For example, persons in poor health were more likely to have inadequate support and negative assessments of the support they received compared to healthier persons. Based on this assumption, it would be expected that social support would deteriorate during injury recovery; thus, an association between social support and time since injury would suggest that reverse causality was plausible. Alternatively, if results demonstrate that social support is not associated with time since injury, reverse causality would seem unlikely. Although the surveys were cross-sectional, the participants' time since injury ranged from approximately 4 months up to 6 years. Therefore, the associations between time since injury (categorised as 0–12 months, 13–24 months, 25–36 months and 37+ months) and social support (categorised as 'yes definitely', 'sometimes', 'not often' and 'no, not at all') were tested using chi-square tests. These were conducted on the total sample and separate analyses were also performed for the following subgroups: 1) participants who were hospitalised, 2) participants with persistent pain, and 3) participants that have not RTW. A p-value of less than .05 was considered significant in all analyses. Data analyses were conducted using the Statistical Analysis System (SAS) version 9.4. Ethical approval for this study was obtained from the host University Human Research Ethics Committee.

Results

Participant characteristics

The characteristics of the study population are presented in Table 1. The mean age of the cohort was 44 years ($SD = 15$). Over half of the participants were male (59 %), married or in a de facto relationship (54 %), and had children (56 %). Three quarters of the participants did not have a university level education (76 %) and were born in Australia (75 %). The majority were employed at the time of the accident (80 %). The most common occupations were technicians and trade workers (22 %), followed by professionals (18 %) and community/personal service workers (13 %). Over half were hospitalised (58 %) and had fractures (57 %) following a transport accident. Forty-three percent of the participants rated their health as excellent prior to the accident.

Table 1 presents the demographics of the study population and the demographics across the 3 outcomes: persistent pain, RTW and mean PCS score. Sixty-three percent of participants reported persistent pain and 74 % of participants have RTW. The mean PCS score was 41.36 ($SD = 7.25$). Males scored highly on the PCS compared to females ($p = .01$). Younger participants had

Table 1 Demographic characteristics of the sample

	N (column %) (n = 1649)	Persistent pain ^a		RTW ^b		PCS Means (SD) (n = 1637)
		N (row %)		N (row %)		
		Yes (n = 1026)	No (n = 609)	Yes (n = 955)	No (n = 327)	
Gender						
Male	965 (58.5 %)	596 (62.3 %)	361 (37.7 %)	609 (74.7 %)	206 (25.3 %)	41.77 (7.03)
Female	684 (41.5 %)	430 (63.4 %)	248 (36.6 %)	346 (74.1 %)	121 (25.9 %)	40.79 (7.50)
p-value		0.64		0.80		.01
Age group						
16–24	176 (10.7 %)	89 (50.9 %)	86 (49.1 %)	116 (80.0 %)	29 (20.0 %)	43.67 (6.22)
25–34	307 (18.6 %)	183 (59.6 %)	124 (40.4 %)	225 (81.2 %)	52 (18.8 %)	42.87 (6.27)
35–44	365 (22.1 %)	237 (65.5 %)	125 (34.5 %)	238 (75.6 %)	77 (24.4 %)	42.47 (7.28)
45–54	392 (23.8 %)	275 (70.7 %)	114 (29.3 %)	222 (68.7 %)	101 (31.3 %)	40.11 (7.31)
55–64	247 (15.0 %)	148 (61.4 %)	93 (38.6 %)	130 (71.8 %)	51 (28.2 %)	40.82 (7.13)
65+	149 (9.0 %)	85 (57.4 %)	63 (42.6 %)	15 (48.4 %)	16 (51.6 %)	36.97 (7.62)
Missing	13 (0.8 %)	9 (69.2 %)	4 (30.8 %)	9 (90.0 %)	1 (10.0 %)	40.70 (8.49)
p-value		<.001		<.001		<.001
Marital status						
Married or in de facto relationship	896 (54.3 %)	568 (64.0 %)	319 (36.0 %)	561 (77.1 %)	167 (22.9 %)	41.62 (7.17)
Widowed/separated/divorced	284 (17.2 %)	197 (70.1 %)	84 (29.9 %)	101 (62.0 %)	62 (38.0 %)	39.63 (7.46)
Never married	459 (27.8 %)	254 (55.6 %)	203 (44.4 %)	289 (75.7 %)	93 (24.4 %)	41.91 (7.14)
Missing	10 (0.6 %)	7 (70.0 %)	3 (30.0 %)	4 (44.4 %)	5 (55.6 %)	42.01 (6.67)
p-value		<.001		<.001		<.001
Children						
Yes	918 (55.7 %)	574 (63.3 %)	333 (36.7 %)	558 (74.7 %)	189 (25.3 %)	41.71 (7.20)
No	717 (43.5 %)	444 (62.2 %)	270 (37.8 %)	391 (74.5 %)	134 (25.5 %)	40.89 (7.31)
Missing	14 (0.8 %)	8 (57.1 %)	6 (42.9 %)	6 (60.0 %)	4 (40.0 %)	42.65 (5.64)
p-value		0.65		0.93		.02
Family composition						
Married or in de facto relationship with children	511 (31.0 %)	332 (65.7 %)	173 (34.3 %)	332 (76.9 %)	100 (23.2 %)	41.87 (7.11)
Married or in de facto with no children	382 (23.2 %)	233 (61.5 %)	146 (38.5 %)	228 (77.6 %)	66 (22.5 %)	41.31 (7.25)
Widowed/separated/divorced with children	129 (7.8 %)	91 (72.2 %)	35 (27.8 %)	52 (64.2 %)	29 (35.8 %)	39.51 (7.41)
Widowed/separated/divorced with no children	154 (9.3 %)	105 (68.2 %)	49 (31.8 %)	49 (59.8 %)	33 (40.2 %)	39.72 (7.55)
Never married with children	276 (16.7 %)	149 (54.4 %)	125 (45.6 %)	173 (74.6 %)	59 (25.4 %)	42.43 (7.09)
Never married with no children	176 (10.7 %)	103 (58.5 %)	73 (41.5 %)	112 (77.2 %)	33 (22.8 %)	41.08 (7.22)
Missing	21 (1.3 %)	13 (61.9 %)	8 (38.1 %)	9 (56.3 %)	7 (43.8 %)	41.81 (5.89)
p-value		.002		.004		<.001
Educational level						
University level education	373 (22.6 %)	205 (55.9 %)	162 (44.1 %)	251 (83.7 %)	49 (16.3 %)	42.85 (7.00)
Less than University level education	1252 (75.9 %)	804 (64.6 %)	440 (35.4 %)	696 (71.6 %)	276 (28.4 %)	40.93 (7.29)
Missing	24 (1.5 %)	17 (70.8 %)	7 (29.2 %)	8 (80.0 %)	2 (20.0 %)	41.00 (5.50)
p-value		.002		<.001		<.001
Country of birth						
Australia	1243 (75.4 %)	769 (62.3 %)	466 (37.7 %)	752 (74.8 %)	253 (25.2 %)	41.55 (7.30)
Others	397 (24.1 %)	253 (64.7 %)	138 (35.3 %)	196 (72.6 %)	74 (27.4 %)	40.74 (7.05)

Table 1 Demographic characteristics of the sample (Continued)

Missing	9 (0.5 %)	4 (44.4 %)	5 (55.6 %)	7 (70.0 %)	0 (0.0 %)	41.97 (6.48)
p-value		.38		.46		.05
Residential location						
Melbourne	1122 (68.0 %)	692 (62.3 %)	419 (37.7 %)	670 (76.8 %)	203 (23.3 %)	41.59 (7.08)
Rest of Victoria	459 (27.8 %)	285 (62.5 %)	171 (37.5 %)	249 (69.6 %)	109 (30.5 %)	41.10 (7.48)
All other	68 (4.1 %)	49 (72.1 %)	19 (28.0 %)	36 (70.6 %)	15 (29.4 %)	39.34 (8.04)
p-value		.27		.03		.22
Employed at the time of accident						
Yes	1320 (80.0 %)	815 (62.4 %)	491 (37.6 %)	955 (74.5 %)	327 (25.5 %)	41.93 (7.06)
No	325 (19.7 %)	208 (64.0 %)	117 (36.0 %)	0 (0.0 %)	0 (0.0 %)	39.07 (7.59)
Missing	4 (0.2 %)	3 (75.0 %)	1 (25.0 %)	0 (0.0 %)	0 (0.0 %)	38.34 (2.59)
p-value		.29				<.001
Occupation ^c						
Managers	136 (10.3 %)	83 (62.9 %)	49 (37.1 %)	98 (74.8 %)	33 (25.2 %)	41.62 (7.34)
Professionals	233 (17.7 %)	134 (58.8 %)	94 (41.2 %)	186 (84.9 %)	33 (15.1 %)	42.63 (6.95)
Technicians and trade workers	293 (22.2 %)	191 (65.4 %)	101 (34.6 %)	212 (73.4 %)	77 (26.6 %)	42.30 (6.99)
Community/personal service workers	166 (12.6 %)	95 (58.3 %)	68 (41.7 %)	113 (70.6 %)	47 (29.4 %)	41.92 (7.44)
Clerical/administration workers	132 (10.0 %)	91 (69.0 %)	41 (31.1 %)	103 (79.8 %)	26 (20.2 %)	40.51 (7.34)
Sales workers	95 (7.2 %)	60 (63.2 %)	35 (36.8 %)	73 (80.2 %)	18 (19.8 %)	42.74 (6.89)
Machine operators/drivers	100 (7.6 %)	54 (54.0 %)	46 (46.0 %)	70 (70.0 %)	30 (30.0 %)	41.15 (6.98)
Labourers	158 (12.0 %)	104 (66.2 %)	53 (33.8 %)	97 (61.8 %)	60 (38.2 %)	41.69 (6.56)
Missing	7 (0.5 %)	3 (42.9 %)	4 (57.1 %)	3 (50.0 %)	3 (50.0 %)	41.36 (5.67)
p-value		.19		<.001		.13
Income ^c						
Less than \$50,000	526 (39.8 %)	333 (63.9 %)	188 (36.1 %)	370 (72.3 %)	142 (27.7 %)	41.74 (7.10)
More than \$50,000	560 (42.4 %)	340 (61.6 %)	212 (38.4 %)	435 (80.1 %)	108 (19.9 %)	42.28 (6.87)
Missing	234 (17.7 %)	142 (60.9 %)	91 (39.1 %)	150 (66.1 %)	77 (33.9 %)	41.51 (7.41)
p-value		.43		.003		.20
Injury types						
Dislocation	119 (7.2 %)	68 (57.1 %)	51 (42.9 %)	79 (79.0 %)	21 (21.0 %)	42.80 (6.46)
Fracture	932 (56.5 %)	565 (61.0 %)	361 (39.0 %)	592 (77.7 %)	170 (13.3 %)	41.39 (7.36)
Soft tissue	517 (31.4 %)	344 (67.5 %)	166 (32.6 %)	246 (67.4 %)	119 (32.6 %)	41.09 (7.26)
Sprain/strain	81 (4.9 %)	49 (61.3 %)	31 (38.8 %)	38 (69.1 %)	17 (30.9 %)	40.63 (6.78)
p-value		.05		.001		.10
Hospitalisation (within 7 days of accident)						
Yes	953 (57.8 %)	597 (63.0 %)	351 (37.0 %)	561 (73.8 %)	199 (26.2 %)	41.14 (7.38)
No	696 (42.2 %)	429 (62.5 %)	258 (37.6 %)	394 (75.5 %)	128 (24.5 %)	41.67 (7.06)
p-value		.83		.50		.15
Health prior to accident						
Excellent	704 (42.7 %)	454 (65.0 %)	245 (35.1 %)	454 (76.3 %)	141 (23.7 %)	42.27 (7.12)
Very good	643 (39.0 %)	390 (61.2 %)	247 (38.8 %)	387 (75.0 %)	129 (25.0 %)	41.16 (7.03)
Good	241 (14.6 %)	148 (62.2 %)	90 (37.8 %)	99 (66.9 %)	49 (33.1 %)	40.34 (7.28)
Fair	46 (2.8 %)	26 (56.5 %)	20 (43.5 %)	13 (68.4 %)	6 (31.6 %)	36.59 (8.83)
Poor	13 (0.8 %)	6 (46.2 %)	7 (53.9 %)	1 (33.3 %)	2 (66.7 %)	38.35 (9.12)
Missing	2 (0.1 %)	2 (100.0 %)	0 (0.0 %)	1 (100.0 %)	0 (0.0 %)	40.06 (3.50)

Table 1 Demographic characteristics of the sample (Continued)

p-value		.35		.07		<.001
Time post-injury						
0–12 months	368 (22.3 %)	222 (62.7 %)	132 (37.3 %)	208 (68.9 %)	94 (31.1 %)	41.51 (7.44)
13–24 months	561 (34.0 %)	341 (60.8 %)	220 (39.2 %)	335 (77.9 %)	95 (22.1 %)	41.91 (7.17)
25–36 months	377 (22.9 %)	211 (56.0 %)	166 (44.0 %)	221 (75.9 %)	70 (24.1 %)	41.75 (7.07)
37+ months	343 (20.8 %)	252 (73.5 %)	91 (26.5 %)	191 (73.7 %)	68 (26.3 %)	39.87 (7.19)
p-value		<.001		.05		<.001

^aRestricted to those who were at least 3 months post-injury

^{b,c}Restricted to those who were employed at the time of the accident

a higher PCS score ($p < .001$) and were more likely to have RTW ($p < .001$). Older participants were more likely to experience persistent pain ($p < .001$). Participants who were widowed, separated, or divorced scored poorly on the PCS ($p < .001$), were less likely to have RTW ($p < .001$), and were more likely to experience persistent pain ($p < .001$) compared to those who were married or in a de facto relationship and never married. Participants with children had a higher PCS score compared to those with no children ($p = .02$). Participants with a university level education scored highly on the PCS ($p < .001$) and were more likely to have RTW ($p < .001$) than those without a university level education. They were also less likely to report persistent pain ($p = .002$). Participants at the 37+ months post-injury scored lower on the PCS ($p < .001$) and were also more likely to report persistent pain ($p < .001$) than participants at less than 36 months post-injury. Participants living in Melbourne ($p = .03$), employed as professionals ($p < .001$), earning more than \$50,000 ($p = .003$), sustained a dislocation ($p = .001$) were more likely to have RTW.

Social support and physical health

Table 2 presents the results of the multiple linear regression analyses examining the relationship between social support and physical health (PCS). Among the hospitalised participants, this table shows that no significant associations were found between marital status, children, family composition and PCS. On the other hand, receiving 'definite' family and friends' support was significantly associated with an increase in PCS score.

Among non-hospitalised participants, being married or in a de facto relationship was significantly associated with an increase in PCS score. In addition, non-hospitalised participants who reported having 'no, not at all' support from family, friends, and neighbours were significantly associated with a poor score on the PCS (Table 2). In addition, no interactions effects were observed for gender and physical health.

Social support and persistent pain

Table 3 presents the results of the multiple logistic regression analyses investigating the relationship between social support and persistent pain. The table shows that being widowed, separated or divorced was significantly associated with increased odds of reporting persistent pain. Participants who reported having 'definite' support from family, friends and neighbours, relative to those reporting 'not often' support were significantly associated with decreased odds of reporting persistent pain. No statistically significant associations with persistent pain were observed in the family structure models for children and family composition. To test if these results were due to a biased sample selection (i.e., participants who have RTW may be more positive about their experience of persistent pain), a separate model was conducted for participants who were working at the time of the accident (not shown). Results from the model with only participants working at the time of the accident were similar to the previous models, thus, results were unlikely due to the sample selection bias. In addition, no interaction effects were observed for gender and persistent pain.

Social support and RTW

Interaction effects were observed for gender and RTW ($p < .1$); thus the RTW models were further stratified by gender. Table 4 presents the results of the multiple logistic regression models assessing the relationship between social support and RTW. The table shows that significant differences were found between men and women. Women receiving support from family, regardless of the amount of support, had decreased odds for RTW, whereas 'definite' support from friends increased the odds of RTW. No such differences were observed among men. For both men and women, support from employers was positively associated with RTW. The associations were more prominent among women. No significant associations were found for marital status and children for both groups.

Table 2 Multiple linear regression models of the relation between social support and physical component score stratified by hospitalisation

Models	Physical Component Score							
	Hospitalised				Non-hospitalised			
	Median	IQR	β	95 % CI	Median	IQR	β	95 % CI
1. Marital status ^a								
Married or in de facto relationship	44.15	37.91–48.07	0.98	−0.23–2.20	45.03	39.68–49.18	1.78*	0.38–3.19
Widowed/separated/divorced	41.79	36.85–47.29	0.87	−0.81–2.55	41.18	36.80–47.16	0.63	−1.14–2.40
Never married (ref)	44.50	38.98–49.27	0.00	.	46.21	38.94–50.50	0.00	.
2. Children ^a								
Yes	44.08	38.88–48.29	0.24	−0.77–1.24	44.95	39.09–49.28	−0.12	−1.20–0.96
No (ref)	43.78	37.55–48.11	0.00	.	44.48	37.98–48.71	0.00	.
3. Family composition ^a								
Married or in de facto relationship with children	44.13	38.65–48.07	1.04	−0.50–2.58	45.21	39.61–49.28	2.14*	0.16–4.11
Married or in de facto with no children	44.20	37.43–48.21	0.93	−0.67–2.53	45.02	39.68–48.71	2.88*	0.85–4.90
Widowed/separated/divorced with children	41.21	36.37–45.56	0.24	−1.95–2.42	42.90	37.60–47.88	1.35	−1.08–3.78
Widowed/separated/divorced with no children	42.56	37.40–49.45	1.05	−0.97–3.07	40.09	36.47–46.88	1.26	−1.24–3.78
Never married with children	45.17	40.22–49.82	0.13	−1.57–1.83	46.03	38.71–50.50	1.16	−0.91–3.22
Never married with no children (ref)	43.78	37.73–47.96	0.00	.	46.27	38.94–50.53	0.00	.
4. Family ^b								
Definitely	45.09	39.56–49.19	3.68*	1.56–5.80	45.83	40.11–49.44	0.58	−1.46–2.62
Yes, sometimes	41.19	36.24–46.73	1.72	−0.57–4.01	42.94	37.37–48.99	−0.73	−2.99–1.53
No, not at all	42.54	36.44–47.64	2.48	−0.15–5.10	40.04	35.96–46.14	−2.56*	−5.04–−0.08
Not often (ref)	40.68	37.46–46.63	0.00	.	42.67	38.58–47.51	0.00	.
5. Friends ^b								
Definitely	45.25	39.26–49.02	2.68*	0.80–4.56	46.21	40.61–49.77	0.56	−1.51–2.64
Yes, sometimes	42.66	37.43–47.77	0.46	−1.52–2.43	44.01	39.18–49.47	−0.70	−2.88–1.49
No, not at all	40.39	35.30–45.61	0.07	−2.40–2.54	38.86	35.76–43.34	−3.35*	−5.92–−0.78
Not often (ref)	41.73	37.59–47.31	0.00	.	42.37	37.96–47.51	0.00	.
6. Neighbours ^b								
Definitely	45.31	40.33–49.03	1.44	−0.17–3.05	46.53	41.68–49.78	1.39	−0.33–3.11
Yes, sometimes	43.54	38.35–48.07	0.24	−1.42–1.91	45.85	38.71–50.56	−0.29	−2.13–1.55
No, not at all	42.86	37.07–47.96	−0.57	−2.12–0.97	42.70	37.44–47.96	−1.86*	−3.48–−0.23
Not often (ref)	43.66	37.59–49.18	0.00	.	44.65	38.47–49.28	0.00	.

