

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email editorial.bmjopen@bmj.com

BMJ Open

Biopsychosocial factors impacting recovery after a minor transport-related injury: protocol for a systematic review

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2017-016314
Article Type:	Protocol
Date Submitted by the Author:	07-Feb-2017
Complete List of Authors:	Samoborec, Stella; Monash University Faculty of Medicine Nursing and Health Sciences, Department of Epidemiology and preventive Medicine Ruseckaite, Rasa; Monash University Faculty of Medicine Nursing and Health Sciences, Department of Epidemiology and Preventive Medicine Romero, Lorena ; The Ian Potter Library, Ground Floor, AMREP Building, The Alfred Evans, Sue; Department of Epidemiology and Preventive Me, Monash University
Primary Subject Heading:	Rehabilitation medicine
Secondary Subject Heading:	Public health, Epidemiology
Keywords:	EPIDEMIOLOGY, ACCIDENT & EMERGENCY MEDICINE, PREVENTIVE MEDICINE

SCHOLARONE™
Manuscripts

December 09 2016

Title page

Biopsychosocial factors impacting recovery after a minor transport-related injury: protocol for a systematic review

Corresponding author

Stella Samoborec BBMed, MBMedSc

Department of Epidemiology and Preventive Medicine (DEPM)

School of Public Health and Preventive Medicine, Monash University, The Alfred Centre, Level 6, 99

Commercial Road, Melbourne, VIC, Australia 3004

Phone : +61399030021

Fax : +61399030556

Email: stella.samoborec@monash.edu

Authors

Rasa Ruseckaite, BSc, MSc, PhD, Senior Research Fellow, DEPM, School of Public Health and Preventive Medicine, Monash University, The Alfred Centre, Level 6, 99 Commercial Road, Melbourne, VIC, Australia 3004.

rasa.ruseckaite@monash.edu

Lorena Romero, BA, MBIT, Senior Medical Librarian, The Ian Potter Library, Ground Floor, AMREP Building, The Alfred, Commercial Road, Melbourne, VIC, Australia 3004.

L.Romero@alfred.org.au

Sue M Evans, BN, Master Clin Epi, PhD FAAQHC, Associate Professor, Head, Clinical Registry Unit

1
2
3 Associate Director, CRE in Patient Safety, DEPM, School of Public Health and Preventive Medicine,
4
5 Monash University, The Alfred Centre, Level 6, 99 Commercial Road, Melbourne, VIC, Australia 3004.
6

7 sue.evans@monash.edu
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

Abstract:

Introduction: Globally, road transport accidents contribute substantially to the number of deaths and to the burden of disability. Up to 50 million people suffer a transport-related non-fatal injury each year, which often leads to long-term disability. Most frequently reported injuries following traffic accidents are minor injuries such as whiplash, contusion, concussion, sprain and strain.

It has been shown that significant numbers of people with minor injuries struggle to recover although the facts for this are still not well explored.

Despite the high prevalence, little is known about the factors facilitating or hindering recovery following minor transport-related injuries. The aim of this systematic review is to understand biological, psychological and social factors related to protracted recovery and identify current gaps in the literature.

Methods and Analysis: The review will be conducted in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A search of the electronic databases, MEDLINE, EMBASE, Cochrane Central Register of Controlled trials (CENTRAL), will be undertaken, in addition to Google Scholar and grey literature to identify studies for the period January 2006 to December 2016. Quantitative and qualitative research articles describing and identifying biopsychosocial factors impacting recovery and health outcomes such as functional recovery, disability, pain intensity, health-related quality of life, mental health outcomes, and social outcomes will be included. A conceptual framework, developed to identify biopsychosocial factors, will be applied to assure defined criterion.

A narrative synthesis based on study findings will be conducted. However, there is little anticipation for meta-analyses due to the heterogeneity of outcomes and profile of those injured. After testing for heterogeneity, results will be reported accordingly.

Ethics and Dissemination: Ethical approval is not required as primary data will not be collected. Review results will be published as a part of a thesis, peer-reviewed journal and conference papers.

Strengths and limitations of the study

This is the first systematic review that evaluates all relevant factors (biological, psychological and social) impacting recovery across the different types of minor transport-related injuries.

The review has distinct inclusion criteria and clearly outlines how the items will be selected and abstracted.

The review aims to systematically structure all the evidence available for biopsychosocial factors impacting recovery regardless of patient's compensation status after minor transport-related injury.

However, some relevant articles may be missed due to the heterogeneity of the tools used to determine severity of injury and because of the nonexistence of a gold standard definition for minor injuries.

Introduction

Worldwide, road transport accidents contribute substantially to the number of deaths and also to the burden of disability. The World Health Organisation (WHO) estimates that by 2020 road accidents will be the third leading cause of disability (1). According to WHO data, deaths from road transport injuries account for around 25% of all deaths from injury (2).

Minor injuries are the most recurrently reported injuries following a transport-related accident (3). While the number will fluctuate between countries, the literature suggests that the total incidence of minor injuries (musculoskeletal and soft tissue) has increased in the last 30 years. Whiplash Associated Disorder (WAD) is the most frequently reported minor injury following a transport accident (3-9). Other minor injuries include contusions, concussions, skin abrasions, lacerations, nerve damages, sprains and strains which sometimes require medical attention and hospitalisation (10). Despite a substantial amount of WAD epidemiology and treatment research, understanding factors that facilitate or hinder recovery is sparse (4).

1
2
3 The complexity and heterogeneity of the profile of those suffering minor injuries, are reasons to
4 explain why many people do not recover as expected (11). It has been estimated that approximately
5 half of the patients with minor injuries may never completely recover (12).
6
7
8

9
10 In Victoria, while preventive measures have been directed to patients with major injuries there are
11 no current preventive recommendations and rehabilitative guidelines for patients with minor
12 injuries. Nevertheless, there is much to be achieved by understanding factors and interventions
13 aimed at reducing long-term disability, and improving recovery for patients who have sustained
14 minor injuries (13). It is important to note there are various complexities in treating and managing
15 patients with minor injuries. Although it is expected that not everyone who sustains a minor injury
16 will develop persistent symptoms, cautious consideration is required to understand and identify in a
17 timely manner those patients with minor injuries who are at high risk of prolonged recovery.
18
19
20
21
22
23
24
25
26
27

28 **Epidemiology of minor transport-related musculoskeletal injuries**

29
30 Patients are classified as sustaining a minor, moderate or severe injury according to their level of
31 consciousness at the time of the initial assessment. In practice, the most widely used measure is the
32 Glasgow Coma Scale (GCS). GCS scores range from 3 to 15, with scores between 13 and 15 indicating
33 a minor injury, between 9 and 12 indicating a moderate injury, and between 3 and 8 indicating a
34 severe injury (14).
35
36
37
38
39
40
41

42 The most common types of minor transport-related injuries are musculoskeletal and/or soft tissue
43 injuries (15). Musculoskeletal injuries refer to those which affect muscles, bones, joints, tendons,
44 ligaments, cartilage and spinal discs. Soft tissue injuries can occur in any soft tissue in the body. If
45 they occur in the skin they are called contusions, in the muscle they are known as strains, and in the
46 tendons and ligaments they are called sprains (16). While some of these injuries are benign and do
47 not require complex treatments, others may lead to chronic and persistent challenges (17, 18). The
48 cause of protracted symptoms are thought to be complex and multifactorial. According to the
49 literature, these injuries are often shown to be painful and sometimes require medical intervention.
50
51
52
53
54
55
56
57
58
59
60

1
2
3 Minor injuries are usually treated in general practices. However some require specialist intervention,
4
5 treatment and, in some cases, hospitalisation (19).
6
7

8 **Rationale and Objectives**

9
10 There is a paucity of research into factors and determinants of recovery following minor injuries. In
11
12 clinical practice there remains a lack of recognition that patients with minor injury may have a slow
13
14 recovery and long-term adverse biopsychosocial consequences (3). Previous research demonstrates
15
16 differences in patient's recovery outcomes and identifies a number of predicting factors leading to
17
18 long-term disability and poor health outcomes (20-24). It is evident that more research is needed to
19
20 understand and investigate whether specific management of patients with minor injuries could
21
22 reduce chronicity and long-term disability. These patients should be identified as early as possible in
23
24 their injury trajectory so that active support and management can be provided. It is believed that the
25
26 quality of management of the most common types of minor injuries should be improved (25).
27
28

29
30 The objectives of this systematic review are to comprehensively examine and identify recovery
31
32 outcomes, biopsychosocial factors, predictors of recovery and determine the benefits of using
33
34 Biopsychosocial model (BPS) on improving recovery after minor transport-related injury.
35
36
37
38
39
40

41 **Methods and Design:**

42
43 A detailed description on population, intervention, comparison and outcome (PICO) of the
44
45 systematic review is outlined in Table 1 and described below:
46
47

48 **Inclusion criteria**

49
50 Studies will be included if they are:
51
52

- 53 • Investigating patients who have sustained minor transport-related injury
- 54 • Assessing biological and/or psychological and/or social factors
- 55
- 56
- 57
- 58
- 59
- 60

- Using BPS as a core model (approach) for identifying health outcomes
- Published in English language
- Published from 1st January 2006 to 05th December 2016.

