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META REVIEW

Barriers and Facilitators Associated with Return to Work Following Minor to Serious Road Traffic Musculoskeletal Injuries: A Systematic Review

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Abstract

Purpose To identify factors impeding or facilitating Return to Work (RTW) after minor to serious musculoskeletal Road Traffic Injuries (RTI). *Methods* Six electronic databases were searched for studies published 1997–2020. Quantitative and qualitative studies were included if they investigated barriers or facilitators associated with RTW in people with minor to serious musculoskeletal RTI aged over 16 years. Methodological quality was assessed using McMaster Critical Review Form for Quantitative studies and McMaster Critical Review Form for Qualitative Studies. Results are presented narratively as meta-analysis was not possible. *Results* Eleven studies (10 quantitative and 1 qualitative) were included. There was strong evidence that individuals with higher overall scores on the (short-form or long-form) Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) at baseline were less likely to RTW, and individuals with higher RTW expectancies at baseline were more likely to RTW after musculoskeletal RTI. There was weak evidence for higher disability levels and psychiatric history impeding RTW after musculoskeletal RTI. *Conclusions* Post-injury scores on the ÖMPQ and RTW expectancies are the most influential factors for RTW after minor to serious musculoskeletal RTI. There is a need to identify consistent measures of RTW to facilitate comparisons between studies.

Keywords Return to work · Traffic accidents · Disability · Trauma

Introduction

Road Traffic Injuries (RTI) are a serious public health issue globally [1]. Minor to serious musculoskeletal injuries are the most common type of RTI [2, 3]. The Abbreviation Injury Scale defines severity of injury on a six-point scale; minor to serious musculoskeletal injuries fall under levels 1 (minor) to 3 (serious) [4], and include injuries such as muscular strains, joint sprains, whiplash, fractures and soft tissue contusions [5]. Recovery from these injuries can place a significant burden on society. In Australia, the number of people hospitalised following RTI has increased annually by 16% between 2010 and 2017, from 32,981 to 39,205. Indeed, RTI in 2016 accounted for the greatest proportion of total road crash costs at AU$13.58 billion [6, 7]. These injuries also impose an emotional and physical cost to the injured individual and their family. Individuals with RTI may experience pain and distress imposed by a complex compensation system, and concerns about job security and future employability [8–13]. Therefore, any disability arising from RTI is not only a health issue but may impact participation in social activities and working life.

Injuries resulting from road traffic accidents can have a significant impact on employment. In an Australian study, 18% of people with minor to moderate musculoskeletal RTI did not Return To Work (RTW) two years following their crash and 50% of those who had RTW were not in sustained employment throughout the two-year period [14].

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Unemployment is associated with higher levels of stress, anxiety, chronic diseases, and premature mortality whereas RTW can preserve pre-injury skills, improve an individual's sense of self-efficacy and confidence, and decrease reliance on society [15, 16]. Thus, it is important to consider work outcomes after a RTI. The importance of work after RTI was recently confirmed when 85% of insurers, clinicians, patients, and researchers (n = 223) participating in a Delphi study, agreed that work is a critical outcome measure for assessing recovery after whiplash injuries (a common form of RTI) [17]. Using RTW as a goal in rehabilitation after RTI should be part of routine clinical practice, and would be facilitated by a better understanding of the factors impeding or facilitating RTW after musculoskeletal RTI.

Several individual, physical, and psychological factors have been identified as barriers and facilitators to RTW after musculoskeletal RTI, though with limited consistency in the empirical literature. For instance, heightened level of pain has been identified as a barrier to RTW. While some studies identified a negative association between greater pain and successful RTW following musculoskeletal RTI [18, 19], others with similar sample size and injury severity, did not [12, 18]. These discrepancies could be explained by the use of different tools to assess pain (e.g. visual analogue scale (VAS) and pain domain of the Örebro Musculoskeletal Pain Questionnaire (ÖMPQ). Similarly, several studies have found lower education [14, 20], and a higher degree of manual labour [20, 21] may impede RTW, while others have not found evidence of such an impact [14, 19, 22]. These inconsistencies might be attributed to differences in the definition of the RTW outcome. Some studies defined RTW as returning to paid work at the same capacity prior to the injury [14, 22], whereas others defined it as working full-time or part-time after injury [19]. There appears to be no established or consistent definition of RTW [23]. These dissimilarities in RTW definition reduce the generalisability of findings and the usability of results in developing evidence-based strategies for the management of RTW after a RTI. The inconsistencies in research describing the barriers and facilitators to RTW, along with the inconsistencies in RTW definition suggests that there is a need to review relevant studies in a systematic way to reach a clear and in-depth understanding of factors impeding or facilitating RTW after musculoskeletal RTI.

To the best of our knowledge, a systematic approach to understanding RTW barriers and facilitators for people with musculoskeletal RTI has not been conducted. A recent systematic review by Samoborec et al. [24] evaluated biopsychosocial factors associated with non-recovery after minor RTI. The primary focus of that review was on recovery with RTW included only as one of the outcome measures used to define recovery along with other measures such as quality of life and pain catastrophizing. Given the pivotal role of RTW for individuals and society, it is important to review factors impeding or facilitating RTW. Furthermore, as minor to serious musculoskeletal injuries constitute the greatest proportion of RTI to better understand the factors impacting RTW, there is a need to review the literature to include a broader range of RTI. Therefore, the objective of this systematic review was to identify factors impeding or facilitating RTW in individuals with minor to serious musculoskeletal RTI.

Materials and Methods

Search Methods

The modified PEO framework (population, exposure (independent variables), and outcome (dependent variables)) was used to develop the study question [25] within this systematic review. A literature search was undertaken by the first author of six online healthcare databases, including PubMed, Web of Science, EMBASE, Cochrane Library, CINAHL, and Scopus in November 2018 and updated in December 2020. In addition, the reference lists of the relevant Cochrane reviews and included full texts were searched for studies that met the inclusion criteria. The initial search strategy was developed in PubMed and then adapted to other databases with the assistance of an expert librarian. The search strategy included search terms previously utilised in relevant studies as well as MeSH/Emtree terms and was formulated based on the population (RTI) and outcome (RTW) variables. The search strategy is included in Online Appendix 1.