^aAll models adjusted for gender, age, education, country of birth, residential location, injury types, prior health and days post-injury

^bAll models adjusted for family composition, gender, age, education, country of birth, residential location, injury types, prior health and days post-injury

* $p < .05$

Reverse causality

To ascertain the possibility of reverse causality, chi-square tests were conducted between time since injury and the various sources of social support (family, friends and neighbours). The models showed a significant association between time since injury and perceived level of family support. Participants at the 0–12 months post-injury were more likely to report having 'yes, definitely', and 'sometimes' support from family and less likely to report having 'no, not all' support from family compared

to participants at the 13 months or more post-injury ($\chi^2(9, N = 1642) = 21.90, p < .01$) (Fig. 1a). A similar pattern was observed among hospitalised participants for family's support, but the statistical association was not significant ($\chi^2(9, N = 948) = 10.27, p = .32$) (Fig. 2a). No statistical associations were found between friends, neighbours' support and time since injury for the total sample (Fig. 1b & c) and the hospitalised participants (Fig. 2b & c). In addition, no statistical associations were found between family, friends and neighbours' support

Table 3 Multiple logistic regression models of the relation between social support and persistent pain

Models	Persistent pain ^a	
	OR	95 % CI
1. Marital status ^b		
Married or in de facto relationship	1.28	0.97–1.69
Widowed/separated/divorced	1.62*	1.11–2.37
Never married (ref)		
Hosmer-Lemeshow fit test	$\chi^2(8) = 11.36$ $p = 0.18$	
2. Children ^b		
Yes	0.96	0.77–1.20
No (ref)		
Hosmer-Lemeshow fit test	$\chi^2(8) = 3.12$ $p = 0.92$	
3. Family composition ^b		
Married or in de facto relationship with children	1.14	0.78–1.68
Married or in de facto with no children	1.13	0.76–1.68
Widowed/separated/divorced with children	1.49	0.87–2.55
Widowed/separated/divorced with no children	1.41	0.85–2.33
Never married with children	0.84	0.55–1.26
Never married with no children (ref)		
Hosmer-Lemeshow fit test	$\chi^2(8) = 10.27$ $p = 0.25$	
4. Family ^c		
Definitely	0.40*	0.24–0.68
Yes, sometimes	0.68	0.39–1.19
No, not at all	0.58	0.31–1.07
Not often (ref)		
Hosmer-Lemeshow fit test	$\chi^2(8) = 9.95$ $p = 0.26$	
5. Friends ^d		
Definitely	0.29*	0.17–0.47
Yes, sometimes	0.50*	0.30–0.89
No, not at all	1.14	0.58–2.25
Not often (ref)		
Hosmer-Lemeshow fit test	$\chi^2(8) = 12.23$ $p = 0.14$	
6. Neighbours ^c		
Definitely	0.59*	0.41–0.84
Yes, sometimes	0.78	0.54–1.15
No, not at all	1.27	0.89–1.81
Not often (ref)		
Hosmer-Lemeshow fit test	$\chi^2(8) = 5.39$ $p = 0.72$	

^aRestricted to those who were at least 3 months post-injury

^bAll models adjusted for gender, age, education, country of birth, residential location, injury types, prior health, days post-injury and hospitalisation

^cAll models adjusted for family composition, gender, age, education, country of birth, residential location, injury types, prior health, days post-injury and hospitalisation

^dDue to problem with model fit, non-significant variables were removed. The final model was adjusted for age, education and days post-injury

* $p < .05$

and time since injury for participants with persistent pain (Fig. 3a, b & c) and participants who did not RTW (Fig. 4a, b & c).

Discussion

The present study examined the relationship between social support and injury outcomes among people with

Table 4 Multiple logistic regression models of the relation between social support and RTW, stratified by gender

Models	RTW ^a		Women	
	Men	95 % CI	OR	95 % CI
1. Marital status ^b				
Married or in de facto relationship	1.56	0.92–2.64	0.72	0.33–1.57
Widowed/separated/divorced	0.66	0.31–1.37	0.67	0.26–1.71
Never married				
Hosmer-Lemeshow fit test	$\chi^2(8) = 6.98$ $p = 0.54$		$\chi^2(8) = 2.13$ $p = 0.98$	
2. Children ^b				
Yes	0.84	0.55–1.27	0.94	0.53–1.67
No (ref)				
Hosmer-Lemeshow fit test	$\chi^2(8) = 14.53$ $p = 0.07$		$\chi^2(8) = 8.03$ $p = 0.43$	
3. Family composition ^b				
Married or in de facto relationship with children	1.22	0.58–2.58	0.57	0.20–1.63
Married or in de facto with no children	1.24	0.56–2.77	0.77	0.26–2.29
Widowed/separated/divorced with children	0.28*	0.10–0.79	0.84	0.24–2.89
Widowed/separated/divorced with no children	0.88	0.31–2.50	0.38	0.10–1.39
Never married with children	0.64	0.28–1.48	0.82	0.27–2.49
Never married with no children (ref)				
Hosmer-Lemeshow fit test	$\chi^2(8) = 3.24$ $p = 0.92$		$\chi^2(8) = 8.22$ $p = 0.41$	
4. Family ^c				
Definitely	2.06	0.76–5.57	0.09*	0.01–0.78
Yes, sometimes	1.35	0.46–3.95	0.07*	0.01–0.62
No, not at all	0.91	0.28–2.93	0.07*	0.01–0.72
Not often (ref)				
Hosmer-Lemeshow fit test	$\chi^2(8) = 8$ $p = 0.75$		$\chi^2(8) = 12.95$ $p = 0.11$	
5. Friends ^c				
Definitely	1.09	0.38–3.10	3.03*	1.15–8.02
Yes, sometimes	0.45	0.16–1.31	2.18	0.77–6.12
No, not at all	0.42	0.12–1.51	1.37	0.36–5.22
Not often (ref)				
Hosmer-Lemeshow fit test	$\chi^2(8) = 9.85$ $p = 0.28$		$\chi^2(8) = 9.81$ $p = 0.28$	
6. Neighbours ^c				
Definitely	1.89	0.90–3.97	1.24	0.43–3.60
Yes, sometimes	1.05	0.51–2.16	0.69	0.24–2.01
No, not at all	0.49*	0.25–0.96	0.65	0.24–1.74
Not often (ref)				
Hosmer-Lemeshow fit test	$\chi^2(8) = 5.25$ $p = 0.73$		$\chi^2(8) = 11.71$ $p = 0.16$	
7. Employers ^c				
Very supportive	5.62*	2.77–11.38	7.22*	2.58–20.20
Somewhat supportive	4.35*	1.90–9.95	6.87*	1.86–25.23

Table 4 Multiple logistic regression models of the relation between social support and RTW, stratified by gender (Continued)

A little supportive	2.86*	1.05–7.76	1.72	0.44–6.79
Not at all supportive (ref)				
Hosmer-Lemeshow fit test	$\chi^2(8) = 7.50 \ p = 0.48$		$\chi^2(8) = 5.15 \ p = 0.74$	

^aRestricted to those who were employed at the time of the accident

^bAll models adjusted for age, education, country of birth, residential location, injury types, prior health, days post-injury, hospitalisation, income and occupation

^cAll models adjusted for family composition, age, education, country of birth, residential location, injury types, prior health, days post-injury, hospitalisation, income and occupation

* $p < .05$

MSI sustained in a transport accident. The results revealed that several aspects of the family structure and sources of social support had a positive impact on physical health, persistent pain and RTW. This study also showed significant gender differences in RTW. The strength of the associations between social support and each of the outcomes varied across family structure and sources of support.

The results of this study can be interpreted using the convoy model. The convoy model suggests that intimate and confiding relationships are regarded as the most beneficial effects of social support [39, 40] and that the availability of a spouse to provide support appears to buffer against the impact of stress from injury [28]. The findings of this study found support for this relationship. The data indicated that recovery is influenced by the family structure, sources of social support and the severity of the injury. Among hospitalised persons, strong support from family and friends was associated with

better physical health. Non-hospitalised persons who reported having no or little support from family and friends had poor physical health scores. In support, past research has shown that severe injury from transport accident requires substantial support from family members [13] and that a lack of social support in general resulted in higher rates of complications [27]. The perception of no or low support could also potentially reflect difficulties in reaching out to support networks or difficulties between asserting independence and being supported by others [13]. Among non-hospitalised persons, family structure such as being married or in a de facto relationship, with or without children, was associated with better physical health. Marriage may be a factor reducing the need for hospitalisation, with several studies demonstrating that married individuals have decreased risk of being hospitalised for a number of diseases [41, 42].

Consistent with the convoy model [28], the results demonstrated that the source of social support followed

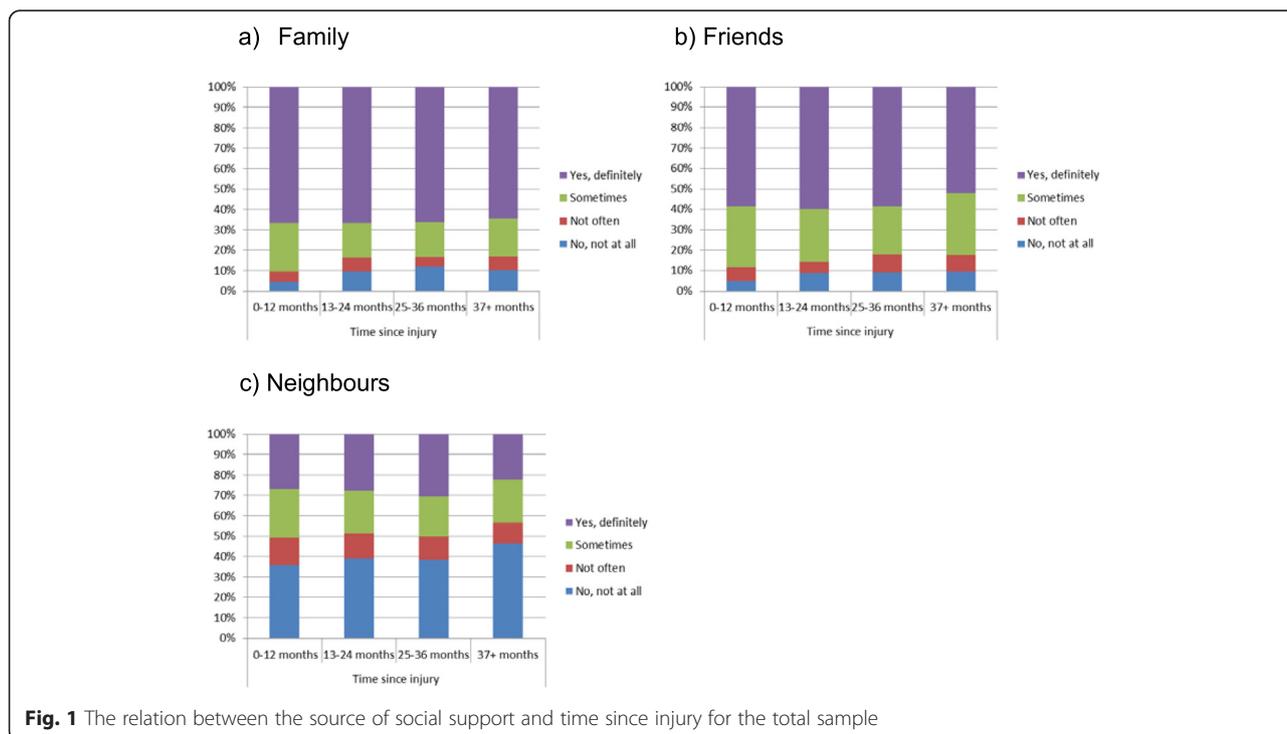
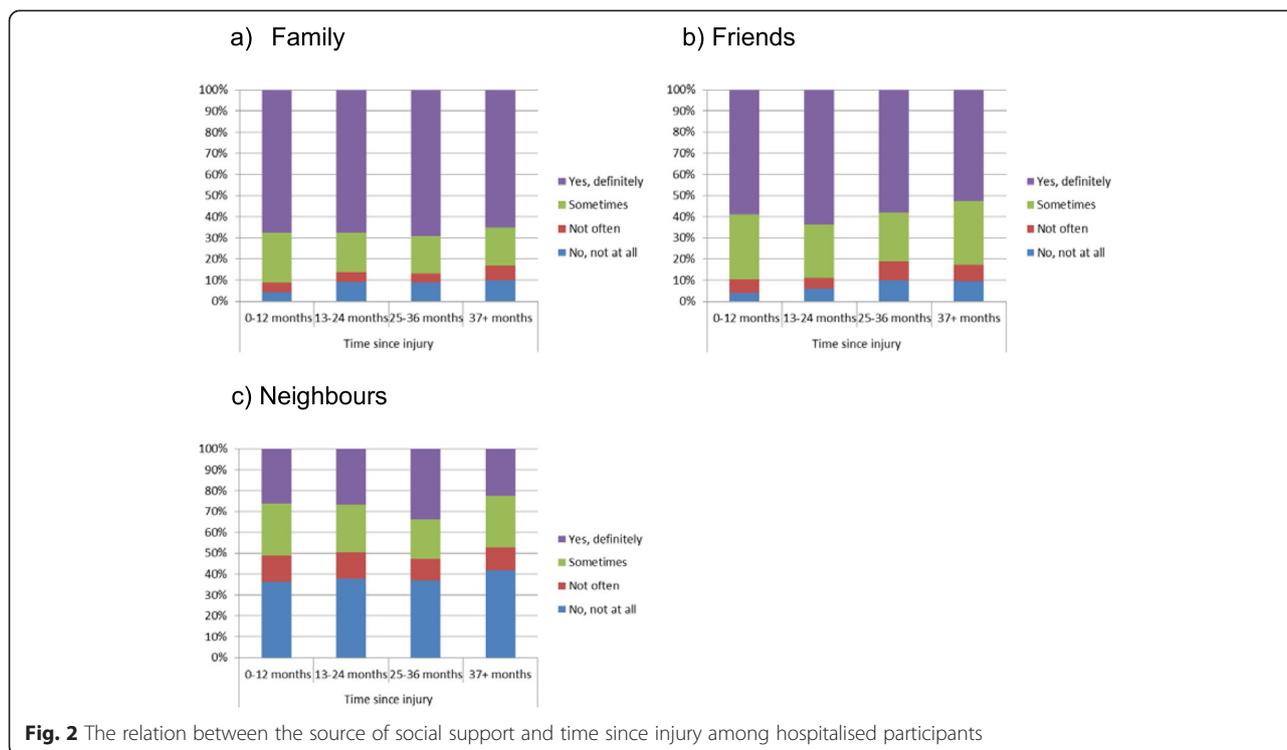
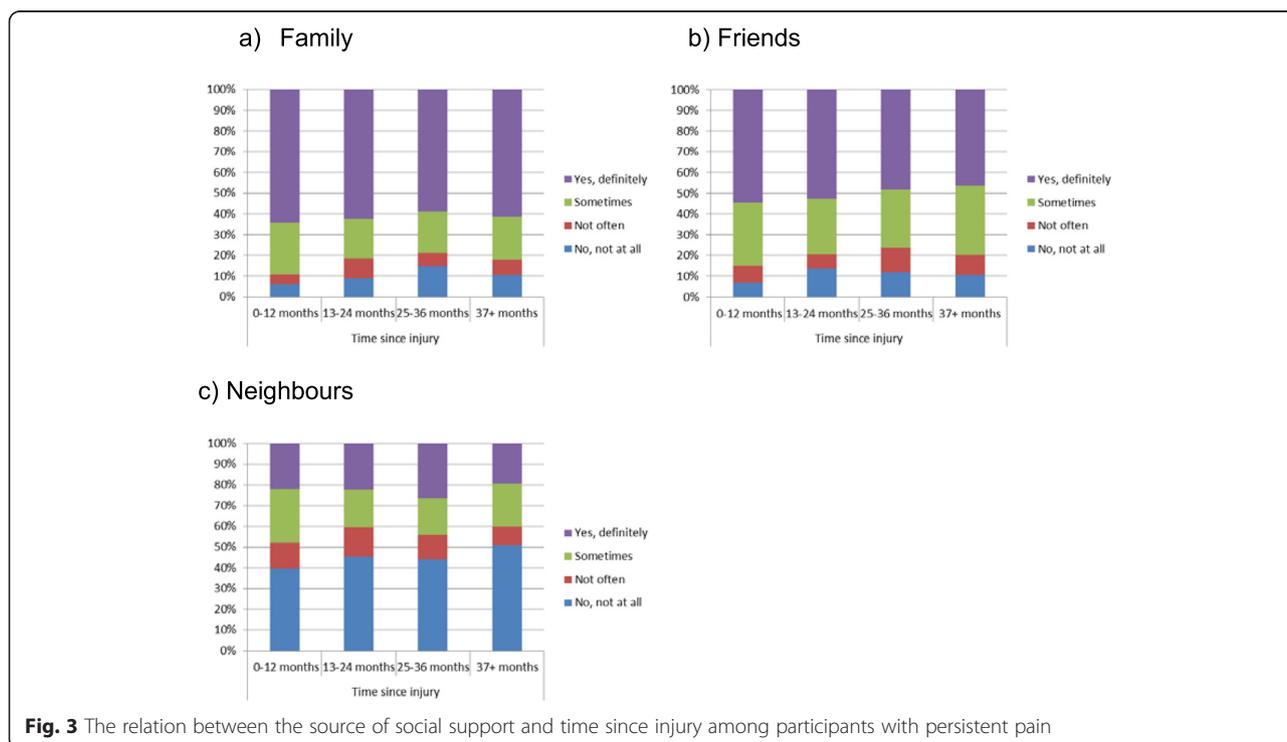


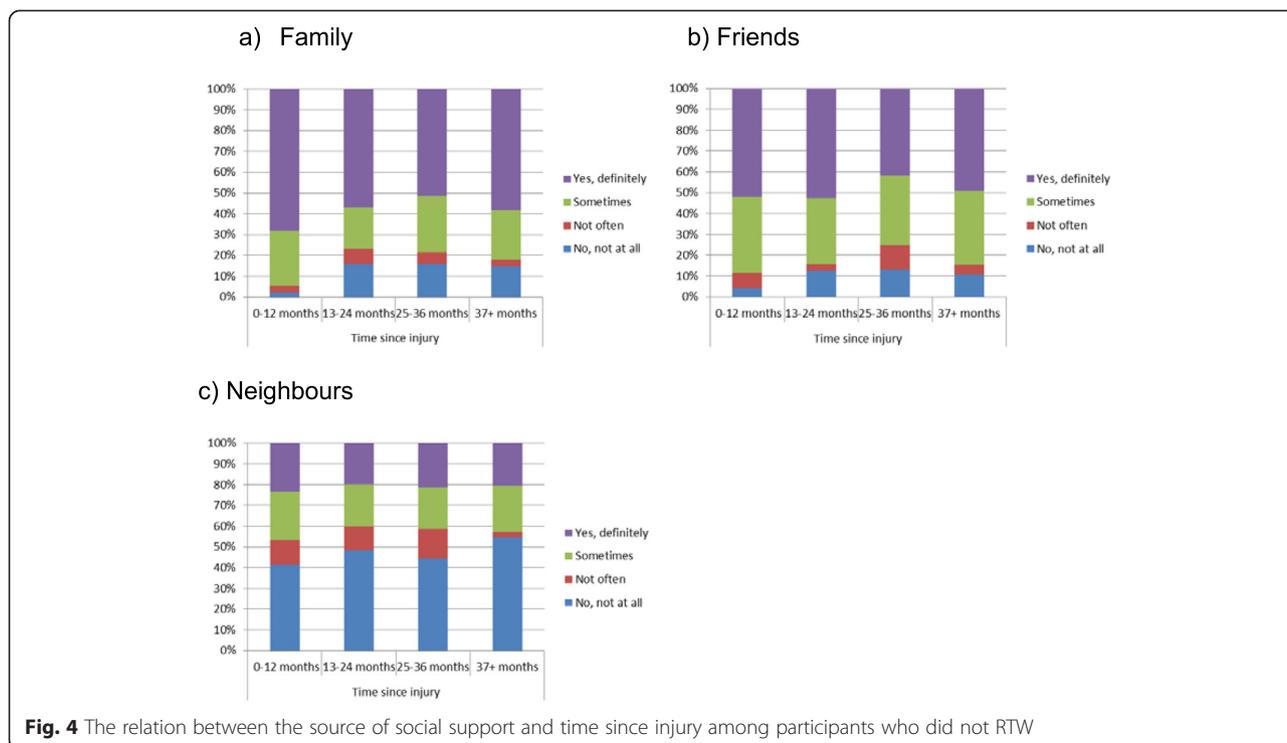
Fig. 1 The relation between the source of social support and time since injury for the total sample



a hierarchically descending order from family to friends among hospitalised persons. Closer and more stable circles (i.e., family) compared with less close and stable circles (i.e., friends and neighbours) were viewed more favourably for support. As family relationships are

bonded by intimacy and kinship, they tend to be more stable compared with friends and therefore are more likely to be the preferred source of support [43]. According to the convoy model, different network members also serve different functions [28]. Past research has





shown that family members are often core providers of material aid and instrumental support, whereas friends more often provide emotional support and companionship [43]. Instrumental support may be the preferred type of support for the improvement of physical health, and this support may have been more likely to be provided by family members than friends. However, we were unable to assess whether the significant association between family support and physical health was related to a specific type of support. Further research is warranted to distinguish among the types of support provided by the different sources of support.