Exclusion criteria

Studies will be excluded if they are:

- Published in a language other than English
- Published prior to 1st January 2006 or after 05th December 2016
- Describing work-related injury
- Involving children and describing paediatrics injuries
- Describing moderate and severe or fatal transport-related injuries
- Investigating other type of outcomes (e.g. compensation outcomes such as cost or impact on cost and quality of compensation systems or services)
- Unpublished manuscripts, dissertations, books and book chapters, conference proceedings, meeting abstracts, and guideline statements.

Study design

Quantitative (e.g. cohort, longitudinal, case studies, prospective, retrospective) and qualitative studies (e.g. ethnography, phenomenological, grounded theory, case report) exploring biopsychosocial factors impacting recovery and related health outcomes in patients with minor transport-related injury will be included. Mixed methods research articles will also be included in the review.

Comparator(s)/control

1
2
3 Comparators such as positive factors and factors facilitating recovery after minor transport-related
4
5 accident will be considered for inclusion.
6
7

8 **Context**

9
10 This review will include injured persons who were involved in a transport accident, whose injuries
11
12 were classified as minor, who are over 18 years of age, and are English-speaking. Minor injuries to be
13
14 included in this review are whiplashes, contusions, abrasions, lacerations, back pain, sprains, strains,
15
16 and concussions. Severe and moderate injuries will be excluded from this review. Children younger
17
18 than 18 years of age will also be excluded.
19
20

21 **Outcome measures/Outcome of interest**

22
23 The following outcomes will be investigated:
24
25

- 26 • Functional recovery (e.g. return to work, or independence, or usual activities)
- 27
- 28 • Disability (e.g. temporary, long-term, permanent)
- 29
- 30 • Pain intensity (e.g. low, moderate, severe)
- 31
- 32 • Health-related quality of life (e.g. poor, good)
- 33
- 34 • Psychological outcomes (e.g. depression, fear, sleep disorder, anxiety, PTSD)
- 35
- 36 • Social outcomes (e.g. socioeconomics, family and community support, quality of health care)
- 37
- 38
- 39
- 40
- 41

42 **Search methods**

43
44 The database records and details of how the search was undertaken will be maintained at each stage
45
46 of the review process. A senior medical librarian (LR) will assist in the final draft of the search
47
48 strategy.
49

50
51 This review will search the following electronic databases: MEDLINE, EMBASE, Cochrane Central
52
53 Register of Controlled Trials (CENTRAL).Google Scholar and other Grey literature sources will also be
54
55 included. The search strategy will be developed in Medline and then adapted to the other databases.
56
57
58
59
60

1
2
3 It will include the subject headings (MeSH) specific to each database and free text words specific to
4
5 the review inclusion criteria. Libraries containing the results of the searches will be created using
6
7 EndNote X7.
8
9

10 **Study screening and selection**

11
12 A three-phase screening process will be applied. In phase one, an experienced medical librarian (LR)
13
14 and a researcher (SS) will conduct the initial search. In a second phase, two researchers (SS, SE) will
15
16 independently screen the titles and abstracts of all articles identified in the search strategy to
17
18 determine eligibility and classify studies as relevant, possibly relevant and irrelevant. During the last
19
20 phase, the researchers (SS, RR) will independently review the full text to make a final determination
21
22 of eligibility. The PRISMA-P methodology, checklist and standard search strategy using pre-defined
23
24 inclusion and exclusion criteria and structured data abstraction tools will be used.
25
26
27

28 **Data extraction**

29
30 Data from the relevant articles will be assessed based on the Cochrane data abstraction form
31
32 (supplementary documents -2). Evidence will be synthesised based on the following information:
33
34

- 35 • Study period (start and end date)
- 36
- 37 • Study population (number of participants)
- 38
- 39 • Type of study (quantitative or qualitative)
- 40
- 41 • Injury studied (type and severity of injury)
- 42
- 43 • The outcomes/s of interest
- 44
- 45 • The type of model or tools used to identify outcomes
- 46
- 47 • The type of factors (biological, psychological and social)
- 48
- 49 • The effect and directions of biopsychosocial factors on outcome/s (positive impact, negative
- 50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
- Limitations of study

- Key findings and recommendations

Data management

The relevant review documentation and search results will be uploaded and saved in Faculty-allocated network storage ("S-drive") located in Monash University and will be backed up on Faculty-allocated network storage. The data will be accessed only by the reviewers.

Study quality and assessing risk of bias

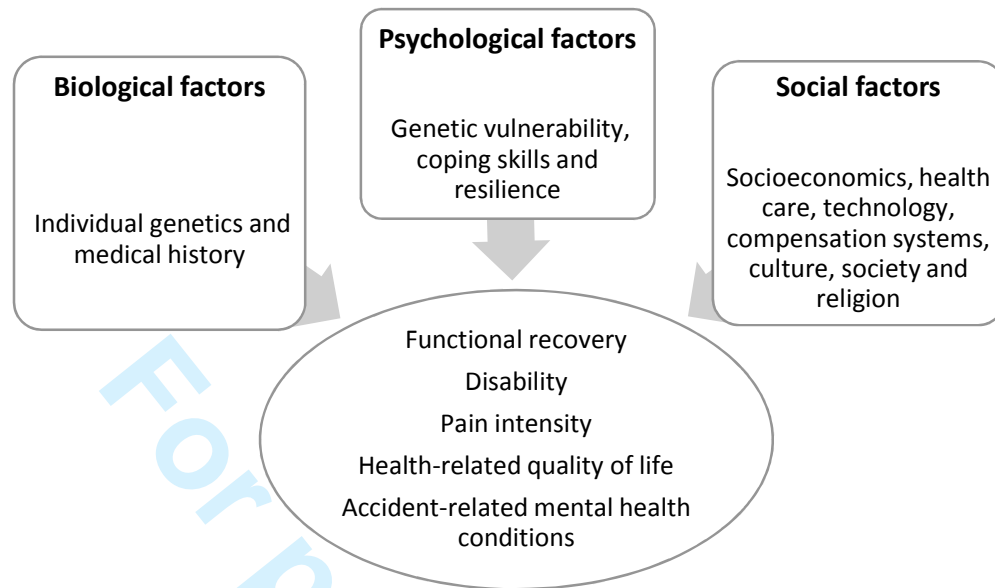
The bias will be assessed using the Scottish Intercollegiate Guideline Network (SIGN) criteria for systematic reviews, randomized controlled trials, cohort studies and case-control studies. This criteria will assist with the evaluation of the impact of selection bias, information bias, and confounding on the results of the study. Two review authors (SS, RR) will independently assess the risk of bias in included studies based on the criteria shown in supplementary document 3.

Analysis

Descriptive analysis

The conceptual framework has been developed to identify biopsychosocial factors impacting recovery and relevant health outcomes (Figure 1). The Cochrane data abstraction criteria will be used to synthesise the results of the included studies.

Figure 1: Conceptual framework for identifying factors impacting recovery based on the biopsychosocial model of health (26).



Statistical analysis

It is predicted that there will be limited capacity to undertake a meta-analysis because of the range of heterogeneity of the factors impacting recovery and the profile of those who have sustained a minor transport-related injury.

Discussion

This review aims to improve methodological understanding of recovery after minor injuries and its associated factors. The review will systematically assess the best available evidence of the biopsychosocial factors hindering recovery following a minor transport-related accident. It aims to provide a detailed description of the range of biological, psychological and social factors and explain in a comprehensive manner why some people with minor injuries do not recover as expected. It will also give a clearer picture of potentially modifiable factors.

The results of this study should form the basis to better understand recovery after minor injury and inform health policy and clinical management about current evidence in the literature.

However, it is to note that there will be challenges in the review process and also in interpreting findings. Firstly, the evaluation of the primary outcomes will depend on the intervention and tools

1
2
3 used to identify these outcomes. Secondly, as some minor injuries do not require hospitalisation,
4
5 less physical evidence will be available for this group. Thirdly, data on compensation status may not
6
7 be investigated as it may not be reported in a sufficient number of studies.
8
9

10 **Ethics and Dissemination:** Ethical approval is not required as primary data will not be collected.
11
12 Review results will be published as a part of thesis, peer-reviewed journal and conferences.
13

14 **Conclusion**

15
16
17 This systematic review will identify gaps in the current knowledge and provide a comprehensive
18
19 summary of why people with minor injuries do not recover as expected based on the
20
21 biopsychosocial model of health.
22
23

24
25 **Systematic Review Trial Registration number:** Systematic review protocol was registered in
26
27 International Prospective Register for Systematic Reviews (PROSPERO) on 14 December 2016.
28
29 Registration number CRD42016052276.
30
31

32 **Supplementary documents:**

- 33 1. Search strategy
- 34 2. Data extraction tool
- 35 3. Criteria for assessing the quality and selection bias of the study adapted from SIGN checklist.
36
37
38
39
40
41
42

43 **Ethics Approval and Dissemination:**

44
45
46 Ethics approval is not required for systematic review as primary data will not be collected. The
47
48 review results will be published as a part of thesis, peer reviewed journal and conference.
49