Inclusion and Exclusion Criteria

This review included papers that reported on barriers and facilitators associated with RTW after minor to serious musculoskeletal RTI. Facilitators are defined as factors that improve RTW via their absence or presence. Barriers, on the other hand, are factors that impede a successful RTW outcome. Studies were included if they met the following criteria:

- Participants aged over 16 years
- Recruited people with minor to serious musculoskeletal RTI (based on the Abbreviated Injury Scale (AIS) score < 3 [26], or the paper's inclusion of "minor to serious injury" (eg; soft tissue contusion, whiplash grade I-III, fractures)
- Investigated barriers and facilitators associated with RTW
- Reported RTW as a dichotomous outcome of work i.e. working versus not working

- Published in English in peer-reviewed journals from 1997 to 2020

The decision to use restrict time of publication was based on the view that some of the main policy modifications related to RTW issues in particular after RTI have been implemented in the last two decades. Studies that had utilised either qualitative methodology (e.g. interviews, focus groups, conversation, and narrative analysis) or quantitative methodology (e.g. cohort, case–control, cross-sectional) were eligible for inclusion. Interventional, experimental, and case studies were excluded. The dichotomous outcome of work status was considered as a RTW outcome in this review to facilitate comparison between studies. RTW was defined as working full-time or part-time after injury. Therefore, studies were excluded if they used other outcomes such at sick leave days or disability duration. Also, studies were excluded if they reported the effect of RTW on other variables (e.g. PTSD), or investigated the impact of a specific intervention on RTW. Studies with a mixed population of RTI (i.e. not just musculoskeletal RTI or mild to serious RTI) were excluded if the reported results were not presented separately. Studies were also excluded if they recruited people with severe and catastrophic injuries (eg; spinal cord injury, amputees, and extensive burns).

Selection of Studies

After removal of duplicates, selection of relevant studies was conducted in two stages using Covidence software [27]: (i) Title and abstract screening; and (ii) Full-Text screening. Both title and abstract screening and full text review were conducted independently by two reviewers (MA, HZ). At the end of each stage, any discrepancies were discussed initially between the reviewers, and if a consensus was not reached, the third reviewer (VJ) was consulted.

Protocol and Registration

The systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-P) guidelines [28]. The protocol was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) on 5 February 2018 (registration number CRD42018084638) and updated on 12 March 2021.

Data Extraction

Data extraction was conducted independently by two authors (MA, HZ). Five domains of data were considered for data extraction, including identification information, study methods, population, barriers and facilitators (independent variables), and outcomes (dependent variables) (Online Appendix 2 and Appendix 3).

Quality Appraisal

Two reviewers (MA, HZ) independently conducted the quality assessment of included papers and disagreements were resolved by discussion and consultation with other authors (EG, TA, VJ). The methodological quality of quantitative papers was assessed using McMaster Critical Review Form for Quantitative Studies [29]. This appraisal tool has been widely used in previous systematic reviews [30–34]. The tool was selected because of its applicability to the study designs of interest in this review (cohort and cross-sectional) and its good inter-rater reliability [33, 35]. The tool assessed 16 items of methodological quality relating to study purpose, literature review, design, sampling, outcome measures, methods, analysis, and conclusions. The tool asked users to grade each criterion by a dichotomous (Yes/No) answer. As dichotomous responses did not provide numerical summation, for ease of ranking the papers, previous reviews have formulated a scoring system [30, 35, 36]. A score of one point was awarded if a criterion was addressed appropriately, and zero score if the criterion was not reported, or achieved inadequately. Upon calculation of quality scores as per previous studies, they were divided into five categories of poor (score < 8), fair (score = 9–10), good (score = 11–12), very good (score = 13–14) and excellent (score = 15–16) [30, 35, 36]. The tool includes a criterion appraising the validity and reliability of the outcome of interest. As there are no reliable and valid tools to measure the RTW outcome in this study, this question was tailored to assess whether the method used for measuring RTW was clearly defined in the included paper.

The quality of qualitative papers was assessed using McMaster Critical Review Form for Qualitative Studies [37]. The tool consists of 22 questions under headings of: study purpose, literature, study design, sampling, data collection, data analysis, trustworthiness, and conclusion and implications. The qualitative papers were scored out of 22, with the same method applied for scoring quantitative papers.

Determining Levels of Evidence

The longitudinal studies (Cohort and case control) were classified into a 3-phase framework to examine the strength of the evidence as used in previous research [38]:

Phase I (exploratory): only descriptive associations between potential prognostic factors and RTW were reported.

Phase II (exploratory): Comparison, stratified, and/or multivariable analyses were used to explore sets of prognostic factors.

Phase III (confirmatory): a specific hypothesis was tested to confirm/disconfirm an independent association between a prognostic factor and RTW, while indicating and controlling for confounding variables.

The level of evidence for all identified barriers and facilitators (in both quantitative and qualitative studies) was determined based on the criteria used in previous studies [39–41].

The data was synthesised into four evidence levels:

(1) Absent: if there was only one study available;
(2) Weak evidence: if two studies identified a significant association in the same direction (either a positive, negative or no association), or if two out of three available studies found a significant association in the same direction and the other identified no significant association;
(3) Strong evidence: if three studies identified a significant association in the same direction (either a positive, negative or no association), or if four or more studies were available, at least 75% ascertained a significant association in the same direction.
(4) Inconsistent evidence: In all other circumstances, evidence was inconsistent.

Results

Literature Search and Study Selection

The search strategy identified 21,469 citations from the search of electronic databases. Searching the reference lists of the Cochrane review articles added three further relevant articles to the imported citations. After removing duplicates, 12,480 titles and abstracts were screened for eligibility, and 267 studies were taken to full-text screening. Subsequently, 10 quantitative studies and 1 qualitative study were included for final analysis (see Fig. 1). There was 100% agreement between the 2 reviewers regarding the 11 papers included in this systematic review.

Methodological Quality Assessment

There was agreement between the two researchers with regards to scoring of the methodical quality in all but one study. The quality of quantitative studies ranged from 10 to 14, representing "fair" to "very good" methodological quality (see Online Appendix 4 [29]). Therefore, no papers were rated either as poor or excellent. Of the 10 included studies, seven papers were very good in quality [14, 18–20, 22, 42, 43], two papers were good [44, 45] and one paper was fair [21]. The quality of the one qualitative paper which met the inclusion criteria was rated as 18 out of 22 [46]. This narrative synthesis is based on all included papers irrespective of the methodological quality score.