According to the convoy model, people who are separated or divorced tend to lose their social network members [28]. For example, people may have less contact with their in-laws and friends to avoid a situation of ‘taking sides’. In contrast, widowhood may lead to an increase in social support in the initial period after the loss of a spouse but the level of support may decrease over time [44]. We found that persons, who were widowed, separated or divorced were almost 2 times as likely to report persistent pain compared to those who never married. This finding has also been supported in the research literature. Persons who are widowed, separated or divorced tend to have worst physical and mental health than those who are married or never married [45]. Widowhood, separation or divorce has also been found to increase the risk of social isolation [46]. These findings suggest that the lack of social support to buffer the

effects of pain may contribute to the presence of self-reported persistent pain. In further support of this argument, we found that receiving strong support from family, friends and neighbours were negatively associated with persistent pain. This is consistent with previous pain studies [47–49] which suggest that people who have access to a large support network, who seek social comfort, understanding and share their concern with others, manage their pain in a more adaptive manner.

Inconsistent with the convoy model, the results showed that, compared to those who reported not receiving frequent support, the odds of reporting persistent pain were reduced for those with strong support from friends (71 % lower), family (60 % lower), and neighbours (41 % lower). The results suggested that friends’ support was the preferred source over family and neighbours’ support in reporting the absence of persistent pain. This result suggests that friends and family members offer different types of support in situations of persistent pain. In support, research has shown that family members have been found to be responsible for providing day-to-day physical assistance whereas friends are more likely to offer social comfort for pain management [50]. However, as previously mentioned, we were unable to assess whether the significant association between each source of support and persistent pain was related to a specific type of support.

According to the convoy model, social support and social relations are shaped by personal characteristics

including gender [28]. Gender can alter the adequacy of support provided by the convoy and subsequently leads to a change in its structure and function. Our results showed some support for this finding, in regards to variation in gender for RTW outcome. Interestingly, we found women receiving support from family, regardless of the amount received, had decreased odds for RTW. Potential reasons for this finding may be that women were less inclined to RTW if they had an alternative source of income such as financial support from their spouse or family members. Alternatively, support from family may negatively influence the recovery process. Strong support such as pushing for recovery, being too protective or helpful may actually have the opposite effect. Women may feel distress, resentment or dependency towards their family members [27, 51].

Whilst support from family was negatively associated with RTW, we found that strong support from friends was positively associated with RTW among women. No such associations were observed among men. The gender differences found may be explained by socialisation. Men's socialisation focuses on autonomy, self-reliance, independence, and de-emphasising feelings whereas for women, socialisation emphasises verbal expressiveness, warmth and intimacy [52]. In support, women have generally more close friends and develop more intimate interpersonal relationships than men [53]. Women are also more likely to seek help and to mobilise their support network than men in times of needs [39, 54, 55]. Although men usually have more extensive networks than women, men are likely to cite their spouse as their only confidant, whereas women cite spouses and friends about the same frequency [56, 57].

We also found that for both men and women, support from employers was positively associated with RTW, although the association was stronger among women. This is consistent with previous studies which found that men benefit from employment support more than family or friends' support [58] and that women received more support from supervisors than men [59]. Men have a strong attachment to work roles [60] and are more likely to RTW faster than women [61]. The stronger association between employment support among women may reflect differences in gender socialisation in which women are more likely than men to give and receive support [55]. An alternative explanation is that organisational policies such as affirmative action which encourage women's RTW may explain the gender differences in RTW. A strong supportive work environment can benefit women by reducing stress, in turn increasing organisational commitment and decreasing absenteeism and turnover [62].

Although the study provides greater insight into the role of social support across a range of MSI outcomes,

the results should be interpreted with regard to several study limitations. First, the cross-sectional design of the study limited interpretation of the exact nature of the relationship between social support and MSI outcomes. We attempted to control for hospitalisation (via stratification) in an effort to reduce the likelihood that the effects of social support are reflective of an association between health and social support that is unrelated to the MSI. The chi-square results also suggested low potential for reverse causality. Future longitudinal studies are required in order to establish causality and causal pathways. Second, a 'good-old-days' bias in self-report of pre-injury health status may be present with the majority of individuals rating their health as excellent or very good prior to the MSI which could have potentially resulted in an over-estimation of their pre-injury health and therefore leading to residual confounding. Future studies should assess pre-injury health status as soon after the injury as possible with a validated measure or obtained pre-injury medical records as a proxy of pre-injury health. Third, although we had information on the source of social support, the survey included a non-standardised measure of social support (single dimension) with limited information on the construct of support (different types of support). Future studies are required to assess the multi-dimensional constructs of support which will lead to a more complete understanding of the impact of social support on outcomes among individuals with MSI. Fourth, persistent pain was measured using a non-standardised measure of pain which may not accurately reflect the presence of persistent pain. Future studies should use a validated measure of persistent pain. Fifth, we did not have information on personality traits which could have potentially influence the perception of social support. For example, individuals with high self-esteem and great social skills are more likely to have a supportive network system than someone who has low self-esteem and poor social skills [63]. In addition, individuals who are confident may have preferred to be independent rather than rely on others for support. Future studies could incorporate a measurement of personality traits in the research design. Sixth, the study is limited by assessing only 1 perspective. As social support is a transaction between 2 or more people, the information might be biased by individual characteristics that filter perceptions. Further research is warranted to assess the interactions and effects of all persons involved in these supportive transactions. Finally, we acknowledge that the testing of a number of models may have increased the chance of a type 1 error. However, all of our hypotheses were developed a-priori and theoretically underpinned by the relevant research literature. Thus, adjusting the alpha level was not considered necessary [64–66].

In summary, the present study confirms the importance of family structure and source of social support in recovery among people with MSI sustained in a transport accident. This study also provides a practical application of the convoy model to an area that requires attention, given the extent of the problem. The study findings have implications for educating social networks members about their potential role in promoting recovery and informing interventions. When developing interventions aiming to strengthen the person's support network, the structure of the network, the source of social support, type of outcomes, injury severity and gender need to be taken into consideration. In addition, this study also highlights the importance of identifying people who have limited access to a social support network. People with limited access to social support from sources such as family, friends and neighbours could potentially benefit from alternative sources of practical and psychological support, such as home services and counselling, respectively. The findings in this study encourage further research exploring alternative pathways to attaining support if unavailable from the social network, and determining subsequent impact on injury outcomes.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

KP and JBG conceived and designed the study. KP performed the statistical analysis, interpretation of the data and drafted the manuscript. JBG and SN reviewed the manuscript critically. All authors read and approved the final manuscript.

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Chapter 5 Social support and healthcare service use

Study two in chapter 4 demonstrated the relationship between social support and musculoskeletal injury (MSI) outcomes. However, this relationship can be affected by broader issues such as healthcare service use. The pathways through which social support exerts its influence on MSI outcomes via healthcare service use are not yet clearly understood. Chapter 5 presents the results of the second component of the research project (i.e. study three). Using a quantitative research design, the aim of the third study was to examine the mechanism (i.e. direct effect, mediation effect and effect modification) through which social support from family and friends influenced healthcare service use, primarily allied and mental health services following compensable MSI. The findings from the analysis of the cross-sectional survey data linked to the administrative claims and payments datasets are presented in a journal article entitled “The influence of social support on healthcare service use following transport-related musculoskeletal injury”. It has been published in BMC Health Services Research Journal and is currently available via the following web link:

<http://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-016-1582-4>

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Monash University

Declaration for Thesis Chapter 5

Prang K-H, Berecki-Gisolf J, Newnam S. The influence of social support on healthcare service use following transport-related musculoskeletal injury. BMC Health Services Research.

2016;16(1):310-321.

Declaration by candidate

In the case of Chapter 5 (i.e. paper three), the nature and extent of my contribution to the work involved the following:

Nature of contribution	Extent of contribution (%)
Principal author responsible for the concept, design, statistical analysis, interpretation of results and writing up of the manuscript	70

The following co-authors contributed to the work:

Name	Nature of contribution	Extent of contribution (%)
Dr. Janneke Berecki-Gisolf	Contributed to the concept and design of the study, and critically reviewed the manuscript	15
Dr. Sharon Newnam	Contributed to the concept and design of the study, and critically reviewed the manuscript	15

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work*.

Candidate's

Signature:



Date 19/07/16

Main Supervisor's

Signature:



Date 19/07/16

RESEARCH ARTICLE

Open Access



The influence of social support on healthcare service use following transport-related musculoskeletal injury

Khic-Houy Prang^{*}, Janneke Berecki-Gisolf and Sharon Newnam

Abstract

Background: Social support has been identified as a significant factor in the recovery of individuals with musculoskeletal injury (MSI). However, relatively limited research has examined the mechanisms through which social support influences healthcare service use. This research examines the direct effects, mediating effects and effect modification of social support on healthcare service use among people with MSI sustained in a transport accident.

Methods: The study design was secondary data analysis of cross-sectional surveys of compensated transport accident victims in Victoria in 2010 and 2011, linked to compensation claims and payment records. Analyses included (i) zero-inflated negative binomial and logistic regressions to model healthcare service use (direct effect), (ii) the Karlson, Holme and Breen (KHB) method to assess social support as a mediator of predisposing factors, need factors and healthcare service use (mediation effect), and (iii) interactions to assess social support as a modifier between predisposing factors, need factors and healthcare service use (effect modification).

Results: Results of the direct analyses showed that support from family was associated with lower uptake of allied healthcare services (odds ratio (OR) 2.17; 95 % confidence intervals (CI) 1.21–3.91). Support from friends was associated with lower uptake (OR 1.87; 95 % CI 1.09–3.21) and lower rate (i.e. number of services per person) of allied healthcare services (incidence rate ratio (IRR) 0.65; 95 % CI 0.52–0.83). Support from friends (OR 0.60; 95 % CI 0.38–0.95) was also associated with lower uptake of mental healthcare services. No statistically significant mediation effects were identified for family or friends' support on the uptake of allied and mental healthcare services. Family support was found to modify the association between socio-economic indexes for areas and mental healthcare service use. In the group that reported having no social support, mental healthcare service uptake in the socioeconomically advantaged group was lower than in the disadvantaged group (OR 0.36; 95 % CI 0.16–0.83).

Conclusions: The findings suggest that social support has a direct and modifying effect on healthcare service use but does not mediate the association between predisposing factors, need factors and healthcare service use. The study findings have implications for the role of social support in the prevention, treatment and intervention of individuals with MSI.

Keywords: Social support, Healthcare service use, Musculoskeletal injury

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Background

Musculoskeletal injuries (MSI) are a major public health problem worldwide, contributing to a large burden of disability. According to the World Health Organisation’s Global Burden of Disease study, the majority of admissions for various non-fatal injuries as a result of a road traffic accident were MSI, with almost 50 % of these being fractures [1]. The burden of MSI is expected to become more significant in coming years with an ageing population and an increase in road traffic accidents in low and middle-income countries, largely due to the increased use of motorised transport and less developed trauma care systems [2]. Considering the probable increase in MSI, the provision of services by healthcare systems to improve health outcomes is crucial. Therefore, an understanding of what facilitates the use of healthcare services, and what influences individuals with MSI to behave differently in relation to their health is urgently needed.

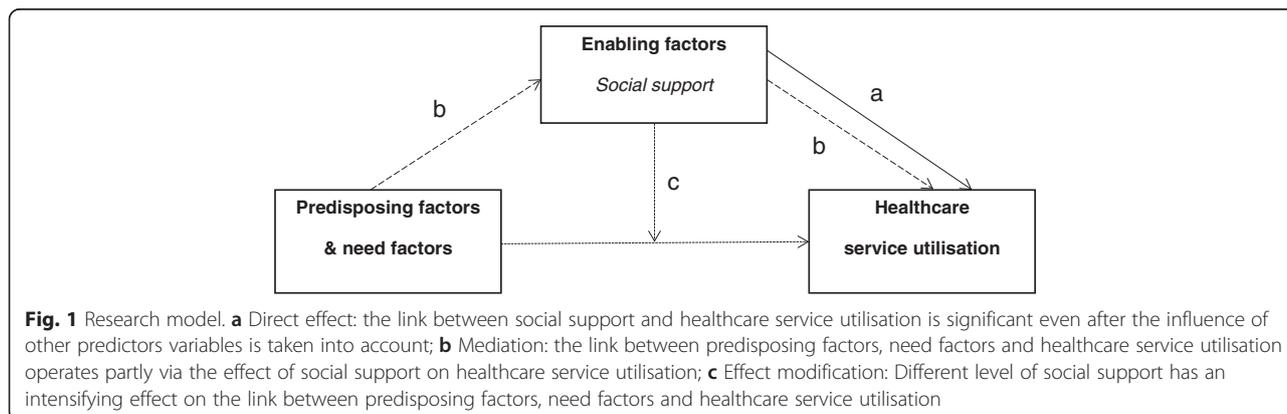
Past studies have demonstrated that the decision to seek healthcare services is influenced by a number of factors including the individual’s health status, socio-demographic characteristics of the individual and their ability to access the type of resources they may need [3–5]. Social support has been identified as a potential factor that may either facilitate (i.e. increase uptake) or buffer (i.e. provide direct support) the uptake of healthcare services [6, 7]. Social support is defined as information leading individuals to believe they are cared for and loved, esteemed and valued, and belong to a network of communication and mutual obligation [8].

The evidence for the relationship between social support and healthcare service use among persons with MSI is limited. Much of what is currently known about social support and healthcare service use has been gathered from research conducted within the general population, older persons, and those with mental illness in which injury effects may be obscured [7, 9–15]. Among these populations, studies have shown mixed

evidence for the role of social support on healthcare service use. A study suggests that social support is relatively unimportant when it comes to healthcare service use [9], whereas, other evidence suggests that social support can either enhance or reduce reliance on healthcare services [7, 10–15]. Several studies have also shown that the combination of stressful life events and social support has a modifying effect on healthcare service use [6, 16]; however, these results have not been replicated in all studies [12]. Variations in study populations, social support measures, availability of healthcare resources, and statistical analysis most likely account for these mixed results [7, 9–15]. Another possible reason is that the studies were not designed to explain how social support affects healthcare services utilisation. Thus, the mechanism through which social support influences healthcare service use remains unclear.

In this study, we adopt the Berecki-Gisolf et al. Healthcare Services Utilisation Framework [17] to explore the mechanisms through which social support influences healthcare service use in the MSI population. Berecki-Gisolf et al. proposed an adapted Andersen and Newman Framework of Healthcare Services Utilisation for a compensated population. In a compensated population, financial barriers to healthcare services are removed, under clauses set by the compensation system. In addition to the three factors proposed in the Andersen and Newman framework to explain healthcare service use: 1) predisposition factors (i.e. socio-cultural characteristics) 2) enabling factors (i.e. individual and community factors) and 3) need factors (i.e. health problems) [3], this extended framework proposes the additional following four factors to reflect the compensable context: 1) compensation system (i.e. scheme policies) 2) regulator (i.e. administrating body) 3) provider incentives and 4) individual incentives.

Figure 1 depicts the proposed conceptual framework. Based on this framework, the aims of the study are to investigate 1) the association between social support and healthcare service use (direct effect); 2) whether social support mediates the association between predisposing



factors, need factors and healthcare service use (mediator); and 3) whether social support modifies the association between predisposing factors, need factors and healthcare service use (effect modifier).

Methods

Study design

We undertook a secondary data analysis of cross-sectional surveys conducted among compensated transport accident victims in Victoria in 2010 and 2011, linked to compensation claims and payment records.

Ethical considerations

The Monash University Human Research Ethics granted exemption from ethical review as the study satisfies 5.1.22 of the National Statement on Ethical Conduct in Human Research ([18], p.40): “Institutions may choose to exempt from ethical review research that: is negligible risk research; and involves the use of existing collections of data or records that contain only non-identifiable data about human beings”.

Transport injury compensation system

In the state of Victoria, Australia, those injured in land-based transport accidents involving a car, motorcycle, tram, bus or train are eligible to claim compensation for treatment, income replacement, rehabilitation and long-term support services via the Transport Accident Commission (TAC), regardless of fault. In addition, the TAC provides compensation for injury and death for individuals travelling in a Victorian-registered motor vehicle in other Australian states. Injuries and death occurring on the road but not involving a motorised vehicle (e.g. a collision between a pedal cyclist and a pedestrian) are not eligible for compensation [19].

Data sources

Data were collected from the Client Outcomes Survey (COS). The TAC conducts an annual COS to measure the health and vocational status of its clients. The survey is designed to inform the TAC about the impact of its claims management practices and the design of the compensation scheme on the health and vocational outcomes of its clients. The survey includes standardised measures of vocational and health status prior to injury, current vocational status, current health status, including physical and mental health, pain, mobility and functional independence, access to and satisfaction with healthcare and satisfaction with the TAC. Data are collected via computer automated telephone interview (CATI) conducted by a third-party social research organisation. The questionnaire takes approximately 25 min to administer.

Data were also collected from the Compensation Research Database (CRD). The CRD is an administrative database held by the Institute for Safety, Compensation and Recovery Research (ISCRR) at Monash University. The database contains de-identified transport-related injury claims data from 1 January 1987 through to 31 December 2014. The database contains one record for every claim received by the TAC, and each record contains information necessary for the management of the compensation claim, including accident, demographic, and injury details, and payments for health and other services. For the purposes of this study, the CRD was linked to the COS via a unique claim identifier.

Study participants

In 2010 and 2011, a total of 2476 participants completed the COS, including 1649 (67 %) participants with MSI. The sample age ranged from 16–89 years. The sample included active and inactive claims. Active claims were defined as having a payment from the TAC within the last six months prior to being surveyed. Inactive claims were defined as having no payments in the last six months but at least one payment made within seven to 24 months prior to being surveyed. The sample comprised of minor to moderate injuries such as soft tissue or complex orthopaedic/multi-trauma, including mild and moderate brain injury. Catastrophic injuries such as spinal cord injury, severe traumatic brain injury, amputees and burns were excluded. In this study, the sample was limited to participants with MSI including sprains/strains, soft tissues, fractures and dislocations.

Measures

Predisposing characteristics

Predisposing characteristics included gender (female vs. male), age, country of birth (Australia vs. others), education (university level vs. less than university level), employment status at time of accident (yes vs. no), occupation, and socio-economic indexes for areas (SEIFA). Age was defined as the age of claimant at the time of the interview and was categorised into six groups: 16–24, 25–34, 35–44, 45–54, 55–64, and 65+ years. Among those working at the time of the accident, occupation was categorised into eight groups according to the Australian and New Zealand Standard Classification of Occupations (ANZSCO) [20]: managers, professionals, technicians and trade workers, community/personal service workers, clerical/administration workers, sales workers, machine operators/drivers and labourers. SEIFA is a measure of relative disadvantage and advantage based on a range of attributes such as a person's residential location and income [21]. The distribution of scores was divided into ten equal deciles. A high decile reflects relative advantage. The deciles were

recoded into two categories, where decile 1–5 reflected relative disadvantage and deciles 6–10 reflected relative advantage.

Need factors

Need factors included physical health, mental health, pre-injury health status (excellent, very good, good, fair and poor), injury types (soft tissue, sprains and strains, fractures, whiplash), time since injury, and hospitalisation (>1 day hospital stay vs. not hospitalised) which was used as a proxy for injury severity [22, 23]. Physical health and mental health were assessed by the Short-Form-12 Health Survey Version 2 (SF-12V2). The SF-12V2 is a validated international tool that consists of twelve questions [24]. The SF-12V2 measures eight concepts: physical functioning, role limitations due to physical health problems, bodily pain, general health, vitality (energy/fatigue), social functioning, role limitations due to emotional problems, and mental health (psychological distress and psychological well-being). Two summary scores were derived: the Physical Component Summary (PCS) and the Mental Component Summary (MCS). The PCS focuses mainly on limitations in physical functioning, role limitations due to physical health problems, bodily pain, and general health. The MCS focuses mainly on role limitations due to mental and emotional problems and social functioning. The scores were derived using Australian weights based on the Australian population norms [25]. Higher scores on the PCS and MCS indicated more positive physical and mental health. Time since injury was derived from the date of the interview and the accident date.