50 **Funding**

51
52
53
54
55
56
57
58
59
60

1
2
3 SS, Monash ID 26381494 has received CMCRC living allowance and CREPS tuition fee scholarship for
4
5 conducting this PhD study. No funding bodies had any role in study design, data collection and
6
7 analysis, decision to publish, or preparation of the manuscript.
8
9

10 **Competing Interests**

11
12 All the authors declare that they have no competing interests.
13
14

15 **Authors' contributions**

16
17 SS, SE, and RR have contributed in developing the idea and methodology for the systematic review.
18
19 SS registered the protocol with PROSPERO and drafted the first manuscript which was reviewed by
20
21 all the authors. The constructive feedback was given from SE and RR and encompassed in the final
22
23 version. The final version was critically revised by all the authors and finalised by SS. All authors read
24
25 and approved the final manuscript.
26
27
28
29

30 **Authors' information**

31
32 SS- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
33
34 Preventive Medicine, Monash University, The Alfred Centre, Level 6, 99 Commercial Road,
35
36 Melbourne, VIC, Australia 3004.
37
38

39
40 RR- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
41
42 Preventive Medicine, Monash University, The Alfred Centre, Level 6, 99 Commercial Road,
43
44 Melbourne, VIC, Australia 3004.
45
46

47
48 LR- The Ian Potter Library, Ground Floor, AMREP Building, The Alfred, Commercial Road, Melbourne,
49
50 VIC, Australia 3004.
51
52

53
54 SE- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
55
56 Preventive Medicine, Monash University, The Alfred Centre, Level 6, 99 Commercial Road,
57
58 Melbourne,
59
60

1
2
3 VIC, Australia 3004.

4
5 **Acknowledgements**
6

7
8 We would like to thank Capital Markets Cooperative Research Centre and Transport Accident
9
10 Commission for their financial support.
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

References

1. World Health Organisation. World report on road traffic injury prevention. Washington D.C.: World Health Organisation 2004.
2. World Health Organisation. World report on road traffic injury prevention Geneva. Switzerland.2004.
3. Casey PP, Feyer AM, Cameron ID. Identifying predictors of early non-recovery in a compensation setting: The Whiplash Outcome Study. *Injury*. 2011;42(1):25-32.
4. Casey PP, Feyer AM, Cameron ID. Course of recovery for whiplash associated disorders in a compensation setting. *Injury*. 2015;46(11):2118-29.
5. Adams H, Ellis T, Stanish WD, Sullivan MJ. Psychosocial factors related to return to work following rehabilitation of whiplash injuries. *J Occup Rehabil*. 2007;17(2):305-15.
6. Atherton K, Wiles NJ, Lecky FE, Hawes SJ, Silman AJ, Macfarlane GJ, et al. Predictors of persistent neck pain after whiplash injury. *Emergency Medicine Journal*. 2006;23(3):195-201.
7. Buitenhuis J, de Jong PJ, Jaspers JP, Groothoff JW. Work disability after whiplash: a prospective cohort study. *Spine*. 2009;34(3):262-7.
8. Crutebo S, Nilsson C, Skillgate E, Holm LW. The course of symptoms for whiplash-associated disorders in Sweden: 6-month followup study. *J Rheumatol*. 2010;37(7):1527-33.
9. Holm LW, Carroll LJ, Cassidy JD, Skillgate E, Ahlborn A. Expectations for recovery important in the prognosis of whiplash injuries. *PLoS Med*. 2008;5(5):e105.
10. Harris IA, Young JM, Jalaludin BB, Solomon MJ. Predictors of neck pain after motor vehicle collisions: a prospective survey. *J Orthop Surg (Hong Kong)*. 2011;19(3):317-21.
11. Gopinath B, Jagnoor J, Harris IA, Nicholas M, Maher CG, Casey P, et al. Comparison of health outcomes between hospitalised and non-hospitalised persons with minor injuries sustained in a road traffic crash in Australia: a prospective cohort study. *Bmj Open*. 2015;5(9).
12. Berecki-Gisolf J, Collie A, McClure R. Reduction in health service use for whiplash injury after motor vehicle accidents in 2000-2009: results from a defined population. *J Rehabil Med*. 2013;45(10):1034-41.
13. Sullivan MJ, Stanish W, Sullivan ME, Tripp D. Differential predictors of pain and disability in patients with whiplash injuries. *Pain Research & Management*.7(2):68-74.
14. Teasell R, Bayona N, Marshall S, Cullen N, Bayley M, Chundamala J, et al. A systematic review of the rehabilitation of moderate to severe acquired brain injuries. *Brain Inj*. 2007;21(2):107-12.
15. Rosenbloom BN, Khan S, McCartney C, Katz J. Systematic review of persistent pain and psychological outcomes following traumatic musculoskeletal injury. *J Pain Res*. 2013;6.
16. Svestkova O. International classification of functioning, disability and health of World Health Organization (ICF). *Prague Med Rep*. 2008;109(4):268-74.
17. Gopinath B, Jagnoor J, Nicholas M, Blyth F, Harris IA, Casey P, et al. Presence and predictors of persistent pain among persons who sustained an injury in a road traffic crash. *Eur J Pain*. 2015;19(8):1111-8.
18. Gopinath B, Harris IA, Nicholas M, Casey P, Blyth F, Maher CG, et al. A comparison of health outcomes in older versus younger adults following a road traffic crash injury: a cohort study. *PLoS One*. 2015;10(4):e0122732.
19. Berecki-Gisolf J, Collie A, McClure R. Work disability after road traffic injury in a mixed population with and without hospitalisation. *Accid Anal Prev*. 2013;51:129-34.
20. Derrett S, Samaranayaka A, Wilson S, Langley J, Ameratunga S, Cameron ID, et al. Prevalence and predictors of sub-acute phase disability after injury among hospitalised and non-hospitalised groups: a longitudinal cohort study. *PLoS One*. 2012;7(9):e44909.
21. Giummarra MJ, Ioannou L, Ponsford J, Cameron PA, Jennings PA, Gibson SJ, et al. Chronic Pain Following Motor Vehicle Collision: A Systematic Review of Outcomes Associated With Seeking or Receiving Compensation. *Clin J Pain*. 2016;32(9):817-27.
22. Harris IA, Young JM, Jalaludin BB, Solomon MJ. The effect of compensation on general health in patients sustaining fractures in motor vehicle trauma. *J Orthop Trauma*. 2008;22(4):216-20.

23. Murgatroyd DF, Casey PP, Cameron ID, Harris IA. The effect of financial compensation on health outcomes following musculoskeletal injury: systematic review. *PLoS One*. 2015;10(2):e0117597.
24. Ozegovic D, Carroll LJ, Cassidy JD. What influences positive return to work expectation? Examining associated factors in a population-based cohort of whiplash-associated disorders. *Spine (Phila Pa 1976)*. 2010;35(15):E708-13.
25. Collie A, Gabbe B, Fitzharris M. Evaluation of a complex, population-based injury claims management intervention for improving injury outcomes: study protocol. *BMJ Open*. 2015;5(5):e006900.
26. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science*. 1977;196(4286):129-36.

Table 1: Description of the population, intervention, comparison and outcome (PICO) of the Systematic Review

Sl#	PICO	Descriptions
1	Population	<ul style="list-style-type: none"> Injured people who were involved in a transport accident and have sustained one or more minor injuries (e.g. whiplash, contusion, sprain, strain, abrasion, laceration, concussion)
2	Intervention	<p>The main phenomena of interest are articles identifying biopsychosocial factors related to prolonged recovery with following inclusion and exclusion criteria:</p> <p>Articles will be included if they were:</p> <ul style="list-style-type: none"> Describing minor transport-related injuries Describing either biological, psychological and social factors impacting recovery Identifying related health outcomes using one or more BPS models or tools <p>Articles will be excluded if they were:</p> <ul style="list-style-type: none"> Written in a language other than English

		<ul style="list-style-type: none"> • Written prior to 1st January 2000 or after 05th December 2016 • Describing work-related injury, articles on moderate and severe or fatal transport-related injuries • Involving children and describing paediatrics injury • Investigating other type of outcomes (e.g. compensation outcomes, cost-associated outcomes) or the impact on cost and quality of compensation systems
3	Comparison	<p>Comparators:</p> <ul style="list-style-type: none"> • Articles on factors facilitating recovery and health outcomes • Studies without a comparator will be included
4	Outcome	<p>Primary outcome measure is:</p> <ul style="list-style-type: none"> • Functional recovery <p>Secondary outcome measures are:</p> <ul style="list-style-type: none"> • Disability • Pain intensity • Health-related quality of life • Accident-related mental health outcomes • Social outcomes

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Final search MEDLINE

Concept A

Minor injuries (Musculoskeletal and soft tissue)