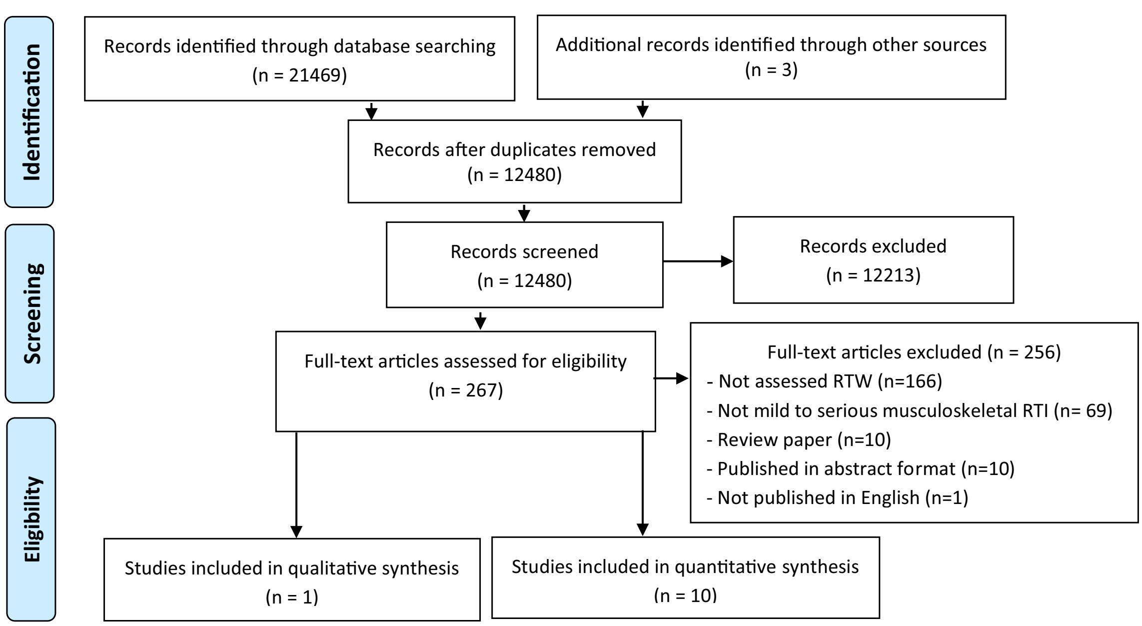

Fig. 1 Retrieval and review process

All quantitative studies included had at least one of the biases, in particular participant selection and recall biases. RTW was not defined in one paper [18] and one study provided insufficient information of the sample characteristics [21]. One study failed to present ethical/consent clearance [21] and the drop-out rate was not reported in two of the included cohort studies [43, 45]. Study implications were not presented in one paper [21] and study limitations were not presented in one paper [22]. Appendix 5 presents details of the criteria met by the qualitative study. This study did not report information regarding study design, procedural rigor, credibility, and confirmability [46].

Data Extraction

Study characteristics of the quantitative studies are presented in Table 1. Of the 10 included studies that explored factors associated with RTW following mild to serious musculoskeletal RTI, the majority were cohort in design (1 retrospective and 8 prospective) and one cross-sectional.

The studies were conducted in Australia (n = 5), UK (n = 2), Canada (n = 2), and Denmark (n = 1). Follow-up times varied from 28 days to 3 years after injury. Pooling of quantitative data for meta-analysis were not possible because RTW as the outcome of interest had not been defined and/or measured in a consistent way. Two studies defined RTW as returning to paid work at the same level prior to the injury [14, 45]. One study defined RTW as working fulltime or part-time after injury [19]. One study defined it as returning successfully to work and maintaining it at 3 months [20] and two studies at one year [42, 43]. Three studies defined RTW as returning to work in full capacity [22], returning to usual work [44] or full working activity [21]. One study did not provide any definitions for RTW outcome [18].

The qualitative study aimed to describe women's experiences of living with whiplash in Sweden. In-depth interviews were conducted with 7 women recruited from a rehabilitation clinic [46]. The data was analysed using inductive approach and qualitative content analysis. Having pain and a physically demanding job were identified as the factors associated with RTW.

Evidence Synthesis

The 10 quantitative studies and one qualitative study were used to determine the level of evidence for factors associated with RTW. From these studies, 45 factors were identified and classified as barriers and facilitators to RTW (Table 2).

Pre-injury Factors

Demographic Factors

Gender Three studies explored the impact of gender on RTW outcome and none of these studies found a significant relationship [14, 21, 22]. Therefore, there is strong evidence that there is no association between gender and RTW.

Age Five studies explored the impact of age on RTW outcome after musculoskeletal RTI [14, 19–22]. One study found a positive association between younger age and RTW [20], however, four studies did not find an association [14, 19, 21, 22]. Therefore, there is strong evidence that there is no association between age and RTW post musculoskeletal RTI.

Marital Status Three studies investigated the impact of marital status on RTW outcome following a musculoskeletal RTI [14, 20, 22]. While two studies did not find any association [14, 22], one study reported that those who were widowed, separated, or divorced were less likely to RTW compared to those who were in a relationship or never married [20]. Therefore, there is inconsistent evidence of an association between marital status and RTW outcome.

Education Level Four studies investigated the impact of education level on RTW outcome [14, 19, 20, 22]. Two studies found positive associations between higher level of education and RTW [14, 20], however, two studies found no association [19, 22]. Therefore, there is inconsistent evidence that a higher level of education can result in better RTW outcome.

Type of Occupation According to the study conducted by Gozzard et al. [21], heavy manual workers were less likely to RTW after musculoskeletal RTI compared with clerical workers and light manual workers. In addition, Prang et al. [20] reported that those who were employed as professionals were more likely to achieve RTW in comparison to non-professional employees. The data that emerged from the qualitative study by Juuso et al. [46] also showed that having a physically demanding job can prevent people from RTW. However, three studies did not report a significant association between the type of occupation and RTW [14, 22, 42]. Therefore, evidence is inconsistent for an association of occupation type and RTW status following musculoskeletal RTI.

Health-Related Factors

Psychiatric History

A weak level of evidence was provided by two studies [19, 21] which both reported a negative association between previous history of psychological illness and RTW.