Enabling factors

Structure of social support included marital status and number of dependent children. Marital status was grouped into married/de facto relationship, widowed/separated/divorced and never married. Preliminary analysis found an association between marital status and number of dependent children; thus a family structure composite was created. The family composition was categorised into six groups: married/de facto relationship with children, married/de facto relationship with no children, widowed/separated/divorced with children, widowed/separated/divorced with no children, never married with children, never married with no children. Sources and functions of social support included accessing help from family and friends. For family and friends items, participants rated their level of agreement with the following question; ‘Can you get help from family members/friends if you need it?’ on a 4-point scale that ranged from 1 “yes, definitely” to 4 “no, not at all”.

Healthcare service use

Two categories of healthcare services were examined in the two year follow-up period from the date of the accident: allied and mental healthcare services. Allied healthcare services included services provided by physiotherapists, chiropractors, osteopaths, acupuncturists and occupational therapists. Mental healthcare service included services provided by psychiatrists, psychologists, general practitioners (restricted to mental health treatment plan only), social workers and vocational counsellors. Allied healthcare service use was measured as the number of services accessed in the two year follow-up period. Due to the small number of mental health care services accessed, mental health care services use was transformed into a binary variable, those who accessed mental health care services (yes) and those who did not (no).

Statistical analyses

Descriptive statistics and frequency distributions of key variables are presented. For the direct effect analyses, two types of models were conducted to examine an association between each source of social support and healthcare service use. Allied healthcare services use was analysed using zero-inflated negative binomial regression (ZINB) modelling. ZINB is a maximum-likelihood count regression analysis, designed for non-normal (i.e. skewed and over dispersed) count data with an excess of zero values [26]. The ZINB models the probability of being a non-user versus a user of healthcare services (i.e. the logistic model component) and weighs cases accordingly in order to determine the prediction of healthcare services use intensity (i.e. the negative binomial regression model component). Vuong tests were conducted to assess the appropriateness of a ZINB model against the standard negative binomial regression model. Mental healthcare services use was analysed using logistic regression modelling. Both models were adjusted for predisposing factors and need factors.

For the mediation analyses, we used the Karlson, Holme and Breen (KHB) method [27] to assess whether social support mediates the association between predisposing factors, need factors and each type of healthcare services use. This method provides unbiased decompositions of total effects into direct and indirect effects for both linear and nonlinear models. The decomposition is accomplished by comparing the estimated coefficients obtained from a reduced model (without mediator) to a full model (with mediator). The differences between these two sets of estimated coefficients provide an estimate of the indirect effect (i.e. the part of the total effect running through the mediating variable). However, the KHB method is currently not suitable for count models. Therefore, allied health care service use was transformed from a count variable into a binary variable -

those who access allied health care services (yes) and those who did not (no).

Lastly, for the effect modification analyses, we tested interaction effects to see whether social support modifies the association between predisposing factors, need factors and healthcare service use. A ZINB model with interaction effect was used to analyse allied healthcare services use and a logistic regression model with interaction effect was used to analyse mental healthcare services use.

In all statistical models, the “*not often*” category in the sources of social support variables was used as the reference group instead of the “*no, not at all*” category as participants who rated not receiving any support may not be a homogenous group (e.g. participants who did not require any help, or did not have family living in the area). A *p*-value of less than 0.05 was considered significant in all analyses. Data analyses were conducted using STATA version 12 and SAS version 9.4.

Results

Participant characteristics

The characteristics of the study population are presented in Table 1. The mean age of the cohort was 44 years (standard deviation 15) and 59 % of the participants were male. Over half of the participants were married or in a de facto relationship (54 %) and 56 % had children. Three quarters of the participants did not have a university level education (76 %). Three quarters of the participants were born in Australia (75 %). The majority were employed at the time of the accident (80 %). Sixty-one percent of the participants were in the State’s upper 50 % of relative socio-economic advantage, based on their area of residence and income. The most common occupations were technicians and trade workers (22 %), followed by professionals (18 %) and community/personal service workers (13 %). Over half were hospitalised (67 %) after the transport accident, and 57 % sustained fractures. Forty-three percent of the participants rated their health as excellent prior to the accident. The mean PCS and MCS scores of participants were 43.6 and 42.2, respectively. One thousand eighty-three participants (66 %) had a total of 53,687 allied healthcare encounters. In contrast, 453 (28 %) participants accessed a total of 5,463 mental healthcare services. The median numbers and interquartile ranges (IQR) of allied and mental healthcare visits were 31 (13–59) and 6 (3–14), respectively.

Direct effects

Table 2 reports the results of the ZINB regression models, which include a logistic model and a negative binomial model. All ZINB models were adjusted for

family composition, predisposing factors (gender, age, country of birth, education and SEIFA) and need factors (physical health, pre-injury health status, injury types, time since injury and hospitalisation). Vuong tests showed the ZINB model as preferred against the standard negative binomial regression models for both family ($z = 15.12$, $p < 0.01$) and friends’ ($z = 15.12$, $p < 0.01$) support.

In the logistic model component of the ZINB model, participants with ‘definite’ (odds ratio (OR), 2.17; 95 % CI, 1.21–3.91) or ‘no’ (OR 2.66; 95 % CI 1.34–5.27) support from family were two and three times as likely to be non-users of allied healthcare services, compared to those with ‘not often’ support from family. In the negative binomial model component of the ZINB model, no statistically significant association was found between family support and allied healthcare service use intensity. In contrast, support from friends was significantly associated with both the use and intensity of allied healthcare services. That is, participants reporting “definite” (OR 1.87; 95 % CI 1.09–3.21) or “no” (OR 2.31; 95 % CI 1.20–4.42) support from friends were twice as likely to be non-users of allied healthcare services, relative to those with “not often” support from friends. Participants with “definite” support from friends had 35 % lower rate of allied healthcare visits (incidence rate ratio (IRR) 0.65; 95 % CI 0.52–0.83), compared to those with “not often” support from friends.

Table 3 presents the results of the logistic regression analyses examining the relationship between social support and mental healthcare service use. All logistic regression models were also adjusted for family composition, predisposing factors (gender, age, country of birth, education and SEIFA) and need factors (mental health, pre-injury health status, injury types, time since injury and hospitalisation). No statistically significant associations were observed with family support and mental healthcare service use. In contrast, the odds of accessing mental healthcare services was 40 % (OR 0.60; 95 % CI 0.38–0.95) lower for participants reporting “definite” support from friends, compared to those reporting “not often” support from friends.

Mediation

Social support was examined as a mediator of the relationship between predisposing factors, need factors, and healthcare service use. Contrary to the hypothesis, there were no significant mediation effects of family or friends’ support on the uptake of allied and mental healthcare services.

Effect modification

Potential interaction effects between predisposing factors, need factors and the source of social support on

Table 1 Demographic characteristics of the sample

	N (column %) (n = 1649)
Gender	
Male	965 (58.5 %)
Female	684 (41.5 %)
Age group ^a	
16–24	176 (10.7 %)
25–34	307 (18.6 %)
35–44	365 (22.1 %)
45–54	392 (23.8 %)
55–64	247 (15.0 %)
65+	149 (9.0 %)
Marital status ^a	
Married or in de facto relationship	896 (54.3 %)
Widowed/Separated/Divorced	284 (17.2 %)
Never married	459 (27.8 %)
Children ^a	
Yes	918 (55.7 %)
No	717 (43.5 %)
Family composition ^a	
Married or in de facto relationship with children	511 (31.0 %)
Married or in de facto with no children	382 (23.2 %)
Widowed/separated/divorced with children	129 (7.8 %)
Widowed/separated/divorced with no children	154 (9.3 %)
Never married with children	276 (16.7 %)
Never married with no children	176 (10.7 %)
Educational level ^a	
University level education	373 (22.6 %)
Less than University level education	1252 (75.9 %)
Country of birth ^a	
Australia	1243 (75.4 %)
Others	397 (24.1 %)
SEIFA ^a	
Upper 50 % (relative advantage)	1005 (60.9 %)
Lower 50 % (relative disadvantage)	631 (38.3 %)
Employed at the time of accident ^a	
Yes	1320 (80.0 %)
No	325 (19.7 %)
Occupation ^{a,b}	
Managers	136 (10.3 %)
Professionals	233 (17.7 %)
Technicians and trade workers	293 (22.2 %)
Community/personal service workers	166 (12.6 %)
Clerical/administration workers	132 (10.0 %)
Sales workers	95 (7.2 %)

Table 1 Demographic characteristics of the sample (Continued)

Machine operators/drivers	100 (7.6 %)
Labourers	158 (12.0 %)
Injury types	
Dislocation	119 (7.2 %)
Fracture	932 (56.5 %)
Soft tissue	517 (31.4 %)
Sprain/strain	81 (4.9 %)
PCS score (mean and sd)	43.6 (7.2)
MCS score (mean and sd)	42.2 (9.8)
Hospitalisation (within 7 days of accident)	
Yes	953 (57.8 %)
No	696 (42.2 %)
Health prior to accident ^a	
Excellent	704 (42.7 %)
Very good	643 (39.0 %)
Good	241 (14.6 %)
Fair	46 (2.8 %)
Poor	13 (0.8 %)
Time post-injury	
0–12 months	362 (22.0 %)
13–24 months	565 (34.3 %)
25–36 months	379 (23.0 %)
37+ months	343 (20.8 %)
Family support ^a	
Definitely	1087 (66.2 %)
Yes, sometimes	307 (18.7 %)
Not often	98 (6.0 %)
No, not at all	150 (9.1 %)
Friends' support ^a	
Definitely	942 (57.7 %)
Yes, sometimes	444 (27.2 %)
Not often	112 (6.9 %)
No, not at all	135 (8.3 %)

^aData missing ranging from 0.1 to 1.5 %^bRestricted to those who were employed at the time of the accident

healthcare service use were tested. Family support modified the association between SEIFA and mental healthcare service use. Figure 2 compares participants in the upper 50 % (relative advantage) to participants in the lower 50 % (relative disadvantage) for various levels of family support. The Y axis represents the level of family support and the X axis represents the OR for the relative advantaged group to the relative disadvantaged group. Among those with no social support, the odds of using mental healthcare services in the advantaged group was 64 % lower (OR 0.36; 95 % CI 0.16–0.83) than the odds of using mental

Table 2 Direct effect: Zero inflated negative binomial regressions for family and friends' support on allied healthcare service use

Models	Allied healthcare service use			
	Logistic		Negative binomial	
	OR	95 % CI	IRR	95 % CI
1. Family ^a				
Definitely	2.17*	1.21–3.91	0.82	0.63–1.06
Yes, sometimes	1.67	0.89–3.14	0.98	0.74–1.30
No, not at all	2.66*	1.34–5.27	0.73	0.53–1.01
Not often (ref)				
2. Friends ^a				
Definitely	1.87*	1.09–3.21	0.65*	0.52–0.83
Yes, sometimes	1.55	0.88–2.72	0.79	0.62–1.01
No, not at all	2.31*	1.20–4.42	0.75	0.55–1.02
Not often (ref)				

OR odds ratio; IRR incidence rate ratio; CI confidence intervals; REF reference
 In the logistic model, an OR value greater than 1 indicates increasing odds of being a more frequent non-user of healthcare services, whereas an OR value less than 1 indicates increasing odds of being a more frequent users of healthcare services. In the negative binomial model, an IRR value greater than 1 indicates increase healthcare service use rate, whereas an IRR less than 1 indicates decrease healthcare service use rate

^aModels adjusted for family composition, gender, age, education, country of birth, SEIFA, injury types, pre-injury health status, hospitalisation, days post-injury, and PCS score
 * $p < 0.05$

Table 3 Direct effect: Logistic regressions for family and friends' support on mental healthcare service use

Models	Mental healthcare service use	
	OR	95 % CI
1. Family ^a		
Definitely	0.74	0.46–1.21
Yes, sometimes	1.21	0.71–2.04
No, not at all	0.72	0.39–1.34
Not often (ref)		
2. Friends ^a		
Definitely	0.60*	0.38–0.95
Yes, sometimes	0.89	0.55–1.42
No, not at all	0.95	0.54–1.68
Not often (ref)		

OR odds ratio; CI confidence intervals; REF reference
 An OR value greater than 1 indicates increasing odds of accessing healthcare services, whereas an OR value less than 1 indicates decreasing odds of accessing healthcare services

^aAll logistic regression models adjusted for family composition, gender, age, education, country of birth, SEIFA, injury types, pre-injury health status, hospitalisation, days post-injury, and MCS score
 * $p < 0.05$

healthcare services in the disadvantaged group. There were no significant interaction effects for friends' support, predisposing factors and need factors on mental healthcare service use.

Discussion

The aim of this study was to address a gap in the literature through exploring the association between social support and healthcare services utilisation among people with compensable MSI. Understanding the mechanisms through which social support influences healthcare services utilisation can lead to the development of social support interventions and ultimately improve health outcomes. Using Berecki-Gisolf et al. adapted Andersen and Newman Framework of Healthcare Services Utilisation for a compensated population [17], the study explored whether social support (i) had a direct effect on healthcare service use, (ii) mediated the association between predisposing factors, need factors and healthcare service use, and (iii) interacted with various predisposing factors, need factors on healthcare service use. Finally, this paper examined whether these associations varied depended upon the source of support and the type of healthcare services involved. In support of the hypotheses, the findings indicated that social support was a direct factor related to healthcare services, and also an effect modifier, but contrary to the hypothesis, not a mediator. The findings suggest that the role of social support is complex and appears to vary depending on the source of support and the type of healthcare services accessed.

The results potentially suggested that individuals with greater social support make less use of healthcare services than to those with less support. This finding is inconsistent with past research conducted within the general population [7], older persons [13] and mental illness [14, 15] populations which found that individuals with greater social support were more likely to seek general medical services. We found that greater support from family and friends were associated with lower uptake of allied healthcare services. Greater support from friends was also associated with lower rate of allied healthcare services. Family relationships are the earliest and often the most enduring of social ties. Families also tend to provide a substantial amount of support in many areas of daily life following injury [28]. Similarly, friendships tend to grow stronger over long periods of time and are linked to positive physical and mental health outcomes [29]. Thereby, supportive relationships may reduce allied healthcare service use by providing direct support. Alternatively, the results may suggest that supportive relationships substitute for formal treatment or perhaps even delay help seeking behaviour.

Interestingly, we also found that no support from family and friends was associated with lower uptake of allied

healthcare services. This is inconsistent with the literature which suggests that when support from family and friends are limited, people are more likely to access healthcare services provided by healthcare professionals [6, 11]. In our study, the absence of social support may have decreased access to healthcare services because there was a lack of health knowledge sharing among social network members and no provision of help from the social network to enable health care seeking behaviour. Alternatively, individuals with no support may have had difficulties in navigating the compensation system in order to access healthcare services. In a compensation system, requests for compensable treatment are mostly required to be approved by the insurer prior to commencement of the service. A qualitative study conducted by Murgatroyd et al. [30] showed that delayed treatment approvals and lack of consistent decision making between insurer and healthcare professionals resulted in dissatisfied participants. In our study, among those with no social support, 30 % had lower satisfaction with the TAC (data not shown). Those with no social support and lower satisfaction with the TAC were also more likely to have a high SEIFA. Given the timeliness of and access to healthcare services via the compensation system, it is possible that these results suggest that individuals with no support and high SEIFA sought healthcare services outside of the compensation system as there were reduced financial barriers. Further research is warranted to explain the relationship between lack of support and healthcare service use.

Furthermore, we found that greater support from friends, but not from family, were associated with lower uptake of mental healthcare services. The results suggest that support from friends reduces the need for mental healthcare services through providing another avenue for support. Research has shown that friends are associated with numerous mental health benefits [29]. For example, having a friend to confide in provides emotional support and contributes to a sense of belonging and overall well-being. This is consistent with past studies conducted in the general population which found that individuals with greater social support were less likely to seek mental healthcare services [7, 10, 12]. In contrast, we found no effect of family support on mental healthcare service use. A likely explanation for the differential effect is that individuals had a greater tendency to confide in friends than family. Past research suggests that family relationships tend to be more complex and viewed by individuals as ambivalent, that is, both closer and more troublesome than friendships [31].

We found that social support from family and friends did not mediate the relationship between predisposing factors, need factors and allied and mental healthcare services. This finding indicates that predisposing factors and need factors do not facilitate the use of healthcare services via social support. There is sparse research in

this area, with the majority of research focusing on the role of social support in mediating stress and health outcomes [8, 32, 33]. Further research is needed to understand the precise nature of the relationship between predisposing factors, need factors, social support, and healthcare service use.

For mental healthcare service use, significant interaction effects emerged between family support and SEIFA. Individuals with no family support and a lower SEIFA were associated with a higher likelihood of consulting a mental health professional than those with a higher SEIFA. This finding suggests that in a no-fault compensable population, financial barriers to healthcare services are reduced, thereby allowing individuals with easy access to healthcare services regardless of socio-economic status and family support. This is inconsistent with past research examining solely SEIFA and healthcare service use. Some studies found that the uptake rates for psychological services decreased among people from more disadvantaged areas, compared to those from less disadvantaged areas [34, 35]. In contrast, a study conducted by Dal Grande et al. reported that the proportion of people who accessed psychiatry and psychological services did not vary by SEIFA [36]. However, these studies did not explicitly test for interaction effects of social support and SEIFA on the uptake of mental healthcare services. Further research is warranted to support the relationship between SEIFA, social support and mental healthcare service use.

Although this study provides greater insight into the role of social support and healthcare service use, several limitations of this study must be noted. By using an existing survey generated by the TAC, the study was restricted in its measures of social support. First, the social support measure was non-standardised and it is therefore not known if the items measured were what they were intended to measure. Second, the social support item was based on a single dimension of social support. There are several dimensions to social support including informational, tangible, appraisal and emotional support; thus, it is plausible that the type of support affects the use of healthcare services differently. Third, only the perception of social support was assessed. It is possible that the size of the participants' social network, the pattern of interaction within the social networks, and the content of advice given by the social network members influences healthcare service use. Future research should investigate supportive exchanges between individuals and social network members in order to better understand how and when social network members either prevent or encourage the uptake of healthcare services. Fourth, we were unable to examine whether social support had an impact on healthcare service use outside of the compensation system, that is, services paid for by a private insurer, or services fully

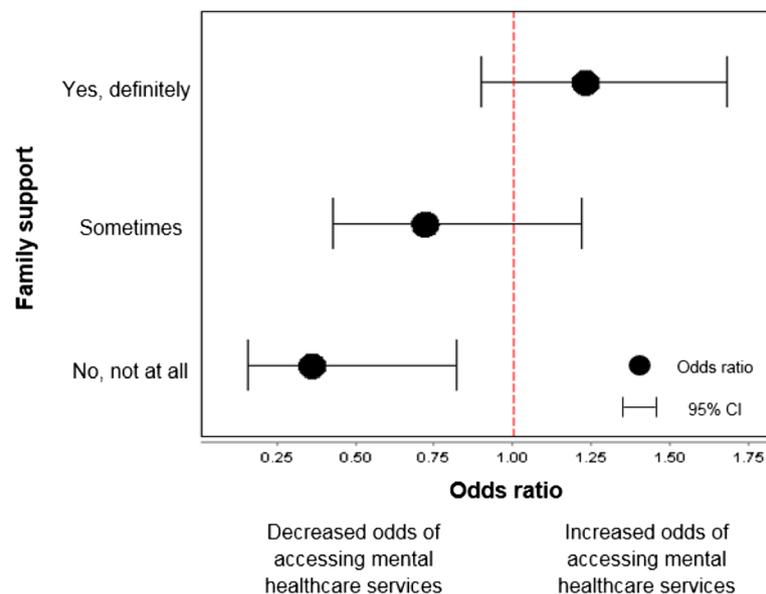


Fig. 2 Effect modification: Interaction effect of family support and SEIFA on mental healthcare service use. Comparison of participants in the upper 50 % (relative advantage) to participants in the lower 50 % (relative disadvantage) for various levels of family support. Reference group is “not often support”. An OR value greater than 1 indicates increasing odds of accessing mental healthcare services, whereas an OR value less than 1 indicates decreasing odds of accessing mental healthcare services. Logistic regression model adjusted for family composition, gender, age, education, country of birth, SEIFA, injury types, pre-injury health status, hospitalisation, days post-injury, and MCS score

billed to Medicare, the Australian universal healthcare program [37]. Fifth, we recognised that the decision to engage with healthcare services is influenced by a variety of psychosocial and socio-economic factors including social support. Future research is required to determine which factors have the greatest impact on the use of healthcare services. Finally, the sample included in this study should not be considered to be representative of the population of individuals with MSI. All participants were injured in a transport accident within a jurisdiction that provides no-fault compensation for healthcare services. This relatively unique situation reduces financial barriers in accessing healthcare services. It also provides data that allows detailed examination of healthcare service use. The study is therefore unlikely to represent those cases of MSI without access to a similar compensation system (e.g. those incurring a MSI via sport, recreation or home). Furthermore, the extent to which these results are applicable to other jurisdictions will need to be considered given the various transport accident compensation schemes in Australia (i.e. hybrid, fault-based, no-fault). Future research is needed to determine the extent to which these findings can be generalised to other jurisdictions, non-compensable transport injury, and to injury that is not transport-related.