#	Searches	Results	Type	Actions	Annotations
1	arm injuries/ or forearm injuries/ or wrist injuries/ or back injuries/ or fractures, cartilage/ or hand injuries/ or finger injuries/ or lacerations/ or leg injuries/ or ankle injuries/ or foot injuries/ or knee injuries/ or neck injuries/ or whiplash injuries/ or soft tissue injuries/ or "sprains and strains"/ or tendon injuries/ or contusions/ or head injuries, closed/ or brain concussion/	102856	Advanced	Display Results More	
2	exp Musculoskeletal System/in [Injuries]	101016	Advanced	Display Results More	
3	exp Whiplash Injuries/	3136	Advanced	Display Results More	
4	((head* or neck* or shoulder* or arm* or forearm* or wrist* or hand* or finger* or upper limb* or upper extremit* or back* or pelvis* or pelvic* or leg* or knee* or foot* or ankle* or feet* or lower limb* or lower extremit* or toe*) adj3 (injur* or contusion or concussion* or abrasion* or laceration* or sprain* or strain*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]	120673	Advanced	Display Results More	
5	whiplash*.mp.	3531	Advanced	Display Results More	
6	(minor adj (injur* or contusion or concussion* or abrasion* or laceration* or sprain* or strain*)).mp.	1796	Advanced	Display Results More	
7	1 or 2 or 3 or 4 or 5 or 6	220258	Advanced	Display Results More	

Concept B

Transport-related accident/injury

8	Accidents, Traffic/	40111	Advanced	Display Results More	
9	((car or cars or truck or trucks or automobile* or cyclist* or cycling* or cycle* or pedestrian* or passenger* or driver* or motor* or vehicle* or vehicul* or transport* or traffic*) adj3 (accident* or collision* or crash* or smash*)).mp.	49562	Advanced	Display Results More	
10	8 or 9	49562	Advanced	Display Results More	

Concept C

Types of studies including limitations to English language and year 2000 – current

[-] <input checked="" type="checkbox"/> Clinical Studies as topic		20	
[-] <input checked="" type="checkbox"/> Epidemiologic Studies		7951	<input type="checkbox"/>
[-] <input checked="" type="checkbox"/> Case-Control Studies		250992	<input type="checkbox"/>
<input checked="" type="checkbox"/> Retrospective Studies		643251	<input type="checkbox"/>
[-] <input checked="" type="checkbox"/> Cohort Studies		233587	<input type="checkbox"/>
<input checked="" type="checkbox"/> Follow-Up Studies		595124	<input type="checkbox"/>
[-] <input checked="" type="checkbox"/> Longitudinal Studies		120932	<input type="checkbox"/>
<input type="checkbox"/> National Longitudinal Study of Adolescent Health		125	<input type="checkbox"/>
<input checked="" type="checkbox"/> Prospective Studies		464937	<input type="checkbox"/>
<input checked="" type="checkbox"/> Retrospective Studies		643251	<input type="checkbox"/>
<input type="checkbox"/> Controlled Before-After Studies		208	<input type="checkbox"/>
<input checked="" type="checkbox"/> Cross-Sectional Studies		255004	<input type="checkbox"/>
<input type="checkbox"/> Historically Controlled Study		87	<input type="checkbox"/>

<input type="checkbox"/>	11	7 and 10	10964	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	12	epidemiologic studies/ or case-control studies/ or retrospective studies/ or cohort studies/ or follow-up studies/ or longitudinal studies/ or prospective studies/ or cross-sectional studies/	2109829	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	13	qualitative research/	33787	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	14	case control.mp.	277453	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	15	((follow up or followup) adj (study or studies)).mp.	612199	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	16	(observational adj (study or studies)).mp.	82240	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	17	((observational or prospective or retrospective) adj (study or studies)).mp.	1191717	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	18	Cross sectional.mp.	324661	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	19	(cohort adj (study or studies)).mp.	296992	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	20	(qualitative adj (study or studies)).mp.	23731	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	21	12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20	2331533	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	22	11 and 21	3108	Advanced	Display Results	More	<input type="checkbox"/>
<input type="checkbox"/>	23	limit 22 to (english language and humans and yr="2006 -Current")	1401	Advanced	Display Results	More	<input type="checkbox"/>



The Cochrane Public Health Group

Data Extraction and Assessment Template

This form suggests elements which should be addressed in your review and is to be modified in keeping with the following instructions. Some questions may be changed from open-ended questions to specific data items where appropriate. Refer to the Cochrane Handbook when undertaking modifications to this form.

Sections can be expanded and irrelevant sections can be removed. It is difficult to design a single form that meets the needs of all reviews. It is therefore important that you consider your needs carefully prior to data extraction and pilot your process. Elements within the template are not intended for use as a scoring system. The components of the *Risk of Bias Table* have been incorporated into this form. Criteria for judging risk of bias as well as examples of appropriate methods of addressing each form of bias are provided in Chapter 8 of the Cochrane Handbook, particularly Table 8.5.c. For tips on how to enter data into RevMan 5, see “Risk of Bias” tables in the RevMan User Guide. If you are using an additional quality assessment tool you will need to add appropriate questions to reflect the additional components.

Notes on using a data extraction form:

- Pilot the Data Extraction Form you plan on using (and note in your protocol that it will, or has, been piloted)
- Be consistent in the order and style you use to describe the information. This will make it easier to complete the Table of Included Studies, prevent you from overlooking information and make reading of the review easier.
- Highlight any missing information as unclear or not described, to make it clear to the reader of your review that the information was not included in the description of the study, not that you forgot to extract it.
- You should include instructions and decision rules on the data collection form. It is crucial that you practice using the form and receive, or give, training if the form was designed by someone other than the person using it.

Cochrane Public Health Group Data Extraction and Assessment Template (*modify to suit your review*)

Study ID:	Report ID :	Date form completed:
First author:	Year of study:	Data extractor:
Citation:		

1. General Information

Publication type	Journal Article <input type="checkbox"/> Abstract <input type="checkbox"/> Other (specify e.g. book chapter) _____
Country of study:	
Funding source of study:	Potential conflict of interest from funding? Y / N / unclear

2. Study Eligibility

Study Characteristics		Page/ Para/ Figure #
Type of study (Review authors to add/remove designs based on criteria specified in protocol)	<input type="checkbox"/> Randomised Controlled Trial (RCT) <input type="checkbox"/> Cluster Randomised Controlled Trial (cluster RCT)	<input type="checkbox"/> Controlled Before and After (CBA) study <ul style="list-style-type: none"> • Contemporaneous data collection • Comparable control site • At least 2 x intervention and 2 x control clusters
	<input type="checkbox"/> Interrupted Time Series (ITS) <ul style="list-style-type: none"> • At least 3 time points before and 3 after the intervention • Clearly defined intervention point 	<input type="checkbox"/> Other design (specify):
	<input type="checkbox"/> A process evaluation of an included study design	<i>Does the study design meet the criteria for inclusion?</i> Yes <input type="checkbox"/> No <input type="checkbox"/> → Exclude Unclear <input type="checkbox"/>
	Description in text:	
Participants (Review authors insert inclusion criteria as defined in Protocol)	Describe the participants included:	
	Are participants defined as a group having specific social or cultural characteristics?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unclear <input type="checkbox"/> Details:
	How is the geographic boundary defined?	Details: Specific location (e.g. state / country):
	<i>Do the participants meet the criteria for inclusion?</i>	Yes <input type="checkbox"/> No <input type="checkbox"/> → Exclude Unclear <input type="checkbox"/>

Types of intervention (Review authors insert inclusion criteria as defined in Protocol)	Strategies included in the intervention			
	Focus of the intervention			
	<i>Does the intervention meet the criteria for inclusion?</i>		Yes <input type="checkbox"/> No <input type="checkbox"/> → Exclude Unclear <input type="checkbox"/>	
Duration of intervention	Start date:	Stop date:	Intervention duration:	
	<i>Is the duration of intervention adequate for inclusion?</i>		Yes <input type="checkbox"/> No <input type="checkbox"/> → Exclude Unclear <input type="checkbox"/>	
Types of outcome measures (Review authors insert inclusion criteria as defined in Protocol)	List outcomes:			
	Outcome measured at a population level or individual level?		Details:	
	<i>Do the outcome measures meet the criteria for inclusion?</i>		Yes <input type="checkbox"/> No <input type="checkbox"/> → Exclude Unclear <input type="checkbox"/>	

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Summary of Assessment for Inclusion

Include in review <input type="checkbox"/>		Exclude from review <input type="checkbox"/>	
Independently assessed, and then compared? No <input type="checkbox"/>	Yes <input type="checkbox"/>	Differences resolved	Yes <input type="checkbox"/> No <input type="checkbox"/>
Request further details?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Contact details of authors:	
Notes:			

DO NOT PROCEED IF PAPER EXCLUDED FROM REVIEW

3. Study details

Study intention	Descriptions as stated in the report/paper	Page/ Para/ Figure #
Aim of intervention	<i>What was the problem that this intervention was designed to address?</i>	
Aim of study	<i>What was the study designed to assess? Are these clearly stated?</i>	
Equity pointer: Social context of the study	<i>e.g. was study conducted in a particular setting that might target/exclude specific population s? See also Inclusion/exclusion criteria under Methods, below.</i>	
Start and end date of the study	<i>Identify which elements of planning of the intervention should be included</i>	
Total study duration		

Methods	Descriptions as stated in the report/paper	Page/ Para/ Figure #
Method/s of recruitment of participants <i>(How were potential participants approached and invited to participate? Where were participants recruited from? Does this differ from the intervention setting?)</i>		
Inclusion/exclusion criteria for participation in study		
Representativeness of sample: Are participants in the study likely to be representative of the target population?		
Total number of intervention groups		
Assumed risk estimate <i>(e. .baseline or population risk noted in Background)</i>	<i>References:</i>	
Sample size calculation: What assumptions were made? Were these assumptions appropriate?	<i>(Yes/No/Unclear)</i>	