Table 1 Quantitative studies' characteristics (First author is presented)

Author, Year country	Study Design/size	Analysis	Study setting	Type/severity of injury	Follow up	RTW definition	Findings (significant factors)
Carriere [43] 2015, Canada	Prospective cohort /154	Exploratory, Phase 2	Physiotherapy clinics	Whiplash grades I-II	1 year	Returning to work and maintaining the work at 1-year follow-up	People with lower RTW expectancies, higher pain catastrophizing and fear of movement were less likely to RTW
Carriere [42] 2017, Canada	Prospective cohort /152	Exploratory, Phase 2	Rehabilitation clinics	Whiplash grades I-II	4 weeks -1 year	Returning to work and maintaining the work at 1-year follow-up	Persons who reported higher perceived injustice and lower RTW expectancies were less likely to RTW
Gopinath[14] 2015, Australia	Prospective cohort /170	Confirmatory, Phase 3	ID*	Mild/moderate MSI	25 to 92 days, 12 and 24 months	Returning to pre-injury paid work	Being admitted to hospital, having pre-injury chronic illness, lower SF-12 MCS and PCS score, lower EQ-5D scores, higher ÖMPSQ score, BMI > 25 kg/m2, and lower education level were negatively associated with RTW
Geldman [44] 2008, UK	Prospective cohort /102	Exploratory, Phase 1	Police department	Whiplash grades I—III	3,6 months	Returning to the usual work	People with higher fitness level were more likely to RTW
Gozzard [21] 2001, UK	Retrospective/586	Exploratory, Phase 2	Medico-legal reports	Whiplash grades I-III	1996–1999	Returning to full working activity	Previous history of psychological illness or anxiety, heavy manual work, neurological symptoms or signs and higher grade of disability were negatively associated with RTW
Gun [18] 2005, Australia	Prospective cohort /147	Confirmatory, Phase 3	ED* and practices	Whiplash grades I-III	6 weeks, 1 year	No definition was provided	Consulting a lawyer and higher SF36 (bodily pain scale) score was associated with higher RTW

Table 1 (continued)

Author, Year country	Study Design/size	Analysis	Study setting	Type/severity of injury	Follow up	RTW definition	Findings (significant factors)
Heron-Delaney [19] 2017, Australia	Prospective cohort /194	Confirmatory, Phase 3	ID*	Minor/moderate MSI	6 months -2 years	Working fulltime or part-time after injury	Being the driver or passenger, having a prior psychiatric diagnosis, high disability level, low mental or physical quality of life, high pain, low function, high expectations of pain persistency, low expectations about RTW, having a psychiatric diagnosis, and elevated depression or anxiety were negatively associated with RTW
Kasch [22] 2019, Denmark	Prospective cohort /143	Exploratory, Phase 2	ED*	Whiplash grades I-III	1 week,6 months, 1 year	Returning to work in the same capacity as before whiplash injury	Persons with higher RHFUQ scores, neck pain, global pain, and PCS symptom score at baseline and 6 months were less likely to RTW
Nguyen [45] 2019, Australia	Prospective cohort/498	Phase 3	ED*	Non-fracture MSI	28 days,6 months	Returning to paid-work at the same level prior to the injury	Persons with ÖMPSQ scores higher than 50 at baseline were less likely to RTW at 6 months
Prang [20] 2015, Australia	Cross sectional/1649	Confirmatory, Phase 2	ID*	minor to moderate MSI	2010–2011	Returning to work for 3 months or more	Younger age, higher educational level, holding higher professional occupation, higher income, Injury types (dislocation vs others), support from employer were positively associated with RTW, whereas being widowed, separated, or divorced was negatively associated with RTW

Table 1 (continued)

ED Emergency Department, *ID* Insurance Databases, *RTW* return to work, *ÖMPSQ* Örebro Musculoskeletal Pain Screening Questionnaire, *RHFUQ* Rivermead Head Injury Follow-Up Questionnaire, *PCS* Post-Concussion Syndrome, *SF* Short Form, *MCS* Mental Component Summary, *PCS* Physical Component Summary, *EQ-5D* European Quality of Life-5 Dimensions, *MSI* Musculoskeletal Injuries

Pre-Injury Health

One study reported a positive association between better pre-injury health and post-injury RTW; however, one study did not find no association [14, 20]. Pre-injury health status in both studies was assessed using a five-point Likert scale (excellent, very good, good, fair, or poor). Therefore, there is inconsistent evidence that better pre-injury health is associated with a positive RTW outcome.

Post-Injury Factors

Physical Health-Related Factors

ÖMPQ Score Three studies examined differences in RTW following musculoskeletal RTI using the ÖMPQ. Heron-Delaney et al. [19] used the original questionnaire with 25 questions. Two other studies used the 10-item short-form as a screening tool [14, 45]. A higher cumulative score in both forms of the questionnaire indicates higher levels of risk. Through these studies, strong evidence was found that those with higher scores on the ÖMPQ were less likely to RTW following musculoskeletal RTI.

Disability Level Heron-Delaney et al. [19] examined the association between disability level and RTW following musculoskeletal RTI using the World Health Organization Disability Assessment Schedule II finding that a higher level of disability is negatively associated with RTW. Gozzard et al. [21] assessed the grade of disability according to the Gargan and Bannister grade, finding that all patients who did not RTW had a higher grade of disability. Therefore, there is weak evidence that a higher level of disability following musculoskeletal RTI can result in a worse RTW outcome.

Severity of Injury Two studies investigated the impact of the severity of injury on RTW [14, 19]. Gopinath et al. [14] found no association between RTI measured by the New Injury Severity Score (NISS) and RTW. Similarly, Heron-Delaney et al. [19] did not identify a significant association between the severity of injury measured by Injury Severity Scale (ISS) and RTW. Therefore, weak evidence is available for an association between injury severity and RTW.

Hospital Admission Gopinath et al. [14] found that staying in hospital for one night or more decreased the likelihood of RTW by 44% and the chance of reporting sustained RTW by 43% two years following the injury. In contrast, Prang et al. [20] did not find a significant association between hospital admission within 7 days of injury and RTW after 3 months. Due to conflicting results, there is inconsistent evidence that hospital admission is negatively associated with RTW.