There are several implications arising from this study for the prevention, treatment and intervention of individuals with MSI. Regarding prevention, the findings suggest that individuals can cope better with MSI by

drawing on the strength of their social support network and decreasing the need for healthcare services. Social support networks should therefore be protected, strengthened and mobilised as potential channels to provide health education and information to alleviate distress. Regarding treatment, these findings suggest that healthcare service providers could potentially engage appropriate individuals within one’s social network (e.g. spouse/friends) in the health treatment plan. Prior to the development of a health treatment plan, healthcare service providers could assess the abilities, assets and capacities of an individual’s social network including potential challenges in the required uptake of healthcare services. Regarding intervention, interventions could be developed and delivered to sustain support services, particularly for those with limited social support. In addition, healthcare service providers could direct intervention efforts toward helping individuals to develop skills that are needed to mobilise and maintain the individual’s existing social support network. They may also aid in the development of new networks such as patient support groups to promote optimal health service use for those without access to a social support network.

Conclusions

In summary, the findings of the current study highlight the importance of social support in accessing healthcare services following a MSI sustained in a transport accident. Although the results varied across sources of

support and different types of services, the findings suggest that social support has a direct and modifying effect on healthcare service use. The findings do not suggest that social support mediates the association between predisposing factors, need factors and healthcare service use. This study contributes to the existing literature through clarifying the mechanisms of social support in healthcare service utilisation. The study findings have implications for the role of social support in the treatment and intervention of individuals with MSI.

Abbreviations

ANZSCO, Australian and New Zealand Standard Classification of Occupations; CATI, computer automated telephone interview; COS, client outcomes survey; CRD, Compensation Research Database; IQR, interquartile ranges; IRR, incidence rate ratio; ISCRR, Institute for Safety, Compensation and Recovery Research; KHB, Karlson, Holme and Breen; MCS, mental component summary; MSI, musculoskeletal injuries; OR, odds ratio; PCS, physical component summary; SEIFA, socio-economic indexes for areas; SF-12V2, Short-Form-12 Health Survey Version 2; TAC, Transport Accident Commission; ZINB, zero-inflated negative binomial regression

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Availability of data and materials

The data that support the findings of this study are available from the TAC and ISCRR but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

Authors' contributions

KP and JBG conceived and designed the study. KP performed the statistical analysis, interpretation of the data and drafted the manuscript. JBG and SN reviewed the manuscript critically. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Ethics approval and consent to participate

The Monash University Human Research Ethics granted exemption from ethical review as the study satisfies 5.1.22 of the National Statement on Ethical Conduct in Human Research in which institutions may choose to exempt from ethical review research that is negligible risk research and involves the use of existing collections of data or records that contain only non-identifiable data about human beings [18].

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Chapter 6 Experiences of social support

The studies in chapter 4 and 5 demonstrated the impact of social support on musculoskeletal injury (MSI) outcomes and how social support influenced the uptake of healthcare services. Although these studies provided further insights into the influence of social support on recovery, the studies do not account for the interdependencies and transactional relationships between the social networks. Social support is a bi-directional interactive process between the provider and the recipient. Chapter 6 presents the results of the third component of the research project (i.e. study four). Using a qualitative research design, the aim of the fourth study was to explore the role of social support and its impact on recovery from compensable MSI from the perspective of the injured persons, their family members, significant others and friends. The findings from the qualitative interviews have been submitted to Disability and Rehabilitation Journal. The journal paper is currently under peer-review.

Prang K-H, Newnam S, Berecki-Gisolf J. "That's what you do for people you love": A qualitative study of social support and recovery from a musculoskeletal injury. Submitted to Disability and Rehabilitation.

Monash University

Declaration for Thesis Chapter 6

Prang K-H, Newnam S, Berecki-Gisolf J. "That's what you do for people you love": A qualitative study of social support and recovery from a musculoskeletal injury. Submitted to Disability and Rehabilitation.

Declaration by candidate

In the case of Chapter 6 (i.e. paper four), the nature and extent of my contribution to the work involved the following:

Nature of contribution	Extent of contribution (%)
Principal author responsible for the concept, design, data collection, thematic analysis, interpretation of results and writing up of the manuscript	70

The following co-authors contributed to the work:

Name	Nature of contribution	Extent of contribution (%)
Dr. Sharon Newnam	Contributed to the concept and design of the study, and critically reviewed the manuscript	15
Dr. Janneke Berecki-Gisolf	Contributed to the concept and design of the study, and critically reviewed the manuscript	15

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work*.

Candidate's

Signature:



Date 19/07/16

Main Supervisor's

Signature:



Date 19/07/16

“That’s what you do for people you love”: A qualitative study of social support and recovery from a musculoskeletal injury

6.1 Abstract

6.1.1 Background

Social support has been identified as a significant factor in facilitating better health outcomes following injury. However, research has primarily focused on the role of social support from the perspective of the person experiencing an injury. Limited research has examined the experiences of the family members and friends of a person with injury. This study aims to explore the perceptions and experiences of social support and recovery following a transport-related musculoskeletal injury (MSI) in a population of injured persons and their family members and friends.

6.1.2 Methods

This study was conducted using a phenomenology qualitative research design. In-depth semi-structured interviews were conducted with ten persons with MSI, recruited via the Transport Accident Commission (TAC) in Victoria, Australia. Seven family members and friends were also interviewed. The data was analysed using thematic analysis.

6.1.3 Results

Several themes were identified including: (1) key sources and types of support received, (2) relationship development and (3) challenges of providing and receiving support. Participants with MSI reported stories about how the social network provided emotional and tangible support. Family members and friends confirmed the supportive acts provided to the participants with MSI. Positive iterative changes in relationships were reported by the participants with MSI. Participants with MSI, their family members and friends described several difficulties including loss of independence, burdensome, and the impact of caring on health and well-being.

6.1.4 Conclusions

The role of social support is complex given the multitude of people involved in the recovery process. The findings of this study suggest that persons with MSI may benefit from support groups and maintenance of existing support networks. Furthermore, family members and friends engaged in the recovery process may benefit from support in this role.

6.2 Background

Musculoskeletal injuries (MSI) are a major public health problem worldwide, contributing to a large burden of disability (1). According to the World Health Organisation's Global Burden of Disease study, the majority of admissions for various non-fatal injuries as a result of a road traffic accident were related to MSI, with almost 50% of these injuries being fractures (2). Beyond immediate health consequences, MSI can result in reduced quality of life, poor mental health, persistent pain, work disability and high medical costs (3-8). The effects of MSI also extend beyond the individual to family members, friends, co-workers, employers, communities and societies (9-11).

Given the burden of MSI, identifying factors that can influence better health outcomes in the recovery process is essential. Social support has been identified as one of the significant factors in the recovery of MSI (12). Social support is defined as information leading individuals to believe they are cared for and loved, esteemed and valued and belong to a network of communication and mutual obligation (13). There are different types of social support that serve different functions. Types of functional support include informational (e.g. information about resources or advice), tangible/instrumental (e.g. assistance with transportation, cooking or financial resources), appraisal (e.g. affirmation/information relevant to self-evaluation) and emotional support (e.g. empathising, listening and caring). These types of social support can be provided by both formal and informal sources. Formal support can include the services provided by medical practitioners, self-help groups, supervisors and co-workers while informal support can be provided by social networks and community, such as family, parents, spouses, other relatives, friends, and peer groups (14).

Research to date suggests that people benefit physically and emotionally from having social support (15, 16). Several studies have reported positive associations between social support and successful recovery outcomes among persons with MSI. For example, Nijs et al. (17) showed that persons with whiplash injury who received emotional, appreciative and informative support reported better long-term functioning outcomes than those who did not receive support. Similarly, Buitenhuis et al. (18) found that persons with whiplash injury who sought social support had shorter duration of neck complaints than those who did not. More recently, Prang et al. (12) and Baltov et al. (19) showed that among persons with MSI, better social support at work from employers and work

colleagues was positively associated with return to work. Furthermore, studies conducted by Coronas et al. (20) and Holeva et al. (21) reported that among a road traffic accident population, lack of social support (i.e. social deprivation) and perceived negative support were associated with the development of post-traumatic stress disorder.

Despite advances made by researchers in examining the impact of social support on recovery outcomes, many gaps in the literature still need to be addressed. Studies have commonly employed quantitative research designs (12, 17-19). The problem with this is that quantitative research (e.g. surveys) provides limited understanding of the behavioural mechanisms underpinning the type of social support required in the recovery process. Rather, existing qualitative research focuses on the role of social support from the perspective of the person experiencing a traumatic injury (22-24), a spinal cord injury (SCI) (25) or a traumatic brain injury (TBI) (26). Given that individuals beyond the injured person play a key role in the recovery process, there is also a need to understand the support provided from the perspective of significant others and the impact the injury has on their lives.

In this study, we explore the role of social support and its impact on recovery from injury from the perspective of both the injured person and their significant others (i.e. family and friends). The significance of this research is in better understanding the behavioural mechanisms underpinning the type of support experienced by persons with MSI and the impact of this support on their family members and friends. This research has the potential to lead to recommendations for a multi-level psychosocial intervention to better the health outcomes for those involved in recovery from injury.

6.3 Methods

6.3.1 Ethical considerations

Ethical approval for this study was granted by Monash University Human Research Ethics Committee. Written consent was obtained from all participants prior to data collection. All participants are referred to by pseudonym.

6.3.2 Design

We undertook a qualitative study incorporating a phenomenological approach. Phenomenology seeks to describe how individuals experience a specific phenomenon. This

approach characterises individuals' lived experiences of a phenomenon through gathering extensive narrative data from a small number of participants. The goal is to generate a deeper understanding and meaning of a particular phenomenon from the individual's perspective (27).

6.3.3 Recruitment

Recruitment of participants occurred via the Transport Accident Commission (TAC). The TAC is a Victorian government-owned organisation that provides no-fault compensation to all persons injured in land-based transport accidents involving a car, motorcycle, tram, bus or train. No-fault benefits include medical treatment, income replacement, rehabilitation and long-term support services.

The TAC conducts a Client Experience Survey (CES) to measure client perceptions of TAC service delivery and to identify process improvements. Following the completion of the CES, clients are asked if they would be interested in being contacted about future research; participants for the current study were drawn from this group of clients.

Potential participants were purposefully selected according to the following criteria: a) sustained a MSI (i.e. dislocations, fractures, soft tissues including whiplash, sprains/strains); b) aged 18 years and over; c) 6-12 months post-MSI (note 2 participants were interviewed at 13-14 months due to the scheduling of the interview) and; d) having the ability to complete an interview in English. Those who met the inclusion criteria were contacted by the TAC to gain consent for their contact details to be disclosed to the researchers. Researchers then contacted the participants who consented for their contact details to be disclosed and interviews were scheduled.

Interviews were conducted over a period of approximately one hour. Upon completion of the interview, each participant was asked to identify a family member or a friend who they felt had provided support to them during their recovery, regardless of whether they were the primary support person or not. Each participant received a \$25 gift card for participating in the study.

6.3.4 Participants

Ten participants with MSI were recruited in the study. Half of the participants were male (n=5) and ranged in age from 39 to 71 years. The participants' marital status, injury types, hospitalisation status, time since injury, educational level and employment status are detailed in Table 6.1. Seven family and friends that were nominated by participants were further recruited in

the study. Six were family members and one was a friend of the participant with a MSI. Family members included mother (n=2), spouse (n=3), and daughter (n=1). Family and friend participants were aged between 19 and 70 years of age. Two male participants without spouses did not nominate a family member or friend to participate in the study. The nominated family member of one participant declined to take part in the study.

6.3.5 Data collection

The data were collected by the first author through semi-structured interviews. The majority of participants were interviewed face-to-face in their own home (n=7) or at a convenient public location to the participants and researcher (i.e. café) (n=6). Four participants were interviewed over the telephone due to rural location (n=2), after hours availability (n=1) and the telephone being the preferred mode of interview (n=1). Interview questions were made up of a range of open-ended questions based on system-based thinking theory which aimed to explore the influence of broader systems (i.e. social support system) and the communication that take places among groups of interacting individuals (i.e. injured person vs. family members or friends) in the context of the compensation system (28, 29). Interview questions included: *“Tell me about your injury and recovery”*, *“Can you think of someone who you had the most interaction with following your injury? Tell me about your relationship with that person?”*, *“Did you encounter any positive or negative experiences from that person? If so, in what ways? How did it affect your recovery?”*, *“Did your relationship with that person change during the period of your recovery? If so, how?”* These open-ended questions intended to facilitate further exploration of the specific experiences identified by the participants. All interviews were audio recorded.

6.3.6 Data analysis

Interview recordings were transcribed verbatim in a Word document, and imported into NVivo 10 for initial coding and storage. Thematic analysis was used for identifying, analysing and reporting patterns (themes) within the data (30). Patterns were identified through a rigorous process of data familiarisation, data coding and theme development and revision. The analysis process was initiated through familiarisation with the data, which involved several readings of the interview transcripts. Following this process, a coding guide was developed which was based on both familiarisation with the data and relevant literature in the area of social support. The first author analysed two interview

transcripts using the coding guide and additional codes were developed during the review of the data. These codes were then refined through discussion between the researchers. Two authors then applied the codes independently to two interview transcripts. There was full agreement on application of all codes. The remaining interview transcripts were then coded by the first author using the final coding guide. For theme development and revision, similar codes were clustered together and subsequently collapsed into emergent themes. The researchers discussed the emergent themes identified from the data until consensus was reached. Purposeful sampling, the use of two independent coders, and consensus amongst the researchers were used to ensure trustworthiness of the data.

Table 6.1 Participants' demographics

Participants with MSI (pseudonym)	Sex	Age	Injury type	Hospitalised	Time since injury (months)	Marital status	Highest completed education level	Employment	Family member/ Friend participants (pseudonym)	Relationship with participants with MSI	Sex	Age
GEORGE	Male	71	Soft Tissue	Yes	8	Separated/ divorced	High school	Retired				
FRED	Male	42	Soft Tissue	No	14	never married	High school	No	SOPHIE	Mother	Female	70
CHARLOTTE	Female	39	Fractures	Yes	9	never married	Diploma	Working	DIANA	Mother	Female	69
EDWARD	Male	65	Fractures	Yes	10	married	PhD	Working (part-time)	MARY	Wife	Female	65
WILLIAM	Male	44	Dislocations	Yes	13	never married	High school	Working	HARRY	Friend	Male	47
SARAH	Female	50	Soft Tissue	Yes	6	married	PhD	Working	ANDREW	Husband	Male	57
CAMILLA	Female	59	Soft Tissue	No	9	married	Post-grad	Retired	ZARA	Daughter	Female	19
CHARLES	Male	52	Fractures	No	13	never married	High school	Working				
ELIZABETH	Female	65	Soft Tissue	Yes	7	married	Bachelor	Retired	PHILLIP	Husband	Male	60
ANNA	Female	56	Soft Tissue	No	10	separated/ divorced	High school	Working				

6.4 Findings

The qualitative analysis explored the role of social support and its impact on recovery from injury from the perspective of both the person with MSI and their family and friends. The findings are organised into three sections, each section denoting a theme. The themes arising from analysis of the interviews were: (1) key sources and types of support received, (2) relationship development and (3) challenges of providing and receiving support. In each theme, the findings concerning participants with MSI will be presented first, followed by the findings concerning family members and friends. The findings in each theme are then compared across the two groups.

6.4.1 Key sources and types of support

Participants with MSI reported stories about how family members, spouses, friends, work colleagues and healthcare practitioners supported them following the transport accident. Similarly, family members and friends recounted numerous emotional and tangible support acts they provided to the participants with MSI. Each group's experiences are discussed, below.

6.4.1.1 *Participants with MSI*

Participants with MSI who did not have a spouse relied heavily on their parents, particularly their mothers to provide tangible support. Tangible support they received included accommodation following the transport accident (i.e. from a week to indefinitely), meals, laundry services, medication management and transportation to medical appointments. There was also evidence to suggest interaction between types of support. Some of the participants reflected on their experiences with their mothers. For example, Charlotte recounted feeling appreciative of the emotional support received from her mother:

“Mum has been there for with me. My dad too, my dad is great but mum you know has been very supportive of me. In the last five years I've actually had two lots of diseases. So she's the primary sort of you know person in my life that's been there throughout the whole thing. So yeah she's held my hand the whole time.” (Charlotte)

Participants with MSI who were married sought emotional and tangible support from their spouses. Married participants with MSI felt fortunate for consistently having their spouses around which allowed them to unreservedly share their concerns regarding the recovery. They also

acknowledged their spouses for taking them to medical appointments. Edward described the tangible supporting activities undertaken by his wife, Mary:

“Yeah so she [wife] was actually back there by the time they’d cleared the ambulance to take me to the hospital. She didn’t come in the ambulance so she followed the ambulance, so that was quite good. So that was very helpful to have someone there doing the TAC claim, to do all the paperwork involved with it. So I didn’t have to worry about that too much, so for me that was all set up pretty quickly. So in two days the claim was put in, the hospital was paid you know it was arranged so it was all done. So she was quite good. She was coming to see me in hospital. She was also my driver. I wasn’t driving for a period of a few weeks.”
(Edward)

In addition, participants with MSI recounted how friends and the community, including neighbours, provided emotional and tangible support. Friends and community members visited the participants with MSI at home, provided words of encouragements and meals. For Camilla, the community was an important source of friendship:

“[Name of suburb] is that sort of place, it is quite community based and people pop in or call and so there’s a genuine concern for people’s wellbeing, which is lovely. Cards and people popping in and when the accident first happened a neighbour might bring over a bowl of soup or something like that so that he [husband] or the kids didn’t have to make a meal. Yes, so that additional community support/friendship support is very important, very strong.” (Camilla)

A number of participants with MSI who were working at the time of the injury expressed gratitude towards their employers and work colleagues for the emotional and tangible support they received. Participants with MSI perceived their employers to be understanding of the injury by allowing sufficient time off work to recover and ensuring that they did not return to work until they were ready. In addition, participants with MSI experienced visits from work colleagues whilst in hospital and received numerous well-wishes via telephone calls. Sarah spoke of the valuable emotional and tangible support she received from her work colleagues:

“Oh my colleagues were lovely because well they visited me because it’s a short walk from our offices to the ward. So they came in and visited me you know about four different

colleagues. And the lady I share an office with, she actually came when I was discharged and she actually expedited my discharge, because my blood pressure was a bit low so she got my blood pressure. But no, no look they were good and look there was a lady who, because my research assistant was away I actually had appointments so one of the other research assistants stepped in and she saw about six of my research participants while I was in hospital so that was a real help. Because it's awful when your diary is full and there's nobody you know it's got to be taken care of." (Sarah)

Other types of support recounted in the interviews included informational support. Participants with MSI received helpful informational support from their healthcare practitioners, including general practitioners (GPs), physiotherapists and psychologists throughout the recovery process. This was particularly important for those who did not have a spouse and had minimal contact with family members. Generally, participants with MSI were satisfied with the treatment they received and commended the healthcare practitioners for their professionalism and guidance. For example, Charles and Sarah spoke highly of the attentive care they received from their doctor and physiotherapist, respectively:

"Yeah the doctor...I've got a really good doctor. If I suggest anything or if he suggests something it's usually very effective and every time I see him he's very attentive. And he's very quick to refer if he thinks that I need somebody else's advice. Yeah so I was quite happy with the doctor." (Charles)

"The physiotherapist was the greatest help because you know I must have seen him about ten times because I had a very stiff neck and initially with very limited movement. And he kind of mobilised my neck and gave me exercises to do. And so even now I do those exercises at my Pilates class." (Sarah)

6.4.1.2 Family members/friends

Family members and friends recounted similar tangible and emotional support acts provided to the participants with MSI. Family members confirmed their acts of tangible support through assisting the injured person with transportation to medical appointments and medication management. For example, Phillip kept a medication notebook to ensure his wife, Elizabeth adhered

to a medication regimen. Family members also provided much tangible assistance to the participants with MSI with household chores (e.g. preparing meals and laundry services) and administrative tasks (e.g. TAC paperwork and payments). In addition, the majority of family members and friends recounted their experience of providing a great amount of emotional support. Diana spoke of the emotional support that she gave to her daughter, Charlotte, which she believed was necessary for the recovery:

“And I think from then on there she [daughter] just had to be encouraged and looked after you know. Just I think with me I think it’s just a bit of gentleness you know. If you’re gentle to yourself and you just you know keep yourself and say if I feel cranky today that’s okay too because I’m in pain. And when people are in pain they’re not exactly nice. So it’s okay to be cranky it’s okay to have pain, it’s okay to cry and all those things, that’s what I’ve always encouraged her and she did that and she worked at getting better. That’s all you can do because ultimately getting better is you know something they work through.” (Diana)

In order to cope with the responsibility of providing care for the participants with MSI, several family members and friends stated that they reached out for emotional and informational support from their spouses, friends and healthcare practitioners. Seeking additional help ensured that they were looking after themselves whilst also being able to care adequately for the participants with MSI. For example, Diana recognised the crucial role her husband played in promoting her general health and well-being throughout her life:

“And you can always count on him [husband] you know to be there for your tears and me to be there for his tears. Anything you tell him he’ll always back you up and look after you. He will always. And that’s what she hasn’t got, that’s why I tend to give her a lot of time because I probably think of my life and how I’ve always got someone always and she hasn’t. So it’s a great you know thing of support when you know your husband is always going to be there for you. I’m very lucky he’d be my biggest support. And because of him that’s how you can keep going. Because you tell him everything and he knows, he knows what it’s like.” (Diana)

6.4.2 Relationship development

The theme of relationship development captures stories about how the relationship evolved following the MSI. The data identified changes in relationships that had a deep impact on both participants with MSI and their family members and friends. For participants with MSI, the focus of discussion was on the improvement of some relationships but not others, as well as breakdown of certain relationships, and role changes within the family. In contrast, family members and friends reported minimal change in their relationship with the participants with MSI.