What was the unit of randomisation? Allocation by individuals or cluster/groups		
What was the unit of analysis? Is this the same as the unit of randomisation?	(Yes/No/Unclear)	
Statistical methods used and appropriateness of these methods	(Check with your statistician if unsure about appropriateness)	

Results

Participants <i>Include if relevant</i>	Include information for each group (i.e. intervention and controls) under study	Page/ Para/ Figure #
<ul style="list-style-type: none"> What percentage of selected individuals agreed to participate? 		
<ul style="list-style-type: none"> Total number randomised (or total pop. at start of study for NRCTs) 		
<ul style="list-style-type: none"> Number allocated to each intervention group (no. of individuals) 		
<ul style="list-style-type: none"> For cluster trials, number of clusters, number of people per cluster 		
<ul style="list-style-type: none"> Where there any significant baseline imbalances? 	Yes <input type="checkbox"/> No <input type="checkbox"/> Unclear <input type="checkbox"/> Details:	
<ul style="list-style-type: none"> Number and reason for (and sociodemographic differences of) withdrawals and exclusions for each intervention group 		
<ul style="list-style-type: none"> Were patients who entered the study adequately accounted for? 		
<ul style="list-style-type: none"> What percentage of patients completed the study? 		
<ul style="list-style-type: none"> What percentage of participants received the allocated intervention or exposure of interest? 		
<ul style="list-style-type: none"> Is the analysis performed by intervention allocation status (intention to treat) rather than the actual intervention received? Have any attempts been made to impute missing data? 		
<ul style="list-style-type: none"> Age (median, mean and range if possible) 		
<ul style="list-style-type: none"> Sex 		

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

• Race/Ethnicity		
• Principal health problem (incl. stage of illness)		
• Diagnostic criteria		
• Co-morbidity		
• Other sociodemographics (eg. Educational level, literacy level, soci-economic status, first language. Also consider possible proxies for these e.g. low baseline nutritional status)		
• PROGRESS categories reported at baseline (indicate letters of those reported: Place of residence, race, occupation, gender, religion, education, SES, social capital)		
Subgroups	<i>Enter a description of any participant subgroups from this paper to be analysed in the review.</i>	

Intervention Group 1

(copy and paste table for each Intervention group)

Group name:	<i>(State brief name for this intervention group.)</i>	Page/ Para/ Figure #
Details of intervention or control condition <i>(Include if relevant in sufficient detail for replication)</i>		
• Setting eg multicentre, university teaching hospitals, rural, metropolitan, school, workplace, community, GP clinic, etc.		
• Theoretical basis (include key references)		
• Content (list the strategies intended and delivered)		
• Did the intervention include strategies to address diversity/disadvantage?	<i>Enter a description of any relevant strategies</i>	
• Delivery (eg. Stages (sequential or simultaneous), timing, frequency, duration, intensity,		

Question	Outcome 1	Page/ Para/ Figure #	Outcome 2	Page/ Para/ Figure #
Is there an analytic framework applied (e.g. logic model, conceptual framework)?				
Outcome definition (with diagnostic criteria if relevant)				
Type of outcome: Is this a modifiable variable (Community level, neighbourhood level, individual level) or desired health outcome				
Time points measured				
Time points reported				
Is there adequate latency for the outcome to be observed?				
Is the measure repeated on the same individuals or redrawn from the population / community for each time point?				
Unit of measurement (if relevant)				
For scales – upper and lower limits and indicate whether high or low score is good				
How is the measure applied? Telephone survey, mail survey, in person by trained assessor, routinely collected data, other				
How is the outcome reported? Self or study assessor				
Is this outcome/tool validated?				
...And has it been used as validated?				
Is it a reliable outcome measure?				
Is there adequate power for this outcome?				

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Were PROGRESS categories analysed by outcome? Indicate the letters of those that outcomes were analysed by (place of residence, race, occupation, gender, religion, education, SES, social capital)				
---	--	--	--	--

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Results

Copy and paste the appropriate table for each outcome and subgroup at each timepoint, including baseline

For RCT/CCT**Dichotomous outcome**

page/para/fig

Comparison					
Outcome					
Subgroup					
Timepoint					
Results	Intervention		Comparison		
	Events	No. participants	Events	No. participants	
No. of missing participants and reasons					
Any other results reported					
Reanalysis required? (specify - (e.g. correlation adjustment)					
Reanalysis possible?	<i>yes/no/unclear</i>				
Reanalysed results					

For RCT/CCT**Continuous****outcome**

page/para/fig

Comparison							
Outcome							
Subgroup							
Timepoint							
Post-intervention or change from baseline?							
Results	Intervention			Comparison			
	Mean	SD (or other variance)	No. participants	Mean	SD (or other variance)	No. participants	
No. missing participants and reasons							

Any other results reported		
Reanalysis required? (specify)		
Reanalysis possible?	<i>yes/no/unclear</i>	
Reanalysed results		

For RCT/CCT

Generic inverse variance method

					Page/para/figure
Comparison					
Outcome					
Subgroup					
Timepoint					
Results	Effect estimate	SE (or other variance)	Intervention no.	Control no.	
No. missing participants and reasons					
Any other results reported					
Reanalysis required? (specify)					
Reanalysis possible?	<i>yes/no/unclear</i>				
Reanalysed results					

For CBA

			Page/para/fig
Comparison			
Assignment	How were control and treatment groups selected?? Is there likely to be an effect if these were the opposite way?		
	Contemporaneous data collection?		
Outcome			
Subgroup			
Timepoint			
Post-intervention or change from baseline?			
	Intervention	Comparison	
No. participants measured			

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

No. missing participants and reasons			
Baseline result (with variance measure)			
Post-intervention results (with variance measure)			
Change (Post – baseline) (with variance measure)			
Difference in change (intervention – control) (with variance measure)			
Any other results reported			
Reanalysis required? (specify)			
Reanalysis possible?	<i>yes/no/unclear</i>		
Reanalysed results			

For ITS**Generic inverse variance method**

Page/para/fig

Comparison		
Outcome		
Subgroup		
Length of timepoints measured		
Snapshot or interval measured		
No. participants measured		
No. missing participants and reasons		
	Pre-intervention	Post-intervention
No. of timepoints measured		

Mean value (with variance measure)				
Difference in means (post – pre)				
Percent relative change				
Result reported by authors (with variance measure)				
Reanalysis required? (specify)				
Reanalysis possible?	<i>yes/no/unclear</i>			
Individual time point results				
Read from figure?	<i>yes/no</i>			
Reanalysed results	Change in level	SE	Change in slope	SE

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Other relevant information

Were outcomes relating to harms/unintended effects of the intervention described? Include any data for these in the outcomes tables above		
Potential for author conflict <i>ie. evidence that author or data collectors would benefit if results favoured the intervention under study or the control</i>		
Key conclusions of the study authors		
Could the inclusion of this study potentially bias the generalisability of the review? Equity pointer: Remember to consider whether disadvantaged populations may have been excluded from the study.		
Is there potential for differences in relative effects between advantaged and disadvantaged populations? (e.g. are children from lower income families less likely to wear bicycle helmets)		
Are interventions likely to be aimed at the disadvantaged? (e.g. school meals aimed at poor children).		
Issues affecting directness (<i>Note any aspects of population, intervention, etc. that affect this study's direct applicability to the review question</i>)		
References to other relevant studies		
Additional notes by review authors		
Correspondence required for further study information (from whom, what and when)		

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Risk of bias assessment

Please refer to Chapter 8 - *Table 8.5.c: Criteria for judging risk of bias in the 'Risk of bias' assessment tool and to the Cochrane EPOC Group's guidance for assessing Risk of bias for studies with a separate control group (RCTs, CCTs, CBAs) and Risk of bias for interrupted time series studies* (Appendix 3) for additional guidance for scoring Yes/No/Unclear. Note that the table below includes items from both EPOC tools. The ITS tool has been incorporated into the bottom of the table and all items for ITS studies are denoted by ITS preceding the risk of bias question.

Domain	Review authors' judgement*	Description	Page/ Para/ Figure #
Was the allocation sequence adequately generated?	Yes / No / Unclear	<i>Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.</i>	
Was allocation adequately concealed?	Yes / No / Unclear	<i>Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.</i>	
Were baseline outcome measurements similar?	Yes/No/Unclear	<i>Note whether baseline outcome measurements were reported and whether there were any important differences between groups. If there were important differences between groups, note whether appropriate adjusted analysis was performed to account for this.</i>	
Were baseline characteristics similar?	Yes/No/Unclear	<i>Note whether baseline characteristics were reported and whether there were any important differences between groups.</i>	
Were incomplete outcome data adequately addressed? <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Yes / No / Unclear	<i>Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.</i>	
Was knowledge of the allocated intervention adequately prevented during the study? <i>Separate assessments should be made for</i>	Yes / No / Unclear	<p><i>Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective, or whether blinding was appropriate.</i></p> <ul style="list-style-type: none"> • Participants – yes, no, unclear [<i>record supporting statement from study</i>]. • Investigators – yes, no, unclear [<i>record supporting statement from study</i>]. 	