Table 2 Factors associated with return to work following road traffic musculoskeletal injuries

Variable	Positive association	Negative association	No association	Evidence level (weak/ strong/ inconsistent)
Pre-injury				
Demographic factors				
Gender			[14, 21, 22]	Strong (no association)
Older age		[20]	[14, 19, 21, 22]	Strong (no association)
Marital status (not married)		[20]	[14, 22]	Inconsistent
Higher education level	[14, 20]		[19, 22]	Inconsistent
Occupation (manual work)		[20, 21, 46]	[14, 22, 42]	Inconsistent
Weight			[22]	Absent
Height			[22]	Absent
Working with raised arms			[22]	Absent
Social class			[21]	Absent
Having children			[20]	Absent
Family composition			[20]	Absent
Higher income level	[20]			Absent
Health-related factors				
Psychiatric history		[19, 21]		Weak (negative)
Better Pre-injury health	[20]		[14]	Inconsistent
Pre-Injury chronic illness		[14]		Absent
Pre-Injury fitness Level	[44]			Absent
Higher BMI			[14]	Absent
Post-injury				
Physical health-related factors				
Higher ÖMPQ score (Baseline)		[14, 19, 45]		Strong (negative)
Higher disability level		[19, 21]		Weak (negative)
Severity of injury			[14, 19]	Weak (no association)
Hospital admission		[14]	[20]	Inconsistent
Higher quality of life (Baseline)	[14]		[18, 19]	Inconsistent
Higher pain intensity		[18, 19, 22, 46]	[14, 42]	Inconsistent
Type of injury	[20]		[14]	Inconsistent
ÖMPSQ function sub-scores	[19]			Absent
Neck pain		[22]		Absent
Neck range of motion			[42]	Absent
Psychological factors				
Higher RTW expectancies	[19, 42, 43]			Strong (positive)
Higher pain catastrophizing		[43]		Absent
Depression symptoms		[19]		Absent
Anxiety symptoms		[19]		Absent
Neurological symptoms		[21]		Absent
PCS			[22]	Absent
Higher RHFUQ scores		[22]		Absent
Perception of threat to life			[19]	Absent
PTSD			[19]	Absent
MDE diagnosis			[19]	Absent
GAD diagnosis			[19]	Absent
DSM-IV diagnosis			[19]	Absent
Social support			[19]	Absent
Support from employer	[20]			Absent
Crash-related factors				
Type of road user (driver/passenger)		[19]		Absent

Table 2 (continued)

Variable	Positive association	Negative association	No association	Evidence level (weak/ strong/ inconsistent)
At fault accident			[14]	Absent
Consulting a lawyer	[18]			Absent
Car Damage (0–100%)			[22]	Absent

The evidence synthesis is based on the multivariate associations when available or the univariate associations when multivariate associations are unavailable (Pvalue > 0.05)

BMI body mass index, *ÖMPSQ* Örebro Musculoskeletal Pain Screening Questionnaire, *PCS* Post-Concussion Syndrome Symptoms, *RHFUQ* Rivermead Head Injury Follow-Up Questionnaire, *PTSD* Post-Traumatic Stress Disorder, *MDE* Major Depressive Episode, *GAD* Generalized Anxiety Disorder, *DSM-IV* Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition

Quality of Life (QoL) Three studies explored the association between QoL and RTW outcome after musculoskeletal RTI [14, 18, 19]. One study found a positive association [14] and two reported no association [18, 19]. The tools utilised for the assessment of the QoL varied across studies, however, the scores provided reflected better mental and physical QoL. Gopinath et al. [14] used the SF-12, whereas Heron-Delaney et al. [19] and Gun et al. [18] used the SF-36 questionnaire [18]. Based on the findings of these studies, there is inconsistent evidence for an association between QoL and a positive work outcome.

Pain Six studies (5 quantitative and 1 qualitative) investigated the association between the presence of pain and RTW status after injury. Four studies found a negative association [18, 19, 22, 46] and two found no association [14, 42]. The tools and methods used for the assessment of the pain varied across studies, however, the scores provided reflected more severe pain in all papers. For example, several studies measured pain intensity using the VAS (0–10) [14, 22]. Heron-Delaney et al. [19] used the pain subscale from the ÖMPQ and calculated the pain score by multiplying the intensity of pain by the frequency of pain. Gun et al. [18] used the SF-36 pain index (0–100) to assess pain severity while Carriere et al. [42] used the Pain Rating Index of the McGill Pain Questionnaire. Based on the mixed results of these studies, there is inconsistent evidence for an association for pain with RTW after musculoskeletal RTI.

Psychological Factors

RTW Expectancies

Three studies investigated the impact of RTW expectation at baseline with RTW status more than one year after injury [19, 42, 43]. Participants were asked to rate the likelihood that they would resume some form of employment over the next month [42, 43] or in 6 months [19] on an 11-point scale where higher score indicated higher chance of RTW. All three studies found that higher RTW expectancy is positively associated with RTW outcome. Heron-Delaney et al. [19] reported that the odds of non-RTW after musculoskeletal RTI (versus RTW) were 9.4 times greater for those with lower RTW expectations at baseline (95% CI. 3.87–22.81). Therefore, strong evidence exists for the positive association between RTW expectancies and RTW status after musculoskeletal RTI.

There was an absence of evidence for several variables in this review (see Table 2), where an association between each of these variables and RTW was only reported in a single paper. Evidence was absent for any association between RTW and: Weight and height [22], fault status [14] and type of road user [19]. Furthermore, absent of evidence was identified for a negative association between RTW and: Pre-Injury chronic illness [14], pain catastrophizing [43], depression symptoms [19], anxiety symptoms [19], higher score on the Rivermead Head Injury Follow-Up Questionnaire (RHFUQ) [22], body mass index [14], and neurological Symptoms [21]. In addition, evidence was absent for a positive association between RTW and: pre-injury fitness level [44], ÖMPQ function score [19], income level [20] and employer support [20].

Discussion

The main aim of this review was to identify factors impeding or facilitating RTW in individuals with minor to serious musculoskeletal RTI. Across the 10 quantitative studies and one qualitative study reviewed, a wide range of factors were identified with the potential to impact RTW with some of these factors investigated in only a few studies. Even though the quality of almost all studies was rated as good and very good, the findings were often inconsistent, limiting the conclusions that could be drawn. Additionally, there was some heterogeneity in the way that the dependant and independent variables were measured, making it difficult to compare findings. In summary, this review shows that measures of better post-injury physical and mental health (ÖMPQ) and RTW expectancy are the most significant factors associated with

RTW outcome following mild to serious musculoskeletal RTI.