6.4.2.1 *Participants with MSI*

Participants with MSI who did not have a spouse mentioned ways in which the injury strengthened the relationships with their family members, notably their mothers. Specifically, they recognised the importance of maternal support and how the injury brought the family closer, as reflected in Fred's comment:

“Yeah it's been good. We've always been close, Mum and I. It [relationship] got stronger. She's been there when I've, well, pick up the pieces as they say. When I've been down and out. Yeah, Mum's Mum, I love her. I won't tell her that of course.” (Fred)

Although participants with MSI who were married received additional support from their spouses in the acute care, they did not believe that the relationships with their spouses changed much over the course of the recovery. The support they received from their spouses following the injury was consistent with support received prior to the injury, citing a strong bond with their spouses due to many years of marriage, as illustrated by Edward:

“Married for 34 years now. It's quite good. Really intensively supported in the first ten days or so when I was off on leave. That was really about the only real sort of change. I needed her [wife] to drive me more than usual. Once I was back at work, past the whole six week period, I'd recovered and there was really probably no real change you know in the relationship.” (Edward)

Despite positive development in some relationships, several participants with MSI who did not have a significant other at the time of the interview recalled stories about a breakdown in their relationship with their significant others following the accident. Charlotte described the loss of

relationship and lack of social support received from her significant other over the course of her recovery:

“But as just the weeks went by I just felt like he [significant other] just became less interested and sort of expected me to get over it faster. And I don't know what happened, it's a big mystery about this relationship but he broke up with me but he never officially broke up with me. I was with him about six weeks all up. He just sort of vanished one day and unfriended me on Facebook and you know blocked me as well that's how we broke up. I was pretty upset about it all yeah.” (Charlotte)

A number of participants with MSI also reported role changes within the family following the MSI. Role changes were related to issues of dependence and social support. Camilla expressed profound changes in her ability to perform satisfactorily in her role as a mother. She relied greatly on her spouse to perform her duties:

“Well in terms of me not being able to lift heavy things to clean, to vacuum. Certainly for the first two to three weeks I wasn't driving a car, our children needed...they were dependent on being taken places which would normally be my responsibility, pickups at night time and things like that. So there were roles...my normal functioning within the relationship had changed and so he [husband] had to step up and take over those responsibilities and to a certain degree the children did too but for him more so it was him.” (Camilla)

6.4.2.2 Family members/friends

In contrast to MSI participants, family members and friends reported minimal changes in their relationships with the participants with MSI following the transport accidents. Mothers of participants with MSI reported always having a strong and close relationship with their children, regardless of the injury. Similarly, spouses described minimal changes in their relationships following the transport accidents. They believed that years of marriage created an intimate bond and loving relationship with their spouses. Mary described the authentic and enduring bond she has developed over the years with her husband, Edward:

“The fact that you actually really do need that person, and it's good to know the relationship is so strong that they're there for you. So that's, I think, is a good thing that happened in our

marriage. To know that it's there and to feel grateful for having that strong, solid relationship. That you're there for them through thick and thin. Which is the way it is. I know he's [husband] there for me. That's the good thing about being married so long. You've had that long companionship and friendship, and we know each other. I've had, you know, bad things happen to me, and he's definitely been there for me, you know, when he has to be." (Mary)

In contrast to the experiences of MSI participants who felt that their familial role had changed following the MSI, family members and friends reported no role changes within the family and social network. They believed the injury was not severe enough that it necessitated role change. Furthermore, they understood it was their role and primary responsibility as a loving mother, spouse, and friend to continuously support the participants with MSI to recover. Diana, Mary and Harry acknowledged this ethical responsibility towards the participants with MSI:

"Because she's [daughter] not married and she's got really, apart from her family you know they're the people that you know she does depend on so that's what you've got to do. It's my role as a mother. And I mean I'm...that's just the way it is you know." (Diana)

"That's what you do for people you love. You do, you step up into the mark when they need you, and you don't expect anything back. It was an additional burden I suppose, but it is part of my job as a wife, and as his partner. That's what you're signed in for." (Mary)

"Well you just don't even think about it. It's just something you do as a friend. As a moral duty you could say." (Harry)

6.4.3 Challenges

The theme of challenges captured stories regarding difficulties in receiving and providing support following the MSI. Different challenges were experienced by the participants with MSI, their family members and friends. For participants with MSI, challenges revolved around loss of independence, self-perception of being a burden and lack of social support. In contrast, family members and friends expressed concerns with their own health and well-being, future planning and frustration with caring.

6.4.3.1 *Participants with MSI*

Independence was raised by the majority of participants. These individuals reported they were appreciative of the support from their spouses and family members but also felt uncomfortable with their dependence on them. Elizabeth expressed frustration with her spouse Phillip when he thought she was unable to perform basic tasks and the impact this had on her mentally:

“He [husband] wanted to put me in cotton wool, because he knew I was in pain...increased pain because of the accident. It got to the point where I would sleep in this chair, he'd sleep in the bed inside. I became like a robot.” (Elizabeth)

Feeling a sense of burden to others was common among the majority of participants. These individuals expressed concern about the physical and emotional burden on their spouses and family members that their injury would cause. George indirectly expressed distress about being a burden to his daughters. He attempted to reduce his burden on his daughters by justifying their behaviours and lifestyles. He described:

“Well we're talking, we're talking. They're busy girls [daughters], they've got their problems, they've got their work, they've got high positions. So they are busy they've got their families, they've got their little ones. I would say we call each other from time to time yeah. My daughters they don't know much about my suffering. They know I'm suffering, they don't know much about it.” (George)

Some participants with MSI such as George, Elizabeth and Charles recognised the negative effects of not receiving support (i.e. isolation) from relatives and friends following the injury. Geographic locations and life circumstances including friends who are raising young families prevented them from accessing and receiving adequate forms of support from their social network. They expressed a desire for emotional and tangible support from their social network such as having someone to talk to, help with mowing the lawn, and transportation to healthcare services when required. Charles described the minimal support received from his friends:

“I haven't had very much support no. I think it's just the day and age that we live in and my age, a lot of my friends have moved away from the area. And my remaining friends are very locked into their work so we don't communicate very often these days.” (Charles)

6.4.3.2 *Family members/friends*

The challenges experienced by family members was different to that of MSI participants. Family members raised concerns regarding their health and well-being. They revealed that caring for the participants with MSI was demanding at times and impacted their health especially if the family member was in paid employment. For example, Phillip felt he had to quit his job to become Elizabeth's full-time carer. Diana and Phillip also developed anxiety and depression, respectively, which they thought may have been directly linked to caring.

"He's [doctor] just given me something to take the edge off. I don't know whether it makes you worry less but it helps you cope with it. Not that you're asleep all the time or anything like that, just to take the edge off my anxiety so that I can cope a bit better. You sort of think oh well this is what I'm going to do because if people depend on you and then you go to pieces." (Diana)

Furthermore, family members expressed concerns with the endless medical appointments which disrupted their lives and made it very difficult to plan for the future. This was reflected in Sophie's comment regarding her son's medical appointments and the inability to go on a vacation:

"Well, we're ready to go down there again but he's [son] still got more important appointments at the moment. He's got to get sort of out. They've [doctors] now diagnosed him with a disease. Once he gets over these next appointments, hopefully we'll book a holiday but I'm running out of time. I don't like going in the cold weather. It's March and he's still got appointments into April." (Sophie)

Finally, family members and friends felt helpless observing the participants with MSI in pain or unable to complete basic household chores (e.g. making the bed and vacuuming). They expressed a desire to help with the recovery of the participants with MSI but became frustrated when the participants with MSI did not want assistance, as illustrated in Phillip's comment:

"An uphill battle. As you saw Elizabeth is very strong willed to the point of being detrimental to her situation in that she tries to take too much on like vacuuming, she's always at the risk of falling. It's one of the problems in being disabled, people don't like to be disabled so they try to push themselves to do, some people, more than they should or can really do, that

having dire consequences. I mean Elizabeth says I'm overprotective or I'm authoritarian but I can see from past actions what will happen if a certain thing is done. You can get very frustrated and the anger can bubble up. Now I just try to take a couple, four deep breaths and try and zone out." (Phillip)

6.5 Discussion

This qualitative study explored the perception and experiences of social support among people with MSI following a transport accident, their family members and friends. To our knowledge, this study is unique in that it is the first to explore the behavioural mechanisms underlying the types of support following a compensable transport injury; thus, this research advances our understanding of the role of social support in improving recovery from injury. The findings suggest that the role of social support is complex given the multitude of people involved in the recovery process. Furthermore, the results revealed similarities and contrasting viewpoints among participants with MSI, their family members and friends across three themes: (1) key sources and types of support received, (2) relationship development and (3) challenges of providing and receiving support.

The results of this study show that different members of the social network provided different types of support. Among participants with MSI, spouses and mothers undertook activities to manage the MSI recovery including physical care, meals, transportation to healthcare services and emotional support. These supports were important and highly valued by the participants with MSI, particularly in the acute stage of recovery when they were unable to care for themselves. The types of support reported are consistent with past qualitative studies conducted among traumatic injury, TBI and SCI populations (25, 31-33).

In contrast, participants with MSI who had minimal contact with family members relied on healthcare providers for informational support regarding their MSI prognosis and treatment. Similarly, past research showed that people with illness who reported no spousal support were more likely to access formal and professional support services for daily care and illness management than those with a spouse (34). The findings suggest that healthcare practitioners need to take into account the social circumstances of persons with MSI, especially when they have limited social support and are unable to care for themselves to ensure optimum recovery.

Relationship changes after the MSI were evident in some relationships but not in others. Participants with MSI who relied heavily on support from their mothers developed stronger relationships with them following their MSI. This finding supports previous work conducted among people with traumatic injury, in which the injury resulted in a strong recognition of the importance of family post-injury (22). The stronger bond is likely due to an acknowledgement, recognition and sense of gratitude for their mother's unwavering commitment and support in time of needs. In contrast, no changes in the relationship with their children were reported by the mothers. Their willingness to assume care for their children is derived from their feeling of love and familial ethical responsibility, as noted in previous traumatic injury and TBI studies (31, 35, 36).

In contrast to the parental and child relationship, no changes in the relationship dynamics were reported among participants with MSI who had a spouse and by their spouses. The quality of the relationship was considered relatively similar prior to the MSI. Our findings do not reiterate previous research in the TBI and SCI populations whereby spousal relationships changes are evident (32, 37, 38). This may be due to the severity of the injury. MSI were viewed by the participants and their spouses to be a relatively minor injury despite the MSI requiring hospitalisation. Furthermore, marriage is considered a unique relationship because of its intensity, duration, and dependence on each other; in this study, the couples were married for a substantial period of time. They were also likely to have previously experienced a number of crises and therefore may have learnt to adapt and manage their problems successfully by depending on each other.

Some participants with MSI had experienced some degree of relationship breakdown with their significant other following the transport accident. Although it was unclear whether the breakdown of the relationship was attributed to the injury, this could suggest that MSI can put severe stress on relationships. Injury may affect intimacy between the participants with MSI and their significant other due to the pressure of caring and providing support to the person with MSI. Past research has shown the rate of relationship breakdown to be relatively high following TBI and SCI (37, 38). In support, evidence from the family members' interviews revealed that one of the major challenges for them was the emotional burden of caring for the injured person and this had an impact on their health and well-being. To minimise relationship breakdown, we recommend that information

regarding the injury recovery process including potential changes in responsibilities and role be provided to partners of persons with MSI by rehabilitation healthcare practitioners. In addition, couple counselling for severe cases would allow the partner to gain further insight and understanding of the impact an injury has on a person, and how to manage and overcome a potential life changing injury together.

A number of challenges and difficulties were identified by the participants with MSI including loss of independence and concerns about being burdensome. Participants with MSI also raised issue with the limited amount of support provided by their social network. Injury deprived individuals of independent performance of self-care and household tasks. As identified in the interviews, spouse and family members recounted playing a central role in completing household tasks such as preparing meals and doing the laundry. Some participants with MSI return to the family home despite having lived away from home prior to the MSI. This represented a huge loss of independence and self-reliance, as described in previous traumatic injury and TBI studies (22, 26). With a better understanding of the consequences of injury and possible role change after injury, healthcare practitioners can target the development of specific skills necessary for the continuation of valued roles.

Participants with MSI also shared common concerns of being a burden on their spouse and family members. Research in the traumatic injury, TBI and SCI populations supports the view expressed by participants with MSI (22, 25, 26). However, there was evidence from the family members and friends' interviews that they perceived their relationship with the injured person to improve over time, regardless that the injured person thought they were a burden. Burden on the family may prevent people from seeking and receiving support, thereby potentially hindering their recovery. Thus, further study is required to explore which strategies are most effective in decreasing persons with MSI's worries and fears about being a burden on their families and friends.

Although the majority of the participants with MS received support from their spouses, family members and friends, several participants with MSI reported not receiving sufficient support and feeling lonely. A lack of social support can result in social isolation. Long periods of loneliness can have a negative impact on physical and mental health (39). This study proposed that the

maintenance of current social support network (i.e. connecting/reconnecting with family and friends) and the development of new social support system (i.e. support groups), particularly for those with limited support is essential to prevent loneliness and isolation. In addition, training for persons with MSI to understand the type of support that is required in a particular situation and identify the people within the social support network who are able to provide it will be imperative for recovery.

Spouses and family members experienced a variety of problems including physical and mental ill health, and a lack of support. Caring was perceived as demanding, emotionally taxing and physically draining by some of the spouses and family members. Some carers suffered from both physical and mental health condition which may have arisen as a direct result of providing care. Similarly, in past studies, caring for an injured family member has been associated with poor general health and mental well-being (32, 35). However, not all family members experience problems, and some were able to make adjustments, particularly when they perceived the MSI to be relatively minor and when familial roles did not alter. The findings suggest that to differing extents, some spouses and family members will require support to help them cope and prevent burnout. Future studies are needed to further explore the needs of the carer, the physical impact of caring and identify which carers are at higher risk of injury and poor health and in need of support and training.

Although this study provides greater insights into the role of social support following a transport accident from the perspective of the persons with MSI, their family members and friends, there are several limitations that should be considered when interpreting these study's findings. The recruitment was based on participants with MSI who completed the CES and agreed to be contacted for future research, which may have resulted in an inclusive biased sample (i.e. selected for convenience). However, the inclusive biased sample does not undermined the study's findings as we recognised that the sample is not fully representative of the MSI population. We also recognised that individual experiences after MSI can vary considerably. Therefore, our small sample may not have captured the complete range of views about how social support affects recovery. The transferability of the findings needs to be considered in this light. Furthermore, due to ethical constraints we were unable to directly approach family members and friends for interviews. Only the nominated family members and friends who were considered to be supportive during the

recovery process were interviewed, which suggest that the participants with MSI may have had more supportive relationships. Interviewing family members and friends who were unsupportive would have provided insight into why certain people are unable to provide support (e.g. uncertainty about the most effective way to provide support, limited ability to provide support under stressful circumstances, pressure on relationship) and would potentially lead to identification of strategies for providing support.

In conclusion, this qualitative study provides a greater understanding of how social support is perceived and experienced by people with MSI, their family members and friends. Three themes were identified: (1) key sources and types of support received, (2) relationship development and (3) challenges of providing and receiving support. For both participants with MSI, their family members and friends, emotional and tangible support were considered important for facilitating recovery from MSI. Changes in some relationships were evident among participants with MSI. However, these relationship changes were not perceived by the family members and friends. For participants with MSI, challenges included independence, burdensome and lack of support, whereas for family members and friends, the difficulties associated with caregiving were health and well-being and future planning. The study suggests that the development of support groups and maintenance of support is particularly critical for those with limited or no support. Supporting family members and friends' continued engagement in the recovery process is essential especially for carers whose health is compromised.

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6.5.2 Declaration of Interest

The authors declare that they have no competing interests.

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Chapter 7 General discussion

The overall aim of the research project was to investigate the role of perceived social support in recovery from compensable musculoskeletal injury (MSI). There were three broad objectives of the research project. The first objective was to identify the types and key sources of social support that are optimal for recovery. This objective was achieved through a systematic literature review (i.e. study one). The second objective was to examine the impact of social support on injury outcomes following compensable MSI. Two studies were conducted to address this objective: the analyses of cross-sectional survey data (i.e. study two) and linking this information to administrative claims and payments data (i.e. study three). The final objective was to assess the perceived interactions and impacts of social support over the course of the injured person's recovery. Interviews with the injured persons, family members, significant others and friends (i.e. study four) were conducted to address the final objective.

The current chapter is divided into four sections. The first section summarises and critically analyses the key findings of each of the studies: systematic literature review (study one in chapter 3), social support and MSI outcomes (study two in chapter 4), social support and healthcare service use (study three in chapter 5) and the experiences of social support (study four in chapter 6). In the second section of this chapter, implications for policy, practice and research are discussed and the third section addresses the methodological considerations of the research project, (i.e. the strengths and limitations). Finally, the fourth section identifies directions for future research.

7.1 Key findings

7.1.1 Systematic review

The first component of the research project (i.e. first study) was a systematic review. In this review, the association between family and work-related social support (e.g. co-workers and supervisors) and MSI outcomes (i.e. physical, psychological and economic) were evaluated. The results showed that the majority of studies focused on social support from co-workers or supervisors, while three studies focused on social support from the family. Best evidence synthesis showed inconclusive evidence for the relationship between work-related support and MSI outcomes. Similarly, there was limited and inconclusive evidence to demonstrate a relationship between family support and MSI outcomes. Overall, the results of the systematic review were inconclusive. The

systematic review highlighted the need for additional research in this area; in particular exploring the role of family and friends' support in recovery from MSI.

7.1.2 Social support and MSI outcomes

Given the inconclusive evidence in the systematic review, the purpose of the second component of the research project was to investigate the impact of social support on MSI outcomes using surveys, administrative claims and payments data. Two studies (i.e. studies two and three) were conducted to address this objective. The aim of the second study was to determine the impact of social support within the social network (i.e. family, friends, neighbours and employer support) on injury outcomes (i.e. physical health, pain and return to work (RTW)) following compensable MSI sustained in a transport accident.