1 2 3 4 5 6 7 8 9	relevant groups of people involved in the study i.e participants, outcome assessors, investigators, data assessors etc		<ul style="list-style-type: none"> Outcomes assessors – yes, no, unclear [<i>record supporting statement from study</i>]. <p>Data assessors – yes, no, unclear [<i>record supporting statement from study</i>].</p>	
10 11 12 13 14 15 16 17	Was the study adequately protected against contamination?	Yes/No/Unclear	State whether and how the possibility of contamination was minimised by the study design/implementation.	
18 19 20 21 22 23 24 25 26 27	Are reports of the study free of suggestion of selective outcome reporting? Assessments should be made for each main outcome (or class of outcomes).	Yes / No / Unclear	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.	
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44	Other sources of bias •	Yes / No / Unclear	State any important concerns about bias not addressed in the other domains in the tool.	
45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	ITS: Was the intervention independent of other changes?	Yes/No/Unclear	Describe whether or not the intervention occurred independently of other changes over time and whether or not the outcomes may have been influenced by other confounding variables/historic events during the study period.	

<p>ITS: Was the shape of the intervention effect pre-specified?</p>	<p>Yes/No/Unclear</p>	<p><i>State whether or not the point of analysis was the point of intervention. If not, describe whether a rationale for the shape of the intervention effect was given by the study authors.</i></p>	
<p>ITS: Was the intervention unlikely to affect data collection?</p>	<p>Yes/No/Unclear</p>	<p><i>Describe whether or not the intervention was likely to affect data collection and what the potential impact might have been.</i></p>	
<p>ITS: Was knowledge of the allocated interventions adequately prevented during the study?</p> <p><i>Separate assessments should be made for relevant groups of people involved in the study i.e participants, outcome assessors, investigators, data assessors etc</i></p>	<p>Yes/No/Unclear</p>	<p><i>Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective, or whether blinding was appropriate.</i></p> <ul style="list-style-type: none"> • Participants – yes, no, unclear <i>[record supporting statement from study].</i> • Investigators – yes, no, unclear <i>[record supporting statement from study].</i> • Outcomes assessors – yes, no, unclear <i>[record supporting statement from study].</i> <p>Data assessors – yes, no, unclear <i>[record supporting statement from study].</i></p>	
<p>ITS: Was incomplete outcome data adequately addressed?</p> <p><i>Assessments should be made for each main outcome (or class of outcomes).</i></p>	<p>Yes/No/Unclear</p>	<p><i>Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.</i></p>	
<p>ITS: Was the study free from selective reporting?</p>	<p>Yes/No/Unclear</p>	<p><i>State how the possibility of selective outcome reporting was examined by the review authors, and what was found.</i></p>	

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

<p>ITS: Was the study free from other risks of bias?</p>	<p>Yes/No/Unclear</p>	<p>State any important concerns about bias not addressed in the other domains in the tool.</p>	
--	-----------------------	--	--

* Note: For each section above 'Yes' indicates a 'low risk of bias'; 'No' indicates a 'high risk of bias'; 'Unclear' indicates an 'uncertain risk of bias'. When entering the data into RevMan, the options to choose from will be 'Low', 'High' and 'Unclear'

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Results

Comparison: _____

Outcome: _____

Subcategory: _____

Treatment group:		Control group:	
Observed (n)	total (N)	observed (n)	total (N)

	Treatment group:	Control group:
Total randomised		
excluded*		
Observed		
lost to follow up*		


*Reasons for loss/exclusion:

Subcategory: _____

Treatment group:		Control group:	
Observed (n)	total (N)	observed (n)	total (N)

	Treatment group:	Control group:
Total randomised		
excluded*		
Observed		
lost to follow up*		

*Reasons for loss/exclusion

	Methodology Checklist 1: Systematic Reviews and Meta-analyses	
SIGN	SIGN gratefully acknowledges the permission received from the authors of the AMSTAR tool to base this checklist on their work: <i>Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Medical Research Methodology 2007, 7:10 doi:10.1186/1471-2288-7-10. Available from http://www.biomedcentral.com/1471-2288/7/10 [cited 10 Sep 2012]</i>	
Study identification (<i>Include author, title, year of publication, journal title, pages</i>)		
Guideline topic:		Key Question No:
Before completing this checklist, consider: Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO reject. IF YES complete the checklist.		
Checklist completed by:		
Section 1: Internal validity		
<i>In a well conducted systematic review:</i>		<i>Does this study do it?</i>
1.1	The research question is clearly defined and the inclusion/ exclusion criteria must be listed in the paper.	Yes <input type="checkbox"/> No <input type="checkbox"/> If no reject
1.2	A comprehensive literature search is carried out.	Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable <input type="checkbox"/> If no reject
1.3	At least two people should have selected studies.	Yes <input type="checkbox"/> No <input type="checkbox"/> Can't say <input type="checkbox"/>
1.4	At least two people should have extracted data.	Yes <input type="checkbox"/> No <input type="checkbox"/> Can't say <input type="checkbox"/>
1.5	The status of publication was not used as an inclusion criterion.	Yes <input type="checkbox"/> No <input type="checkbox"/>
1.6	The excluded studies are listed.	Yes <input type="checkbox"/> No <input type="checkbox"/>
1.7	The relevant characteristics of the included studies are provided.	Yes <input type="checkbox"/> No <input type="checkbox"/>

1.8	The scientific quality of the included studies was assessed and reported.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1.9	Was the scientific quality of the included studies used appropriately?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1.10	Appropriate methods are used to combine the individual study findings.	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Not applicable <input type="checkbox"/>
1.11	The likelihood of publication bias was assessed appropriately.	Yes <input type="checkbox"/> Not applicable <input type="checkbox"/>	No <input type="checkbox"/>
1.12	Conflicts of interest are declared.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	What is your overall assessment of the methodological quality of this review?	High quality (++) <input type="checkbox"/> Acceptable (+) <input type="checkbox"/> Low quality (-) <input type="checkbox"/> Unacceptable – reject 0 <input type="checkbox"/>	
2.2	Are the results of this study directly applicable to the patient group targeted by this guideline?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
2.3	Notes:		



PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Yes
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Yes
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	Yes
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	Yes
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Yes
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Yes
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Yes
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Yes
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	Yes
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	Yes
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Yes
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Yes
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2 for each meta-analysis).	



PRISMA 2009 Checklist

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: www.prisma-statement.org.

BMJ Open

Biopsychosocial factors impacting recovery after a minor transport-related injury: protocol for a systematic review

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2017-016314.R1
Article Type:	Protocol
Date Submitted by the Author:	29-May-2017
Complete List of Authors:	Samoborec, Stella; Monash University Faculty of Medicine Nursing and Health Sciences, Department of Epidemiology and Preventive Medicine Ruseckaite, Rasa; Monash University Faculty of Medicine Nursing and Health Sciences, Department of Epidemiology and Preventive Medicine Romero, Lorena ; The Ian Potter Library, Ground Floor, AMREP Building, The Alfred Evans, Sue; Monash University, Department of Epidemiology and Preventive Medicine
Primary Subject Heading:	Rehabilitation medicine
Secondary Subject Heading:	Public health, Epidemiology
Keywords:	EPIDEMIOLOGY, PREVENTIVE MEDICINE, TRAFFIC ACCIDENTS, INJURY

SCHOLARONE™
Manuscripts

1
2
3 1 **Title page**

4
5
6 2 Biopsychosocial factors impacting recovery after a minor transport-related injury: protocol for a
7
8 3 systematic review

9
10
11 4 **Corresponding author**

12
13 5 Stella Samoborec BBMed, MBMedSc - Epidemiology

14
15
16 6 Department of Epidemiology and Preventive Medicine (DEPM)

17
18
19 7 School of Public Health and Preventive Medicine, Monash University,

20
21
22 8 553 St Kilda Road, Melbourne, VIC, Australia 3004

23
24
25 9 Phone +61399030021

26
27
28 10 Fax +61399030556

29
30
31 11 Email: stella.samoborec@monash.edu

32
33 12 **Authors:**

34
35
36 13 Rasa Ruseckaite, BSc, MSc, PhD, Senior Research Fellow, DEPM, School of Public Health and
37
38 14 Preventive Medicine, Monash University,

39
40
41 15 553 St Kilda Road, Melbourne, VIC, Australia 3004.

42
43 16 rasa.ruseckaite@monash.edu

44
45 17

46
47 18 Lorena Romero, BA, MBIT, Senior Medical Librarian, The Ian Potter Library, Ground Floor, AMREP

48
49 19 Building, The Alfred, Commercial Road, Melbourne, VIC, Australia 3004.

50
51 20 L.Romero@alfred.org.au

52
53 21

54
55 22 Sue M Evans, BN, Master Clinical Epidemiology, PhD FAAQHC, Associate Professor, Head, Clinical

56
57 23 Registry Unit

1
2
3 24 Associate Director, CRE in Patient Safety, DEPM, School of Public Health and Preventive Medicine,
4
5 25 Monash University,
6
7 26 553 St Kilda Road, Melbourne, VIC, Australia 3004.
8
9 27 sue.evans@monash.edu
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

1
2
3 50 **Abstract:**
4

5 51 **Introduction:** Globally, road transport accidents contribute substantially to the number of deaths
6
7 52 and also to the burden of disability. Up to 50 million people suffer a transport-related non-fatal
8
9 53 injury each year, which often leads to long-term disability.