This review found strong evidence that individuals with higher scores on the ÖMPQ at baseline were less likely to RTW after musculoskeletal RTI [14, 19, 45]. A higher score on this questionnaire demonstrates higher levels of risk for developing ongoing musculoskeletal pain. In addition to RTI, this tool has been widely used as a screening tool to identify those at risk of delayed-RTW following occupational injuries. Nicholas et al. [47] reported that the ÖMPQ score significantly predicted the number of days to RTW in 213 injured workers. The ÖMPQ is a multi-dimensional tool that assesses physical and mental health including level of pain, self-perceived function/disability, distress, fear avoidance, and recovery expectation. The significance of the ÖMPQ score at baseline in RTW of people with musculoskeletal RTI highlights the usability of this tool in identifying several factors impacting RTW at the one point in time. In addition, the combination of multiple variables as assessed in the ÖMPQ speaks to the multi-dimensional nature of work. This information will assist clinicians and practitioners identify those at risk of poorer RTW so that interventions can be implemented early in the recovery journey.

Strong evidence was identified that RTW expectancy immediately post-injury is the main post-injury psychological factor impacting RTW [19, 42, 43]. This finding is consistent with previous reviews addressing people with RTI [24] and non-RTI (long-term neck or back pain [48]; non-chronic low back pain [49]), suggesting the universality of this construct. However, it was suggested that while RTW expectation is significantly associated with work disability, it may not have sufficient predictive strength as recovery expectations might change over time due to different personal, psychological, and environmental factors. In addition those with severe to critical injuries have a more realistic appraisal of their potential for work compared to those with minor to serious injuries [49]. As such, regular assessment of this factor would be advantageous to identify those who need more support in the acute, sub-acute or chronic phases of recovery from musculoskeletal RTI. RTW expectancy was one of the main modifiable factors associated with RTW identified in this review [43]. This highlights the importance of strategies used to improve injured person's expectations for recovery.

Other factors that might impact RTW are severity of pain and injury. In the best evidence synthesis of systematic reviews by Cancelliere et al. [50], pain was identified as one of the strongest factors affecting RTW after work or non-work related injury. However, our review found inconsistent evidence for an association between pain intensity and RTW with a negative association being reported by four studies [18, 19, 22, 46] and no association by two studies [14, 42]. This inconsistent result may be due to different time points and tools used to assess the level of pain with two papers using the one question to assess the intensity of pain (VAS scale) [14, 22] and three using scales which explore other aspects of pain such as pain domains of ÖMPQ (2 questions), SF 36, and the McGill Pain Questionnaire [18, 19, 42]. Furthermore, this review found weak evidence, indicating no significant association between the severity of injury and RTW in contrast with other studies [51, 52]. Additionally, inconsistent evidence was identified for the impact of hospital admission [14, 20], QOL [14, 18, 19], and type of injury [14, 20] on RTW status.

Pre-injury health-related factors have been shown to be influential in recovery of people with RTI [24, 53]. However, our review identified only weak evidence for a negative association between having psychiatric history and RTW [19, 21] and inconsistent evidence to support better pre-injury health status facilitates RTW after a musculoskeletal RTI [14, 20]. In the review conducted by Samoborec et al. [24], pre-accident physical and mental health status were found to have strong associations with poor or non-recovery after RTI. Studies included in the Samoborec review [24] had mainly assessed the impact of pre-injury health-related factors on general health and quality of life as markers of recovery. This inconsistency in findings suggests that factors influencing recovery do not necessarily impact RTW outcome and suggests that RTW is not always a marker of recovery, mainly because the validity of assuming recovery after RTW is not clear [23, 54]. In studies with a specific focus on RTW, pre-injury health-related factors were considered important to assess because of their possible role in immediate identification of patients who may be vulnerable to poorer prognosis following RTI. Despite the importance of these factors, the majority of studies included in this review have focused on the impact of post-injury factors. Therefore, it seems that there is a need to further explore the association between pre-injury physical and psychological health-related factors and RTW after musculoskeletal RTI.

This review provided insights into the impact of demographic factors on RTW of people with musculoskeletal RTI. Strong evidence was identified that there are no associations between RTW and gender [14, 21, 22] or older age [14, 19–22]. Moreover, inconsistent evidence identified a negative or no association between marital status [14, 20, 22] and occupation type [14, 20–22, 42] with RTW. Similarly, inconsistent evidence was found for an association (positive or no) between education level and RTW [14, 19, 20, 22]. A recent review reported no association between recovery after whiplash and gender [38]. Similarly, the systematic meta-review by Sarrami et al. [55] identified conflicting evidence for an association between education and gender with the outcome of whiplash injuries. However, the review by Samoborec et al. [24] found that older age, female gender, and lower educational level may negatively impact recovery after RTI. These dissimilarities may be attributed to the methodological differences such as the primary outcome of interest (recovery vs RTW), time limit used for the search, eligibility criteria, and different tools/ methods used to assess the methodological quality of studies and categorising the level of evidence.

This review has several strengths including the comprehensive search strategy, involvement of two independent reviewers, and hand searching the references of selected studies. However, limitations exist. This review only included studies that reported RTW as a dichotomous outcome of work to facilitate comparison with previous reviews. In a recent Delphi study conducted to develop a core outcome set for whiplash associated disorders, work-related outcome was described as the "impact on injured person's ability to work or return to work" [17]. It is possible that reviewing papers in the context of musculoskeletal RTI which measured work outcomes using other approaches such as work capacity might have identified further or different barriers and facilitators. Also, this study only included minor to serious musculoskeletal RTI, which means the findings may not be generalisable to factors impacting RTW following severe and catastrophic injuries. It also needs to be mentioned that one of the studies included in this review was cross-sectional in design and therefore was not able to define direct causation. Furthermore, studies that were included in this review used inconsistent definitions and/or outcome measures for RTW. Therefore, statistical pooling of data in a meta-analysis was not possible. To address this issue, Popay's guideline for presenting a narrative synthesis was followed and a robust methodology was used to classify the level of evidence [56].

This review highlighted several opportunities for future research. Studies to date have used self-assessment questionnaires or insurance databases of injured persons to explore barriers and facilitators of RTW after musculoskeletal RTI. This often resulted in identifying factors with conflicting evidence of association with RTW and not amenable to intervention such as pre-injury health status or demographic characteristics. Other known factors that may be modifiable and often not assessed, are system factors such as quality of case management and legal involvement [57, 58]. Therefore, more research is needed to explore modifiable factors. Furthermore, despite the dominant role of qualitative methodology in identifying unknown factors, only one qualitative study was included in this review with the main focus being on recovery and not specifically on RTW. Hence, there is a need to further investigate unknown factors using qualitative methodology. Finally, to improve the reliability of findings, more studies should be conducted utilising a consistent measure and definition of RTW.