The results of this study revealed that both the structure and the source of social support had a positive impact on post-injury physical health, pain and RTW. The strength of the associations between social support and each outcome varied across structure and sources of support: support from family and friends was associated with better physical health among those who were hospitalised; being married or in a de facto relationship was associated with better physical health; being widowed, separated or divorced was associated with more self-reported persistent pain; support from family, friends and neighbours was associated with less persistent pain. There were also significant gender differences. Among women, support from family was negatively associated with RTW, whereas support from friends was positively associated with RTW. These associations were not observed among men, indicating that men and women experienced different benefits and gaps in social support. For both men and women, support from employers was positively associated with RTW. Overall, the results of the study demonstrated that family structure and sources of social support had a positive impact on physical health, persistent pain and RTW following compensable MSI. This study suggested that improved access to social support could improve recovery. It also highlighted the importance of identifying 'at risk' people who have limited access to a social support network.

7.1.3 Social support and healthcare service use

The second component of the research project (i.e. study three) aimed to examine the mechanisms (i.e. direct effects, mediating effects and effect modification) through which social support influenced healthcare service use among people with compensable MSI sustained in a transport accident. The results revealed that family support was associated with less use of allied healthcare services whilst support from friends was associated with less use of allied and mental healthcare services. In addition, support from family modified the association between SEIFA and mental healthcare service use. In the group that reported having no social support, those with a lower SEIFA had a higher likelihood of using mental healthcare services than those with a higher SEIFA. Overall, the results of the study demonstrated not only that social support had direct and modifying effects on healthcare service use but that the source of social support can impact the type of healthcare service use. The findings of this study suggested that persons with compensable MSI can cope by drawing on the strength of their social network, thereby decreasing the need for healthcare services. However, this recommendation should be tempered as this strategy could be at risk of decreasing access to care when urgently required, potentially placing greater demands on family members and friends to provide support.

7.1.4 Experiences of social support

The third component of the research project (i.e. study four) explored the perceptions and experiences of social support and recovery from compensable MSI, from both the perspective of the injured person, their family members, significant others and friends. This study identified three central themes including: (1) key sources and types of support received, (2) relationship development and (3) challenges of providing and receiving support. In the first theme, emotional and tangible support were reported as the primary types of support provided by family members, significant others and friends to assist with recovery. In the second theme, stable relationships and positive iterative changes in relationships between the injured persons and family members, significant others or friends were reported. In the third theme, a number of difficulties were described. For the injured persons, this included loss of independence, burdensome and lack of social support. For family

members, significant others and friends, difficulties with caregiving activities and future planning were raised.

The results of this study identified a number of facilitators and barriers in receiving and providing social support for recovery from the perspective of the injured person and their social network. Therefore, interventions could be targeted to enhance facilitators and reduce the barriers of social support with the aim to develop new social support systems for those with limited support. Ultimately this approach would be designed to maintain and improve existing social support networks and thereby improve the injured person's recovery. In addition, the study suggested that family members, significant others and friends involved in the recovery process may benefit from support in this role, especially those whose health are compromised.

7.2 Implications

Findings from this research project showed that social support is an important coping resource in supporting recovery from compensable MSI. The findings have a number of important implications for theory, as well as policy and practice in primary and tertiary prevention. These implications are discussed in greater detail below.

7.2.1 Theoretical implications

Given that social support is a complex concept consisting of several sub-constructs, the measurement and operationalisation of social support has generally been challenging. Several conceptual frameworks have emerged throughout the years in an attempt to describe the various sub-constructs of social support including perceived support, received support, structural support and functional support (1-3). Other conceptual frameworks have also been developed to describe the pathways through which social support influence health (4, 5).

For this research project, a number of conceptual frameworks related to social support were used to guide the research project because a single conceptual framework was deemed insufficient to describe the various aspects of social support including its mechanisms. In the second study, the convoy model was applied to examine how social relations between the individual and each member of the convoy model (i.e. family, friends, neighbours and workplace) varied across various MSI outcomes (i.e. physical health, pain and RTW). Aligned with this model, it was found that the

provision of social support varied according to the structural and source of support, personal and situational characteristics. For example, the results of study two provided some evidence that the sources of support followed the hierarchically descending order from family to friends for physical health and RTW outcomes but not pain outcome. The results of this study also provided support for the personal (e.g. gender) and situational characteristics (e.g. hospitalisation) of the convoy model. Overall, the findings of this study aligned with the convoy model. However, future research is required to test the lifespan component of the convoy model; in particular whether social support from the social network varies throughout the MSI recovery process.

In the third study, Berecki-Gisolf et al. adaption of Andersen and Newman's behavioural model of healthcare service utilisation was applied to explain how social support from family members and friends affected healthcare service utilisation in the context of the compensation system. Overall, the results provided support for components of the adapted behavioural model of healthcare service utilisation. The findings of this study demonstrated that Berecki-Gisolf et al. adaption of Andersen and Newman's behavioural model of healthcare service utilisation can explain how social support influenced the uptake of allied and mental health services in the context of the compensation system. This study showed that enabling factors such as social support from family and friends had a direct and modifying effect on the uptake of healthcare services, after adjusting for several predisposing and need factors. As this study focused on certain aspects of the model, further research is warranted to test the other components of the model such as providers and individuals' incentive factors and the impact this has on the uptake of healthcare services.

The convoy model and the adapted behavioural model of healthcare service utilisation provided the basis for understanding how perceived social support can influence recovery and the uptake of healthcare services. However, both conceptual frameworks focused on the individual and do not take into account the interdependencies and transactional relationships between systems. To overcome this limitation, the fourth study used the Bronfenbrenner's bioecological system model to describe the perception of social support from the perspective of the persons with MSI and their family members and friends in the context of the compensation system. The findings of this study supported some of the bi-directional relationships represented in the microsystem component of the

bioecological system. For example, the results showed that the experiences of persons with MSI affected interpersonal relationships positively (e.g. increased the strength of the relationship) and negatively (e.g. impacted health and well-being) and that this affect was bi-directional. Although this study focused on a compensable population, it was outside the scope of this research project to explore how processes (e.g. claim process) within the compensation system impact the bi-directional relationships in the microsystem. Thus, future research could be directed toward the identification of factors operating at the macrosystem level, such as compensation system process, that could potentially impact recovery outcomes.

In summary, the findings of this research project both supported and extended existing conceptual frameworks. One notable application of these models is that both the convoy model and the bioecological system model were initially developed to describe human development over time and not injury recovery. Therefore, the phases of human development do not necessarily match those of injury recovery. Thus, future research could adapt the lifespan component in these conceptual frameworks to consider elements of injury recovery trajectory and care continuum provided by family members, significant others and friends. For example, the injury recovery trajectory could be conceptualised within four phases: acute care, medical stabilisation, transition to outpatient care, and long-term rehabilitation and recovery (6). Similarly, the care continuum could encompass five phases: event, stabilisation, preparation, implementation and adaptation (7). Combining elements of injury recovery trajectory and care continuum in parallel with the existing conceptual frameworks, which already account for individual variations, could provide additional information on phase-specific support needs of the injured persons, family members, significant others and friends.

7.2.2 Policy and practice implications

The findings have a number of potential important implications for policy and practice in primary and tertiary prevention. Primary prevention to promote social support prior to sustaining a MSI is key to ensuring that people can build important supportive resources that can be accessed during times of personal challenge and crisis. Tertiary prevention for persons with MSI includes the collection of socio-demographics information by the TAC including information on the cause for the

lack of support, and the development of appropriate social support programs (e.g. support groups and the use of e-health technologies) for those who are identified at high risk of lacking support. For family members and friends, tertiary prevention focusing on the recognition of support provided by them in the recovery process and the awareness of formal services available to them are essential to mitigate the negative impacts of caring. These implications are discussed in greater detail below.

7.2.2.1 Primary prevention

As evidenced by the results of this research and given the demographic changes in industrialised society, an important implication of the research project is the need for the development and maintenance of social relationships and social support as a preventive resource and coping mechanism to improve health outcomes when dealing with adversity, including injury. The composition and functions of families and households have changed from the traditional family consisting of a married couple with children to a diversity of family forms including single-person households, single parenthood, co-habitation, and same-sex partnerships (8). Single-person households are expected to be the fastest-growing household type in coming decades (9). Economic globalisation and modern transportation have contributed to human mobility and an increase in transnational family in which people live apart from their families for extended periods of time (10). Information and communication technologies (ICT), in particular the internet, are firmly embedded in everyday life with online social networking transforming social interactions (11). Changes in family structures, greater geographical separation of families and increased ICT are all affecting the way in which individuals perceive the availability of support, express the needs for support and the capacity to provide support.

Despite the increase in globalisation and technology that would presumably foster social connection, current evidence indicates that the quantity and quality of social relationships in industrialised societies are decreasing with people becoming increasingly more socially isolated (12). As evidenced by the results of this research, fostering social relationships and accessing social support as a prevention resource to improve health outcomes prior to stressful events should be considered a health promotion strategy. This strategy could engage those who deliver care as well as those who receive it, including family members, friends, community and the government. In

support, governments and organisations have gradually recognised the importance of informal social support from family and friends in promoting and strengthening the population's health and wellbeing, without increasing spending through rebalancing of responsibilities among individual, families and the state. For example, the WHO has identified the strengthening of social networks and social support as a health promotion strategy (13). Similarly, government bodies such as VicHealth, a health promotion foundation in Victoria Australia, established a focus on increasing social participation as a key priority area for action, in response to a survey conducted in 2015 (14). They found that among young Victorians, those with strong social support had higher levels of happiness, were less vulnerable to depression and better equipped to cope with adversity. They also found that one in four young Victorians reported having limited access to social support in a time of need. One in eight young Victorians reported a very high intensity of loneliness. In response to these findings, VicHealth's goal is for Victorians to be more resilient and better connected by 2023 (15). In order to achieve this goal, VicHealth aims to increase opportunities for social connection via positive relationships, supportive networks and strong community engagements. The results of this research support such an initiative.

Despite the increase in government involvement in promoting informal social support from family and friends, concerns have been raised regarding the shift in the burden for caring under the guise of community care away from the state to the family, in particularly to the unpaid labour of women (16). As evidenced by this research, this strategy has the potential of negative implications. For example, study three suggested that persons with MSI who are adequately buffered by their informal networks were less likely to access allied and mental healthcare services from the Transport Accident Commission (TAC). Study four demonstrated that women were the predominant providers of informal support for family members. These findings suggest that the lack of demand for formal healthcare services may place greater pressure on informal support, which is disproportionately expected to be delivered by women. Therefore, a greater integration of both informal and formal support is required. Governments need to identify what the optimal balance of informal and formal care is to avoid strain on either the formal or informal support sector. Consistent with this argument,

the shifting of responsibility for caring between the state and the family, the issue of social equity and the effect these factors potentially have on injury recovery is an area of future research.

7.2.2.2 Tertiary prevention for persons with MSI

The findings of the research project also have implications for tertiary prevention. For example, this research demonstrated that the collection and early analysis of appropriate socio-demographics information by the TAC is needed to identify those with limited access to social support and to predict those at risk of adverse health outcomes. At present, the TAC does not collect administrative data pertaining to the structural aspects of social support such as marital status, number of children, and household composition in their administrative claims files. Rather, these data are only collected in client satisfaction surveys among a selected sub-group of clients several times a year. As evidenced by the results of this study, such information is important in the recovery process and, thus, could be used for the screening of those at risk of poor recovery and would ensure that resources and efforts are directed where most needed. To illustrate, study two demonstrated that both the structure and the source of social support were associated with post-injury physical health, pain and RTW.

In addition to the collection of appropriate socio-demographic information, the TAC could consider why people with a lack of social support do not have social support from the outset. For example, study four demonstrated that feelings of inflicting undue burden, geographic locations and life circumstances prevented persons with MSI from accessing and receiving support from their social network. The findings of this study are supported by the literature which has shown that persons who are introverted and highly independent may not want support from others (17, 18). As such, interventions would be inappropriate for this population which do not experience distress over their low level of support or express any desire to change. In contrast, past research has demonstrated that persons with low social support may also differ depending on whether they possess or do not possess the social skills for the development of social relationships (19, 20); thus, interventions for these groups of people may be appropriate. Therefore, assessing the abilities, assets and capacities of an individual and his/her social network may provide important clues as to

how their social support needs are best met. This information could be integrated into screening protocol and pre-treatment assessment at the TAC and similar insurance systems.

A second recommendation for tertiary prevention is the development of informal support interventions. As described previously, study two showed which characteristics of support and sources of informal and formal support were either positively or negatively associated with MSI outcomes. When developing informal support interventions aimed at strengthening the injured person's social network, the structure of the social network, the source of social support, the type of outcomes, the injury severity, and the gender of the injured person, all need to be taken into consideration. With this knowledge, informal support interventions can then be designed to target the group identified to most benefit from improved access to social support. For example, previous informal support interventions targeted at various populations with a range of issues (21) and people with brain injury (22) focus on: 1) increasing social contact by improving the quality of existing social network or increasing the social network size by developing new relationships to expand the social network, 2) increasing enacted types of support (i.e. emotional, informational, instrumental and appraisal support) by teaching family and friends how to better interact and provide support and 3) help individuals to develop and improve social skills to facilitate more supportive relationships.

A third recommendation for tertiary intervention arising from this research project is the development of formal support interventions for those with limited or no access to informal support. Study two showed that almost 20% of persons with MSI reported having 'not often' or 'no, not at all' support from family and friends, and approximately 50% reported having 'not often' or 'no, not at all' support from their neighbours. Furthermore, study four demonstrated that a small number of persons with MSI relied on formal source of support, in particularly healthcare providers. Therefore, formal support interventions such as support groups and e-health technologies such as mobile health, online social networks and virtual communities could be promoted as a preventative strategy for those with limited or no access to social support from informal sources of support.

With regards to support groups, this initiative could be promoted as a low cost initiative designed to promote physical and mental health, improve coping, make friends and gain a sense of engagement (23). In support of this recommendation, past research has shown that social support

groups are better at providing informational and emotional support but not tangible support (24). E-health could also be utilised to promote online social support interventions, given the widespread availability of electronic peer to peer community forums, where people with common interests gather virtually to share experiences, ask questions, or provide emotional support and self-help (25). An example of such an initiative is M-health, which uses mobile computing in health care and public health (26). M-health can be used to facilitate data collection, encourage healthy lifestyle initiatives, self-manage condition and improve communication between healthcare providers and their patients. For example, m-health can be used as a tool to provide social support. An American study using a text message based social support intervention in a chronic pain population has shown that receiving two supportive text messages daily has shown to reduce the pain experience by patients with chronic pain compared to the control group (27). The study demonstrated that text messaging can change the perception of pain by showing patients that they matter and that people care about their well-being.

7.2.2.3 Tertiary prevention for family members and friends

In addition to designing interventions for injured persons, the findings of this research support the need for interventions for family members and friends. The findings of study four showed that while not all family members, significant others and friends suffered adverse health impacts as a result of their increased caregiving requirements, a number of family members and significant others experienced negative physical and mental health effects arising from caring. For example, the findings of this study found that providing support for the persons with MSI impacted their health and well-being to the extent that two persons reported developing a mental disorder. These results suggested that family members, significant others and friends engaged in the recovery process may benefit from support in this role to help them cope and prevent burnout. The Australian Commonwealth government currently provides a range of support services to alleviate carer burden under the Carer Recognition Act 2010 (28). This Act stipulates that support activities are limited to carers providing ongoing care for someone with a disability, medical condition, mental illness or someone who is frail and aged. Family members, significant others and friends who provide support for an individual who requires care including those arising from an injury are not considered carers

and therefore are not eligible for government's support. The findings of study four demonstrated that the provision of social support from family members, significant others and friend to persons with MSI can continued up to a year post-injury. As such support for family members, significant others and friends are urgently required.

A fourth recommendation for tertiary intervention is the recognition of support provided by family members, significant others and friends to the injured person. Interventions to mitigate the negative impacts of caring by family members and friends for persons injured in a transport accident are required. At present, the TAC funds the reasonable costs of post-acute support such as personal care, mobility, transfers, banking or shopping tasks for a maximum of five years from the date of the person's transport injury unless the person has sustained a severe injury. However, post-acute support can only be provided by approved attendant care agency for a maximum of 40 hours (29). As evident in study four, the majority of these tangible support tasks were largely performed by family members, significant others and friends. Greater recognition and assessment of the amount and type of care and risk to long-term well-being of family members, significant others and friends involved in the recovery process by the TAC is required to ensure that the needs of the carers are recognised for the realistic length of recovery and that carers are provided with information on 'the reality' of the caring role. With regards to the latter, services such as basic training for carers, psychological counselling and information and educational resources could be provided to carers at the onset of the injured person's claim.

A fifth recommendation for tertiary intervention is public awareness of formal support available for family members, significant others and friends. The TAC funds time-limited respite breaks up to a maximum of 28 days per calendar year for family member and friends who provide substantial unpaid care and support (30). It is unclear whether the family members, significant others and friends in study four were aware of the availability of such service as no participants revealed seeking support in respite care. Instead, family members, significant others and friends expressed seeking support from their spouse, family members, friends and healthcare providers in order to cope with the burden of caring. Although this study represented only a small number of this population, the findings suggest that greater improvements in access and awareness of formal

support services to alleviate the impact of caring is required. Furthermore, a number of family members were retired or voluntarily left their job to take responsibility for the injured person. Financial support or additional home help could be provided to family members and friends to alleviate the burden of caring.

7.3 Methodological considerations

A number of strengths and limitations emerged during the conduct of this research project including the mixed methods research design, secondary data analyses, measurement of social support, scope of social support, personality traits and coping styles and generalisability. These methodological issues are discussed in greater detail below.

7.3.1 Strengths

A strength of this research project was the application of a mixed methods research approach to the study design. Given the different injury recovery trajectory and the multitude of people involved in the recovery process, combining quantitative data (i.e. statistical trends) with qualitative data (i.e. stories and personal experiences) provided a holistic perspective to exploring this complex issue. In this research project, the quantitative findings demonstrated the effects of social support on MSI outcomes. However, the quantitative component focused on the individual and lacked detailed information on the types of support required for recovery. The qualitative analysis allowed in-depth information on the types of support, relationship developments and challenges of support from the perspective of the person experiencing a MSI but also their family members, significant others and friends. Incorporating a qualitative component to the research project provided a richer understanding of the role of family support in MSI over and above the quantitative data alone.

A second notable strength of this research project was the use of secondary data in the quantitative component of the research project. Accessing the client outcomes survey (COS) from the TAC allowed the use of real-life applied and subjective data to address important recovery and injury outcomes research questions not yet considered by the TAC. The COS was also conducted among a large sample, therefore the testing of a number of statistical models was possible. In addition, the COS was linked to different objective data sources including the TAC administrative

claims and payments datasets which allowed a thorough examination of the mechanisms through which social support influenced healthcare service use.

7.3.2 Limitations

Despite the strengths of this research project, the limitations need to be noted. First, by using applied TAC data, the research project was restricted in its measures of social support which could have potentially affected the validity of the research. TAC's definition of social support does not match the definition of social support as defined in the literature. For example, TAC defined social support as "help" from "family", "friends", "neighbours" and "employers" whilst the literature defined social support as "information leading individuals to believe they are cared for and loved, esteemed and valued and belong to a network of communication and mutual obligation".

The literature also incorporates several sub-constructs including perceived support and functional support. The social support measure in the COS were based on a single dimension of social support that was non-standardised. To address this issue, the qualitative study was conducted to gather supplementary information about functional support. A recommendation emerging from this research is that the TAC consider the use of a valid instrument of social support that captures its multi-dimensional components including perceived support, received support, support structure and functional support. Such an instrument would have the capacity to lead to a more complete understanding of the impact of social support on injury outcomes among individuals with MSI.

Second, this research project was limited in its scope of social support, in particular the roles of formal sources of support and ICT including the internet. This research project primarily focused on the role of informal support from significant others, family and friends. The role of formal support from employers and healthcare providers was briefly explored in studies two and four from the perspective of the person who experienced the MSI. However, no interviews were conducted with healthcare providers and employers. Therefore, how healthcare providers and employers viewed their roles in the provision of support and recovery, beyond the provision of informational support is unknown. In addition, the nature of the relationship between informal and formal support and the impact of ICT, including the internet, on the provision of support remains unclear. A social network

analysis (31) of all the connections between formal and informal support and the methods of communication involved in the recovery process is required to understand the reciprocal relationships that exists in the network and the impact this network has on injury outcomes. This provides direction for further research.