10
11 54 It has been shown that substantial number of people with minor injuries struggles to recover and
12
13 55 the reasons are still not well explored.

14
15
16 56 Despite the high prevalence, little is known about the factors facilitating or hindering recovery
17
18 57 following minor transport-related injuries. The aim of this paper is to present a protocol for the
19
20 58 systematic review aiming to understand biopsychosocial factors related to protracted recovery and
21
22 59 identify current gaps in the literature.

23
24 60 **Methods and analysis:** The review will be conducted in compliance with the Preferred Reporting
25
26 61 Items for Systematic Reviews and Meta-Analyses (PRISMA -P) guidelines. A search of the electronic
27
28 62 databases, MEDLINE, EMBASE, Cochrane Central Register of Controlled trials (CENTRAL), will be
29
30 63 undertaken, in addition to Google Scholar and grey literature to identify studies in period from 2006
31
32 64 to 2016. Quantitative and qualitative research articles describing and identifying biopsychosocial
33
34 65 factors impacting recovery and health outcomes such as functional recovery, disability, pain intensity,
35
36 66 health-related quality of life, psychological and social outcomes will be included. A conceptual
37
38 67 framework developed to identify biopsychosocial factors will be applied to assure defined criterion.
39
40 68 A narrative synthesis based on study findings will be conducted. At present, there is little
41
42 69 anticipation for meta-analyses due to the heterogeneity of factors and outcomes assessed.

43
44 70 **Ethics and dissemination:** Ethical approval is not required as primary data will not be collected.
45
46 71 Review results will be published as a part of thesis, peer-reviewed journal and conferences.
47
48 72

49
50
51
52 73 **Strengths and limitations of the study**

53
54 74 This will be the first systematic review evaluating all associated biopsychosocial factors impacting
55
56 75 recovery across the different types of minor transport-related injuries.
57
58
59
60

1
2
3 76 The review has distinct inclusion criteria and clearly outlines how the items will be selected and
4
5 77 abstracted.

6
7 78 The review aims to offer highest level of evidence on factors deterring recovery after minor traffic-
8
9 79 related injuries.

10
11 80 However, due to the variety of factors and relevant outcomes, comparison of the outcomes may not
12
13 81 be possible.

14
15 82 The potential issue of heterogeneity across the studies may affect the study results.

16 17 83 **Introduction**

18
19
20 84 Worldwide, road transport accidents contribute substantially to the number of deaths and also to
21
22 85 the burden of disability. The World Health Organisation (WHO) estimates that by 2020 road
23
24 86 accidents will be the third leading cause of disability (1). According to WHO data, deaths from road
25
26 87 traffic injuries account for around 25% of all deaths from injury (2).

27
28
29 88 Minor injuries are the most recurrently reported injuries following a transport-related accident (3).

30
31
32 89 While the number will fluctuate between countries, the literature suggest that the total incidence of
33
34 90 minor injuries (musculoskeletal and soft tissue) has increased in the last 30 years (4). Whiplash and
35
36 91 Whiplash Associated Disorder (WAD) are the most frequently reported minor injuries following a
37
38 92 transport accident (3, 5-10). Other minor injuries include whiplash, contusions, skin abrasions,
39
40 93 lacerations, sprains and strains, as defined by Minor Injury Guidelines. The guideline defines a Minor
41
42 94 injury as follows: "minor injury means a sprain, strain, whiplash associated disorder, contusion,
43
44 95 abrasion, laceration or subluxation and any clinically associated sequelae. This term is to be
45
46 96 interpreted to apply where a person sustains any one or more of these injuries" (11). Despite a
47
48 97 substantial amount of WAD epidemiology and treatment research, understanding factors that
49
50 98 facilitate or hinder recovery for WAD and other minor injuries is scant (5).

51
52
53 99 The complexity, and heterogeneity of the profile, of those suffering minor injuries are reasons to
54
55 100 explain why many people do not recover as expected (12). It has been estimated that approximately

1
2
3 101 half of the patients with minor injuries may never completely recover (13) and large proportion of
4
5 102 people with Whiplash Associated Disorder (WAD) would suffer psychological distress for at least 3
6
7 103 years post-accident (14).
8
9

10 104 In Victoria, while preventive methods have been directed to patients with major injuries there are
11
12 105 no preventive recommendations and rehabilitative guidelines for patients with minor injuries. Yet, it
13
14 106 is believed that there is much to be achieved by understanding factors and interventions aimed at
15
16 107 reducing long-term disability, and improving recovery for those who have sustained minor injuries
17
18 108 (15). It is also important to note that there are various complexities in treating and managing
19
20 109 patients with minor injuries. Although it is expected that not everyone who sustains a minor injury
21
22 110 will develop persistent symptoms, cautious consideration is required to understand and identify in a
23
24 111 timely manner those patients with minor injuries who are at high risk of protracted recovery.
25
26
27

28 112 **Minor transport-related musculoskeletal injuries**

29
30
31 113 The severity of injuries between different groups and patients are compared according to different
32
33 114 scales. Numerous injury severity scales exist in practice and in the literature. However, the
34
35 115 assessment of motor vehicle injuries relies mainly on the Abbreviated Injury Scale (AIS) (16). AIS is
36
37 116 the first broadly implemented injury severity scale used in practice and is primarily an anatomical
38
39 117 measure of injury severity. It classifies severity on the basis of the region of the body injured and the
40
41 118 degree of the injury in that particular body region. For example, an AIS score of 1 interprets a minor
42
43 119 injury, while an AIS score of 6 is considered as a non-survivable injury. It is important to note that the
44
45 120 scores from 1 to 6 do not reflect an interval scale, and comparable AIS scores may not be similar
46
47 121 across different body regions. In summary, a higher severity score indicates a gradually more severe
48
49 122 injury (17).
50
51
52

53 123 The most common types of minor transport-related injuries are musculoskeletal and/or soft tissue
54
55 124 injuries (18). Musculoskeletal injuries refer to those which affect muscles, bones, joints, tendons,
56
57 125 ligaments, cartilage and spinal discs. Soft tissue injuries can arise in any soft tissue in the body. If
58
59
60

1
2
3 126 they occur in the skin they are known as contusions, in the muscle they are identified as strains, and
4
5 127 in the tendons and ligaments they are recognized as sprains (19). While some of these injuries are
6
7 128 benign and do not require complex treatments, others may lead to chronic and persistent challenges
8
9 129 (20, 21). The cause of protracted symptoms are thought to be complex and multifactorial. According
10
11 130 to the literature, these conditions are often shown to be painful and require medical intervention.
12
13 131 Minor injuries are usually treated in primary health care. However some require specialist
14
15 132 intervention, treatment and, in some cases, hospitalisation (22). It is to note that there is no current
16
17 133 evidence of types and number of medical treatments which would be most beneficial for patients
18
19 134 with minor traffic-related injuries.

22 23 135 **Rationale and objectives**

24
25
26 136 There is still paucity of research into predictors and determinants of recovery following minor
27
28 137 injuries. In clinical practice there remains a lack of recognition that patients with minor injury may
29
30 138 have a slow recovery and long-term adverse biopsychosocial consequences (3). Previous research
31
32 139 demonstrates differences in patient's recovery outcomes and identifies a number of factors leading
33
34 140 to long-term disability and poor health outcomes (23-27). However, the results are not consisted
35
36 141 and generalisable to larger population. It is evident that more research is needed to understand and
37
38 142 investigate whether early identification of the most predictive factors could reduce chronicity and
39
40 143 long-term disability. It is also believed that the quality of management of the most common types of
41
42 144 minor injuries should be improved (28). In conclusion, these patients should be identified as early as
43
44 145 possible in their injury trajectory so that active support and management can be provided.

45
46
47
48 146 The objectives of the proposed systematic review are to identify and assess biopsychosocial factors
49
50 147 and relevant predictors of recovery and determine the benefits of using Biopsychosocial model (BPS)
51
52 148 or approach on identifying health outcomes after minor transport-related injury.

53 54 55 149 **Methods and analyses:**

1
2
3 150 A detailed description on population, intervention, comparison and outcome (PICO) of the
4
5 151 systematic review is outlined in Table 1 and described below:
6
7

8 152 **Inclusion criteria:**

9
10 153 Articles will be included if they are:

- 11
12
13
14 154 • Investigating patients sustained minor transport-related injury
15
16 155 • Assessing biological, psychological and social factors as defined by Biopsychosocial model of
17
18 156 health (29)
19
20 157 • Using Biopsychosocial model of health as a core model or approach for identifying health
21
22 158 outcomes
23
24 159 • Published in English language
25
26
27 160 • Published in the last decade (from 1st January 2006 to 05th December 2016).
28

29
30 161 **Exclusion criteria:**

31
32 162 Articles will be excluded if they were:

- 33
34
35 163 • Published in a language other than English
36
37 164 • Published prior to 1st January 2006 or after 05th December 2016
38
39 165 • Describing work-related injury
40
41 166 • Involving children and describing paediatrics injuries
42
43 167 • Describing moderate and severe or fatal transport-related injuries (based on Abbreviated
44
45 168 Injury Scale scores of 2-6)
46
47 169 • Investigating other type of outcomes (e.g. compensation outcomes such as cost or impact on
48
49 170 cost and quality of compensation systems or services)
50
51 171 • Unpublished manuscripts, dissertations, books and book chapters, conference proceedings,
52
53 172 meeting abstracts, and guideline statements will be excluded.
54
55
56
57

58 173 **Study design**
59
60

1
2
3 174 Quantitative (e.g. cohort, longitudinal, case studies, prospective and retrospective) and qualitative
4
5 175 studies (e.g. ethnography, phenomenological, grounded theory and case report) exploring
6
7 176 biopsychosocial factors impacting recovery and related health outcomes in patients with minor
8
9 177 transport-related injury will be included. Mixed methods research articles will also be included in the
10
11 178 review.