In conclusion, the findings of this review showed that post-injury physical and mental health as assessed by the ÖMPQ was strongly associated with RTW for people with RTI. Early utilisation of this multidimensional tool to identify those who are at risk of poor RTW and potentially identify those in need of extra support is recommended. The other factor with the strongest evidence for work outcomes was RTW expectancy which has the potential to be modifiable. Interventions addressing both physical and psychological to improve work outcomes are needed.

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Declarations

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

References

1. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. 2018 Nov 10. Report No.: 0140–6736 Contract No.: 10159.
2. Bayan P, Bhawalkar JS, Jadhav SL, Banerjee A. Profile of non-fatal injuries due to road traffic accidents from a industrial town in India. Int J Crit Illn Inj Sci. 2013;3(1):8–11.
3. Casey PP, Guy L, Cameron ID. Determining return to work in a compensation setting: A review of New South Wales workplace rehabilitation service provider referrals over 5 years. Work. 2014;48:11–20.
4. Abbreviated Injury Scale: NSW Institute of Trauma and Injury Management; [Available from: https://aci.health.nsw.gov.au/get-involved/institute-of-trauma-and-injury-management/data/injury-scoring/abbreviated_injury_scale.
5. Motor Accident Insurance Commission, Statistical Information 1 July to 31 December 2016. . Queensland: Queensland Government; 2016.
6. Litchfield F. The cost of road crashes in Australia 2016: An overview of safety strategies. Canberra: The Australian National University; 2017.
7. Bureau of Infrastructure, Transport and Regional Economics. Road trauma Australia 2019 statistical summary. Canberra ACT: BITRE; 2020.
8. Kendall E, Buys N. The psychosocial consequences of motor vehicle accidents. J Pers Interpers Loss. 1999;4(1):47–66.
9. Craig A, Tran Y, Guest R, Gopinath B, Jagnoor J, Bryant RA, et al. Psychological impact of injuries sustained in motor vehicle crashes: systematic review and meta-analysis. BMJ Open. 2016;6(9):e011993.

10. Kenardy J, Edmed SL, Shourie S, Warren J, Crothers A, Brown EA, et al. Changing patterns in the prevalence of posttraumatic stress disorder, major depressive episode and generalized anxiety disorder over 24 months following a road traffic crash: Results from the UQ SuPPORT study. J Affect Disord. 2018;236:172–9.
11. Kenardy J, Heron-Delaney M, Hendrikz J, Warren J, Edmed SL, Brown E. Recovery trajectories for long-term health-related quality of life following a road traffic crash injury: Results from the UQ SuPPORT study. J Affect Disord. 2017;214:8–14.
12. Kenardy J, Heron-Delaney M, Warren J, Brown E. The effect of mental health on long-term health-related quality of life following a road traffic crash: results from the UQ SuPPORT study. Injury. 2015;46(5):883–90.
13. Dano AM. Road injuries and long-run effects on income and employment. Health Econ. 2005;14(9):955–70.
14. Gopinath B, Jagnoor J, Harris IA, Nicholas M, Casey P, Blyth F, et al. Prognostic indicators of social outcomes in persons who sustained an injury in a road traffic crash. Injury. 2015;46(5):909–17.
15. Gray SE, Hassani-Mahmooei B, Kendall E, Cameron ID, Kenardy J, Collie A. Factors associated with graduated return to work following injury in a road traffic crash. J Transp Health. 2018;10:167–77.
16. Pharr JR, Moonie, S., & Bungum, T. J. (2012) The impact of unemployment on mental and physical health, access to health care and health risk behaviors. ISRN Public Health. 2012;7.
17. Chen K, Andersen T, Carroll L, Connelly L, Côté P, Curatolo M, et al. Recommendations for core outcome domain set for whiplash-associated disorders (CATWAD). Clin J Pain. 2019;35(9):727–36.
18. Gun RT, Osti OL, O'Riordan A, Mpelasoka F, Eckerwall CG, Smyth JF. Risk factors for prolonged disability after whiplash injury: a prospective study. Spine. 2005;30(4):386–91.
19. Heron-Delaney M, Warren J, Kenardy JA. Predictors of non-return to work 2 years post-injury in road traffic crash survivors: Results from the UQ SuPPORT study. Injury. 2017;48(6):1120–8.
20. Prang K-H, Berecki-Gisolf J, Newnam S. Recovery from musculoskeletal injury: the role of social support following a transport accident. Health Qual Life Outcomes. 2015;13:97.
21. Gozzard C, Bannister G, Langkamer G, Khan S, Gargan M. Factors affecting employment after whiplash injury 2001. 506–9 p.
22. Kasch H, Jensen LL. Minor head injury symptoms and recovery from whiplash injury: A 1-year prospective study. Rehabilitation Process and Outcome. 2019;8:1179572719845634.
23. Steenstra IA, Lee H, de Vroome EM, Busse JW, Hogg-Johnson SJ. Comparing current definitions of return to work: a measurement approach. J Occup Rehabil. 2012;22(3):394–400.
24. Samoborec S, Ruseckaite R, Ayton D, Evans S. Biopsychosocial factors associated with non-recovery after a minor transport-related injury: A systematic review. PLoS ONE. 2018;13(6):e0198352.
25. Moola S, Munn Z, Sears K, Sfetcu R, Currie M, Lisy K, et al. Conducting systematic reviews of association (etiology): The Joanna Briggs Institute's approach. Int J Evid Based Healthc. 2015;13(3):163–9.
26. Association for the Advancement of Automotive Medicine; [Available from: https://www.aaam.org/abbreviated-injury-scale-ais/.
27. Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. [Available from: www.covidence.org.
28. Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 elaboration and explanation. BMJ. 2015;349:g7647.
29. Law M SD, Pollock N, Letts L, Bosch J, Westmoreland M. Guidelines for critical review form e quantitative studies 1998.
30. Barras S. A systematic and critical review of the literature: The effectiveness of occupational therapy home assessment on a range of outcome measures. Aust Occup Ther J. 2005;52(4):326–36.
31. Gane EM, Michaleff ZA, Cottrell MA, McPhail SM, Hatton AL, Panizza BJ, et al. Prevalence, incidence, and risk factors for shoulder and neck dysfunction after neck dissection: A systematic review. European Journal of Surgical Oncology (EJSO). 2017;43(7):1199–218.
32. Schabrun SM, Hillier S. Evidence for the retraining of sensation after stroke: a systematic review. Clin Rehabil. 2009;23(1):27–39.
33. Lekkas P, Larsen T, Kumar S, Grimmer K, Nyland L, Chipchase L, et al. No model of clinical education for physiotherapy students is superior to another: a systematic review. Australian Journal of Physiotherapy. 2007;53(1):19–28.
34. Ducat WH, Kumar S. A systematic review of professional supervision experiences and effects for allied health practitioners working in non-metropolitan health care settings. Report. 2015;8:397.
35. Daly AE, Bialocerkowski AE. Does evidence support physiotherapy management of adult complex regional pain syndrome type one? a systematic review. Eur J Pain. 2009;13(4):339–53.
36. Wells C, Kolt G, Marshall P, Hill B, Bialocerkowski A. The effectiveness of pilates exercise in people with chronic low back pain: a systematic review. PLoS ONE. 2014;9(7):100402.
37. Letts L, Wilkins S, Law M, Stewart D, Bosch J, Westmorland M, editors. Guidelines for critical review form - Qualitative studies (version 2.0), McMaster University Occupational Therapy Evidence-Based Practice Research Group2007.
38. Shearer HM, Carroll LJ, Côté P, Randhawa K, Southerst D, Varatharajan S, et al. The course and factors associated with recovery of whiplash-associated disorders: an updated systematic review by the Ontario protocol for traffic injury management (OPTIMa) collaboration. European Journal of Physiotherapy. 2020:1–16.
39. Donker-Cools BHPM, Wind H, Frings-Dresen MHW. Prognostic factors of return to work after traumatic or non-traumatic acquired brain injury. Disabil Rehabil. 2016;38(8):733–41.
40. de Croon EM, Sluiter JK, Nijssen TF, Dijkmans BAC, Lankhorst GJ, Frings-Dresen MHW. Predictive factors of work disability in rheumatoid arthritis: a systematic literature review. Ann Rheum Dis. 2004;63:1362–7.
41. van Velzen JM, van Bennekom CAM, Edelaar MJA, Sluiter JK, Frings-Dresen MHW. Prognostic factors of return to work after acquired brain injury: A systematic review. Brain Inj. 2009;23(5):385–95.
42. Carriere JS, Thibault P, Adams H, Milioto M, Ditto B, Sullivan MJL. Expectancies mediate the relationship between perceived injustice and return to work following whiplash injury A 1-year prospective study. Eur J Pain. 2017;21(7):1234–42.
43. Carriere JS, Thibault P, Milioto M, Sullivan MJL. Expectancies Mediate the relations among pain catastrophizing, fear of movement, and return to work outcomes after whiplash injury. J Pain. 2015;16(12):1280–7.
44. Geldman M, Moore A, Cheek L. The effect of pre-injury physical fitness on the initial severity and recovery from whiplash injury, at six-month follow-up. Clin Rehabil. 2008;22(4):364–76.
45. Nguyen H, Rebbeck T, Kifley A, Jagnoor J, Dinh M, Shetty A, et al. Positive recovery for low-risk injuries screened by the short form - Örebro musculoskeletal pain screening questionnaire following road traffic injury: evidence from an inception cohort study in New South Wales, Australia. BMC Musculoskelet Disord. 2019;20(1):531.
46. Juuso P, Skär L, Söderberg S. Recovery despite everyday pain: Women's experiences of living with whiplash-associated disorder. Musculoskeletal Care. 2020;18(1):20–8.
47. Nicholas MK, Costa DSJ, Linton SJ, Main CJ, Shaw WS, Pearce R, et al. Predicting return to work in a heterogeneous sample of