Third, the first component of the research project (i.e. study one) included a number of research studies with small numbers of participants, whilst two separate papers used the same sample. Despite care having been taken in interpreting the findings from these papers, the power to detect an association between social support and MSI outcomes may have been limited. This is especially important as small sample sizes are characteristic of the field, largely due to the intensive nature of data collection. Future research ought to include larger samples as to more adequately capture the full demographic and injury recovery spectrum. Future systematic reviews could also address this issue by ensuring that appropriate weights are provided to studies with larger sample sizes and to papers using the same sample.

Fourth, several confounders such as mental health, personality traits and coping styles could have potentially influenced participants' perception of social support as well as their ability and perceived need to seek social support. The analyses conducted in the second component of the research project (i.e. study two) were not adjusted for these factors. Hence, the influence, if any, of these factors on the recovery, and by extension the relationship between social support and MSI outcomes, was not examined. It is unclear whether those with poor recovery required more support because they had poor mental health or whether their poor outcomes were mainly due to the lack of social support, and this remains a key area for future research. Similarly, personality traits and additional coping styles were also not available in the COS. Personality traits may influence the appraisal process and consequently the coping style. For example, empirical evidence has shown that optimistic or individuals with higher level of extroversion are more likely to appraise a stressful situations more positively, be more likely to have a supportive network system and consequently engage in a pro-active coping style such as seeking social support (32). In contrast, more pessimistic or individuals predisposed to higher levels of neuroticism are more likely to appraise a stressful situation as negative and underestimate their ability to deal with the stressor which leads to a passive

coping style (33). Therefore, the TAC could incorporate a measurement of personality traits and coping styles in their administrative claims data in order to identify those at risk of using a maladaptive coping style and in the greatest need of support.

Finally, the sample included in this research project should not be considered to be representative of the population of individuals with MSI. In the second component of the research project (i.e. studies two and three), the participants' response rate for the COS was less than 50%, and it may be the case that non-responders may have different recovery trajectories than those that did respond. The extent of this bias cannot be determined. Further, and largely due to the time constraints of this research project, the sample size in the third component of the research project (i.e. study four) was small and heterogeneous, with the heterogeneity giving some confidence that the findings could be indicative of the relationship between social support and MSI outcomes. In addition, all participants were injured in a transport accident within a jurisdiction that provides no-fault compensation. The research project is therefore unlikely to represent those cases of MSI without access to similar compensation system (e.g. those incurring a MSI via sports, recreations or home). Furthermore, the extent to which these results are applicable to other jurisdictions will need to be considered given the various transport accident compensation schemes in Australia (i.e. hybrid, fault-based, no-fault). Future research is needed to determine the extent to which these findings can be generalised to other jurisdictions, non-compensable transport injury, and to injury that is not transport-related.

Although not considered a direct limitation, this research project was conducted in a western culture country. Therefore, the results of this research project must be interpreted within this cultural lens. The literature suggests variations in how people from different cultural backgrounds may perceive, utilise and be affected by social support (34). For example, in western culture countries, independence is valued over interdependence. In this individualistic culture, people may seek support effortlessly because they share the cultural assumption that individuals make their own decisions and that others have the freedom to choose to help. In contrast, in East Asian culture countries, interdependence is endorsed over independence. People in the collective culture may have difficulties in seeking support because they share the cultural assumption that individuals

should not burden their social networks. In support, past research has found that Asian and Asian Americans were less likely to report drawing on social support for coping with stress than were European Americans (35). Therefore, the findings from this research project may not be generalisable to non-westernised culture countries given variations in cultural norms and social values.

7.4 Future research directions

To further our understanding of the role of perceived social support in recovery from MSI, future research could consider the study design, methodological approaches, additional potential sources of social support (beyond informal sources of support), assess how perceived social support interacts with various biomedical and psychosocial factors known to influence injury recovery the effects of ICT on the perception of social support. These future research directions are discussed in greater detail below.

First, longitudinal studies and life course perspective are necessary in order to separate the causal pathways between social support and recovery. The majority of the literature suggests that social support facilitates recovery (36-39), but it is also possible that poor recovery leads to a deterioration in social support (reverse causality). To date, the causal pathway is generally assumed to run unidirectionally from social support to health. Although study two provided insights into the role of social support and MSI outcomes, the cross-sectional design of the study limited the interpretation of the nature of the relationship between social support and MSI outcomes. Longitudinal studies would allow for a thorough testing of reverse causality via the monitoring of change in social support over the course of the injured person's recovery. In addition, incorporating multiple qualitative perspectives in the longitudinal studies would enable assessment of social support from multiple members of the social network at different time points and the effects this has on MSI outcomes.

Second, future research is required to understand if healthcare providers may be used to provide some aspect of social support beyond informational support for those with limited or no social support. Study four demonstrated that a number of participants reported relying on healthcare providers for informational support throughout their recovery, particularly those who did not have

access to informal support. In support of this finding, past research has shown that patients expected more social support from healthcare providers in an effort to cope with related stress and negative emotions experienced (40). Other research has also found that support provided by healthcare providers had a greater impact on managing the negative emotions of patients as compared to the social support provided by family and friends (40). Beyond informational support, healthcare providers may consider placing greater emphasis on providing emotional support to reduce or eliminate negative emotions in their patients as an added role responsibility. Future studies could assess the impact of providing these additional activities (e.g. emotional support) by healthcare providers. Future studies could also examine whether healthcare providers' support complements or undermines the perceived support provided by family and friends. If healthcare providers' support indeed complements informal support, further research will be required to determine the optimal balance between formal and informal support and what potential impact this has on recovery.

Third, social support is only one of many psychosocial factors in the recovery of MSI. It is recognised that a wide range of other psychosocial factors (e.g. psychological distress, recovery expectations), as well as biomedical factors (e.g. type of injury, severity of injury) influence MSI recovery (41-43). Although studies two and three accounted for a number of demographics and injury-related factors in the analyses, future studies could examine how social support in addition to biomedical and psychosocial factors interact to influence recovery. By assessing a range of factors that have the potential to influence recovery, quantification of the amount of variance accounted by each of the factors will allow a more targeted approach to intervention design. That is, prioritisation of recovery-related factors by healthcare providers and for interventions to be designed accordingly by researchers.

Fourth, although this research project did not specifically examine the impact of online social support on MSI outcomes, given the widespread use of ICT such as smart mobile phones, social networking sites (e.g. Facebook), video conferencing (e.g. Skype) and social media for socialising and the development or maintenance of relationships, future research could explore the impacts of ICT on interpersonal relationships and the perception of social support. ICT can potentially facilitate the perception and provision of social support, particularly emotional and informational support for

those with limited support. For example, past research has found that Facebook users have closer, more trustworthy and supportive relationships than the average American (44). The number of Facebook friends was also found to be positively associated with perceived social support, which in turn leads to reduced stress and increased life satisfaction (45). Further research is needed to assess the quality and benefits of perceived social support online.

7.5 Conclusions

This research project has highlighted the importance of the role of perceived social support as a coping resource in supporting recovery from compensable MSI. In particular, the findings contribute to the injury outcomes literature by identifying which social support characteristics and sources of support were either positively or negatively associated with MSI outcomes and the uptake of healthcare services. The findings also identified a number of facilitators and barriers to providing and receiving social support for injured persons such as the strength of the relationship and feelings of burden from the perspective of the injured person and their informal social network. This research project has several primary and tertiary prevention implications: the potential of social support as a prevention resource and coping mechanism when dealing with injury, the collection of socio-demographic information during the screening protocol to identify those at the greatest risk of poor support, the development of informal and formal support interventions for those who lack support, and the provision of support for family members, significant others and friends.

The major strength of this research project lay in its use of a mixed methods research design and secondary data analyses. Limitations regarding the measurement of social support, limited scope to address multiple sources of support, and the lack of information on personality traits and coping styles could have potentially affected the validity and the generalisability of the research. However, these limitations provide avenues for possible future research directions including the use of a validated social support measure within future longitudinal study design to identify phase-support needs, and to consider the potential roles of formal sources of support (i.e. healthcare providers) and technology (i.e. the internet) in providing support for injured persons. Whilst recognising the limitations of this research project, the findings and the recommendations provided underscore the importance of social support in recovery from compensable MSI.

7.6 References

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Appendices

Appendix A Ethics approval



Khic-Houy Prang <khic-houy.prang@monash.edu>

Fwd: MUHREC - Amendment - CF09/2655 - 2009001538 - Transport Accident Compensation Outcomes Study - stage 2

4 messages

From: MRO Human Ethics Team <muhrec@monash.edu>
Date: 4 September 2013 2:01:03 PM AEST
To: Alex Collie <alex.collie@monash.edu>
Subject: **MUHREC - Amendment - CF09/2655 - 2009001538 - Transport Accident Compensation Outcomes Study - stage 2**

PLEASE NOTE: To ensure speedy turnaround time, this correspondence is being sent by email only. MUHREC will endeavour to copy all investigators on correspondence relating to this project, but it is the responsibility of the first-named investigator to ensure that their co-investigators are aware of the content of the correspondence.

Dear Researchers

Thank you for submitting a Request for Amendment to the above named project.

This is to advise that the following amendments have been approved:

- Add new co-investigators - Dr Sharon Newnam and Dr Janneke Berecki-Gisolf
- Add new student researcher Ms Khic-Houy Prang

Please forward an annual report to comply with the Terms of Approval.

Thank you for keeping the Committee informed.

Professor Nip Thomson
Chair, MUHREC

Human Ethics
Monash Research Office

Our aim is exceptional service

Monash University
Level 1, Building 3e, Clayton Campus
Wellington Rd
Clayton VIC 3800, Australia

Telephone: +61 3 9905 5490
Email: muhrec@monash.edu
Website: <http://www.monash.edu.au/researchoffice/human>
ABN 12 377 614 012 CRICOS Provider No 00008C



MONASH University

Monash University Human Research Ethics Committee (MUHREC)
Research Office

25 November 2015

Dear Researchers

Project Number: CF15/4298 - 2015001843

Project Title: The influence of social support on healthcare service use following transport-related musculoskeletal injury

Chief Investigator: Dr Janneke Berecki-Gisolf

The above application has been reviewed by the Chairs of the Monash University Human Research Ethics Committee (MUHREC) who determined that the proposal satisfies section 5.1.22 of the National Statement on Ethical Conduct in Human Research.

Therefore, the Committee has granted an exemption from ethical review for the research as described in your proposal.

Thank you for your assistance.

Professor Nip Thomson
Chair, MUHREC

cc: Ms Khic-Houy Prang, Dr Sharon Newnam

Monash University, Room 111, Chancellery Building E
24 Sports Walk, Clayton Campus, Wellington Rd
Clayton VIC 3800, Australia
Telephone: +61 3 9905 5490 Facsimile: +61 3 9905 3831
Email: muhrec@monash.edu <http://intranet.monash.edu.au/researchadmin/human/index.php>
ABN 12 377 614 012 CRICOS Provider #00008C



Human Ethics Certificate of Approval

This is to certify that the project below was considered by the Monash University Human Research Ethics Committee. The Committee was satisfied that the proposal meets the requirements of the *National Statement on Ethical Conduct in Human Research* and has granted approval.

Project Number: CF14/2232 - 2014001193
Project Title: The role of perceived social support in recovery from musculoskeletal injury
Chief Investigator: Dr Sharon Newnam
Approved: **From:** 1 September 2014 **To:** 1 September 2019

Terms of approval - Failure to comply with the terms below is in breach of your approval and the Australian Code for the Responsible Conduct of Research.

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, before any data collection can occur at the specified organisation.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must include your project number.
6. **Amendments to the approved project (including changes in personnel):** Require the submission of a Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

Professor Nip Thomson
Chair, MUHREC

cc: Dr Janneke Berecki-Gisolf, Ms Khic-houy Prang



MONASH University

EXPLANATORY STATEMENT

Group 1: Person with musculoskeletal injury

Project: The role of perceived social support in recovery from musculoskeletal injury

Dr. Sharon Newnam

Monash Injury Research Institute

Phone: 9905 4370

email: sharon.newnam@monash.edu

Ms. Khic-Houy Prang

Monash Injury Research Institute

Phone : 99020362

email: khic-houy.prang@monash.edu

My name is Khic-Houy Prang and I am conducting a research project under the supervision of Dr. Sharon Newnam, a Senior Research Fellow at the Monash Injury Research Institute, towards a PhD at Monash University.

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?

The study aims to investigate the relationship between social support and recovery from musculoskeletal injury. The study involves you participating in a semi-structured interview which will be audio taped and transcribed. You will be asked a range of questions that relate to your recovery and social support network. The interview questions are designed to draw out your opinions and there are no right or wrong answers. The interview will take about one hour to complete and will take place at a location that is convenient to you and the interviewer. At the end of the interview, you will be asked to pass the explanatory statement group 2 to a family member/friend for participation in the study. A reminder call or email letter (depending on your preference) will be made to you to remind you to pass the study explanatory statement to a family member/friend.

Why were you chosen for this research?

You have been asked to take part in this study because:

- You have been identified as having sustained a musculoskeletal injury from a transport accident
- You have previously agreed to be contacted by the TAC to participate in research

Consenting to participate in the project and withdrawing from the research

Your participation in this project is voluntary and you are under no obligation to consent to participate. If you do agree to participate, you will be asked to give your consent by signing a consent form prior to taking part in the interview. You can withdraw from the research at any time during the study without comment or penalty. Your participation or refusal in this study will in no way affect your current or future relationship with the TAC.

Possible benefits and risks to participants

There are no direct benefits of participation in this study. However, the responses given in the interview have the potential to improve health outcomes for those who have sustained a compensable musculoskeletal injury. No physical or psychological harm or discomfort is foreseen in participating in this study. However, if you do experience any distress or discomfort answering any of the questions, you can refrain from responding at any time.

Services on offer if adversely affected

In the unexpected event that you experience discomfort, the following support services are freely available:

Road Trauma Support Team
www.rtssv.org.au
Tel: 1300 367 797

Lifeline
www.lifeline.org.au
Tel: 13 11 14

The Injured Workers Support Network
www.injuredworkerssupport.org.au
Tel: (02) 9749 7566

Payment

If you choose to participate in this study, you will receive a \$25 payment to reimburse you for your time and travel costs.

Confidentiality

All information collected about you during the course of the research will be kept strictly confidential. A report of the study may be submitted for publication from the study's findings, but individual participants or any identifying information will not be reported.

Storage of data

Data collected during the research will be stored in accordance with Monash University regulations, kept on University premises, in a locked filing cabinet for 5 years. Only my supervisor and I will have access to it.

Results

If you would like to be informed of the research findings, please contact Khic-Houy Prang on 9902 0362 or khic-houy.prang@monash.edu.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the

Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

Tel: +61 3 9905 2052 Email: muhrec@monash.edu Fax: +61 3 9905
3831

Thank you,



Dr. Sharon Newnam



Ms. Khic-Houy Prang



EXPLANATORY STATEMENT

Group 2: Family member/friend

Project: The role of perceived social support in recovery from musculoskeletal injury

Dr. Sharon Newnam

Monash Injury Research Institute

Phone: 9905 4370

email: sharon.newnam@monash.edu

Ms. Khic-Houy Prang

Monash Injury Research Institute

Phone : 99020362

email: khic-houy.prang@monash.edu

My name is Khic-Houy Prang and I am conducting a research project under the supervision of Dr. Sharon Newnam, a Senior Research Fellow at the Monash Injury Research Institute, towards a PhD at Monash University.

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?

The study aims to investigate the relationship between social support and recovery from musculoskeletal injury. The study involves you participating in a semi-structured interview which will be audio taped and transcribed. You will be asked a range of questions that relate to your interactions with the person who sustained an injury. The interview questions are designed to draw out your opinions and there are no right or wrong answers. The interview will take about one hour to complete and will take place at a location that is convenient to you and the interviewer. If you are interested in participating in this study, please consent to your contact details (name and telephone number) to be passed on via the person who sustained an injury to the Monash research team. A Monash research team member will call you to organise an interview time.

Why were you chosen for this research?

You have been asked to take part in this study because:

- You have been identified by a person who sustained an injury as someone who played a role over the course of their recovery

Consenting to participate in the project and withdrawing from the research

Your participation in this project is voluntary and you are under no obligation to consent to participate. If you do agree to participate, you will be asked to give your consent by signing a consent form prior to taking part in the interview. You can withdraw from the research at any time during the study without comment or penalty. Your participation or refusal in this study will in no way affect the current or future relationship of the person who sustained an injury with the TAC.

Possible benefits and risks to participants

There are no direct benefits of participation in this study. However, the responses given in the interview have the potential to improve health outcomes for those who have sustained a

compensable musculoskeletal injury. No physical or psychological harm or discomfort is foreseen in participating in this study. However, if you do experience any distress or discomfort answering any of the questions, you can refrain from responding at any time.

Services on offer if adversely affected

In the unexpected event that you experience discomfort, the following support services are freely available:

Road Trauma Support Team

www.rtssv.org.au

Tel: 1300 367 797

Lifeline

www.lifeline.org.au

Tel: 13 11 14

The Injured Workers Support Network

www.injuredworkerssupport.org.au

Tel: (02) 9749 7566

Payment

If you choose to participate in this study, you will receive a \$25 payment to reimburse you for your time and travel costs.

Confidentiality

All information collected about you during the course of the research will be kept strictly confidential. A report of the study may be submitted for publication from the study's findings, but individual participants or any identifying information will not be reported.

Storage of data

Data collected during the research will be stored in accordance with Monash University regulations, kept on University premises, in a locked filing cabinet for 5 years. Only my supervisor and I will have access to it.

Results

If you would like to be informed of the research findings, please contact Khic-Houy Prang on 9902 0362 or khic-houy.prang@monash.edu.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the

Executive Officer, Monash University Human Research Ethics (MUHREC):

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Room 111, Building 3e
Research Office
Monash University VIC 3800

Tel: +61 3 9905 2052 Email: muhrec@monash.edu Fax: +61 3 9905 3831

Thank you,



Dr. Sharon Newnam



Ms. Khic-Houy Prang

CONSENT FORM

Group 1: Person with musculoskeletal injury

Project: The role of perceived social support in recovery from musculoskeletal injury

Chief Investigator: Dr. Sharon Newnam

Student researcher: Ms. Khic-Houy Prang

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
Taking part in a 1 hour interview	<input type="checkbox"/>	<input type="checkbox"/>
Audio recording during the interview	<input type="checkbox"/>	<input type="checkbox"/>

Name of Participant _____

Participant Signature _____ Date _____

CONSENT FORM

Group 2: Family member/friend

Project: The role of perceived social support in recovery from musculoskeletal injury

Chief Investigator: Dr. Sharon Newnam

Student researcher: Ms. Khic-Houy Prang

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
Taking part in a 1 hour interview	<input type="checkbox"/>	<input type="checkbox"/>
Audio recording during the interview	<input type="checkbox"/>	<input type="checkbox"/>

Name of Participant _____

Participant Signature _____ Date _____

Appendix C Proof of submission



Khic-Houy Prang <khic-houy.prang@monash.edu>

Disability and Rehabilitation - Manuscript ID TIDS-05-2016-077

2 messages

davemuller01@btinternet.com <davemuller01@btinternet.com>

19 May 2016 at 13:11

To: khic-houy.prang@monash.edu

Cc: khic-houy.prang@monash.edu, sharon.newnam@monash.edu, janneke.berecki-gisolf@monash.edu

18-May-2016

Dear Dr Prang:

Your manuscript entitled ""That's what you do for people you love": A qualitative study of social support and recovery from a musculoskeletal injury" has been successfully submitted online and is presently being given full consideration for publication in Disability and Rehabilitation.

Your manuscript ID is TIDS-05-2016-077.

Please mention the above manuscript ID in all future correspondence or when calling the office for questions. If there are any changes in your street address or e-mail address, please log in to Manuscript Central at <https://mc.manuscriptcentral.com/dandr> and edit your user information as appropriate.

You can also view the status of your manuscript at any time by checking your Author Centre after logging in to <https://mc.manuscriptcentral.com/dandr>.

Thank you for submitting your manuscript to Disability and Rehabilitation.

Sincerely,
Disability and Rehabilitation Editorial Office

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<http://informahealthcare.com/alerts>