recently injured workers using the brief ÖMPSQ-SF. J Occup Rehabil. 2019;29(2):295–302.
48. Rashid M, Kristofferzon M-L, Nilsson A, Heiden M. Factors associated with return to work among people on work absence due to long-term neck or back pain: a narrative systematic review. BMJ Open. 2017;7(6):e014939.
49. Iles RA, Davidson M, Taylor NF. Psychosocial predictors of failure to return to work in non-chronic non-specific low back pain: a systematic review. Occup Environ Med. 2008;65(8):507.
50. Cancelliere C, Donovan J, Stochkendahl MJ, Biscardi M, Ammendolia C, Myburgh C, et al. Factors affecting return to work after injury or illness: best evidence synthesis of systematic reviews. Chiropr Man Therap. 2016;24(1):1–23.
51. Hepp U, Moergeli H, Buchi S, Bruchhaus-Steinert H, Sensky T, Schnyder U. The long-term prediction of return to work following serious accidental injuries: A follow up study. BMC Psychiatry. 2011;11(1):53.
52. Soberg HL, Finset A, Bautz-Holter E, Sandvik L, Roise O. Return to work after severe multiple injuries: a multidimensional approach on status 1 and 2 years postinjury. J Trauma. 2007;62(2):471–81.
53. Carstensen TB, Frostholm L, Oernboel E, Kongsted A, Kasch H, Jensen TS, et al. Post-trauma ratings of pre-collision pain and psychological distress predict poor outcome following acute whiplash trauma: a 12-month follow-up study. Pain. 2008;139(2):248–59.
54. Smits EJ, Gane EM, Brakenridge CL, Andrews NE, Johnston V. Expert consensus and perspectives on recovery following road traffic crashes: a Delphi study. Disabil Rehabilitat. 2020. https://doi.org/10.1080/09638288.2020.1855677.
55. Sarrami P, Armstrong E, Naylor JM, Harris IA. Factors predicting outcome in whiplash injury: a systematic meta-review of prognostic factors. J Orthop Traumatol. 2017;18(1):9–16.
56. Guidance on the conduct of narrative synthesis in systematic reviews. A product from the ESCR methods Programme. [press release]. Lancaster: ESRC Methods Program, 2006.
57. Murgatroyd D, Lockwood K, Garth B, Cameron ID. The perceptions and experiences of people injured in motor vehicle crashes in a compensation scheme setting: a qualitative study. BMC Public Health. 2015;15(1):423.
58. Lindsay GM, Mior SA, Côté P, Carroll LJ, Shearer HM. Patients' experiences with vehicle collision to inform the development of clinical practice guidelines: a narrative inquiry. J Manipulative Physiol Ther. 2016;39(3):218–28.