14 179 **Comparator(s)/control**

17 180 Comparators such as positive factors and factors enabling recovery after minor transport-related
18
19 181 accident will be considered for inclusion.

22 182 **Context**

23
24 183 Studies conducted in the clinical environments such as acute care (emergency departments), and
25
26 184 sub-acute care (primary health care, pain clinics, rehabilitation centres) will be included. Settings
27
28 185 such as insurance databases and registries will also be included.

32 186 **Outcome measure/outcome of interest**

33
34 187 The following outcomes will be investigated:

- 35
36
37
38 188 • Functional recovery (e.g. return to work, or independence, or usual activities)
39
40 189 • Disability (e.g. temporary, long-term, permanent)
41
42 190 • Pain intensity (e.g. low, moderate, severe)
43
44 191 • Health-related quality of life (e.g. poor, good)
45
46 192 • Psychological outcomes (e.g. depression, fear, sleep disorder, anxiety, PTSD)
47
48 193 • Social outcomes (e.g. socioeconomics, return to work, family and community support,
49
50 194 quality of health care)
51
52

53
54 195

56 196 **Search methods**

1
2
3 197 The database records and details of how the search was undertaken will be maintained at each stage
4
5 198 of the review process. A senior medical librarian (LR) will assist in the final draft of the search
6
7 199 strategy.

8
9
10 200 The suggested review will search the following electronic databases: MEDLINE, EMBASE, Cochrane
11
12 201 Central Register of Controlled Trials (CENTRAL), and the Google Scholar. If relevant, grey literature
13
14 202 may also be included. The search strategy will be developed in Medline and then adopted to the
15
16 203 other databases. It will include the subject headings (MeSH) specific to each database and a free text
17
18 204 word specific to review inclusion criteria. The complete search strategy can be seen in Appendix 1.
19
20 205 Databases containing the results of the searches will be created using EndNote X7.

21 22 23 24 206 **Study screening and selection**

25
26 207 A three-phase screening process will be applied. In phase one, an experienced medical librarian (LR)
27
28 208 and a researcher (SS) will conduct the initial search. In a second phase, two researchers (SS, SME) will
29
30 209 independently screen the titles and abstracts of all articles identified in the search strategy to
31
32 210 determine eligibility and classify studies as relevant, possibly relevant and irrelevant. During the last
33
34 211 phase, the researchers (SS, RR) will independently review the full text to make a final determination
35
36 212 of eligibility. Any disagreements that arise between the reviewers will be resolved through a
37
38 213 discussion and consensus. The PRISMA-P methodology, checklist and standard search strategy using
39
40 214 pre-defined inclusion and exclusion criteria and structured data abstraction tools will be used.

41 42 43 44 215 **Data extraction**

45
46 216 Data from the relevant articles will be assessed based on the Cochrane data abstraction form (30).
47
48 217 The data will be extracted by two reviewers (SS, RR) and any inconsistencies arising will be identified
49
50 218 and resolved through discussion with a third reviewer. Evidence will be synthesised based on the
51
52 219 following information:

- 53
54
55
56 220
 - Study period (start and end date)
- 57
58
59
60

- 1
2
3 221 • Study population (number of participants)
4
5 222 • Type of study (quantitative or qualitative)
6
7 223 • Injury studied (type and severity of injury)
8
9
10 224 • The outcomes/s of interest
11
12 225 • Tools used to identify outcomes
13
14 226 • The type of factors (biological, psychological and social)
15
16 227 • The effect and directions of biopsychosocial factors on outcome/s (prediction and impact)
17
18 228 • Limitations of study
19
20
21 229 • Key findings and recommendations
22

230 **Data management**

231 The relevant review documentation and search results will be uploaded and saved in Faculty-
232 allocated network storage ("S-drive") located in Monash University and will be backed up on Faculty-
233 allocated network storage. The data will be accessed only by the reviewers.

234 **Study quality and assessing risk of bias**

235 The bias will be assessed using the Scottish Intercollegiate Guideline Network (SIGN) criteria (31).
236 This criteria will assist with the evaluation of the impact of selection bias, information bias, and
237 confounding on the results of the study. Two review authors (SS, RR) will independently assess the
238 risk of bias in included studies. Qualitative studies will be assessed by Cochrane guidance for
239 inclusion of qualitative research in systematic reviews (32). The core elements such as credibility,
240 transferability, dependability and confirmability will be assessed and reported accordingly. Any
241 discrepancies arising will be discussed between the reviewers.

242 **Analysis**

243 **Descriptive analysis**

1
2
3 244 The conceptual framework has been developed to identify biopsychosocial factors impacting
4
5 245 recovery and relevant health outcomes (Figure 1). The Cochrane data abstraction criteria (30) will be
6
7 246 used to synthesise the results of the included studies.
8
9

10 247 **Figure 1:** Conceptual framework for identifying factors impacting recovery after traffic-related
11
12 248 accident.
13

14
15
16 249
17

18
19 250
20

21 251 **Statistical analysis**

22
23
24 252 Unavoidably, number of different studies brought together will differ and high variability is expected
25
26 253 for the proposed review. It is anticipated that there will be limited capacity to undertake a meta-
27
28 254 analysis because of the range and the heterogeneity of the factors, outcomes and profile of those
29
30 255 who have sustained a minor transport-related injury. However, careful consideration will be
31
32 256 undertaken involving a consultation with a systematic review experts based on the attributes of the
33
34 257 included studies. If a decision is made to conduct a meta-analysis, reviewers will consider
35
36 258 recommendations on selecting an appropriate method for dealing with heterogeneity in meta-
37
38 259 analysis outlined by Schroll et al (33). We will likely consider random effect meta-analysis as it is
39
40 260 highly unlikely that all studies will be functionally equal. If we determined that heterogeneity is too
41
42 261 large and decide not to pursue meta-analysis, we will present descriptive analyses for the included
43
44 262 studies.
45
46
47

48 263 **Discussion**

49
50
51 264 The proposed review aims to improve understanding of recovery after minor injuries and its
52
53 265 associated factors. It intends to assess the best available evidence of the biopsychosocial factors
54
55 266 hindering recovery following a minor transport-related accident. The review main aim is to provide a
56
57
58
59
60

267 detailed description of a range of biological, psychological and social factors and explain why some
268 people with minor injuries do not recover as expected.

269

270 The results of this study should form the basis to better understand recovery after minor injury and
271 inform health policy and clinical management about current evidence in the literature.

272 However, it is to note that there will be challenges in the review process and also in interpreting
273 findings. Firstly, the evaluation of the primary outcomes will depend on the intervention and tools
274 used to identify these outcomes. Secondly, as some minor injuries do not require hospitalisation,
275 less physical proof will be available for this group. Thirdly, data on social outcomes may not be
276 representative as it may not be reported in a sufficient number of studies.

277 **Ethics and Dissemination:** Ethical approval is not required as primary data will not be collected.

278 Review results will be published as a part of thesis, peer-reviewed journal and conferences.

279 **Conclusion**

280 The proposed systematic review will aim to identify gaps in the current knowledge and provide a
281 detailed summary of factors deterring recovery at different time points after traffic-related accident
282 based on the biopsychosocial model of health.

283 **Systematic Review Trial Registration number:** Systematic review protocol was registered in
284 International Prospective Register for Systematic Reviews (PROSPERO) on 14 December 2016.
285 Registration number CRD42016052276.

286 **Supplementary documents:**

- 287 1. Search strategy (Appendix1)
- 288 2. Figure 1: Conceptual framework

289

1
2
3 290 **Ethics Approval and Dissemination:**
4

5
6 291 Ethics approval is not required for systematic review as primary data will not be collected. The
7
8 292 review results will be published as a part of thesis, peer reviewed journal and conference.
9

10
11 293 **Funding**
12

13
14 294 SS, Monash ID 26381494 has received CMCRC/TAC living allowance for conducting this study. No
15
16 295 funding bodies had any role in study design, data collection and analysis, decision to publish, or
17
18 296 preparation of the manuscript.
19

20
21 297 **Competing Interests**
22

23
24 298 All the authors declare that they have no competing interests
25

26
27 299 **Authors' contributions**
28

29
30 300 SS, SME, and RR have contributed in developing the idea and methodology for systematic review. SS
31
32 301 registered the protocol with PROSPERO and drafted the first manuscript which was reviewed by all
33
34 302 the authors. The constructive feedback was given from SME and RR and encompassed in the final
35
36 303 version. The final version was critically revised by all the authors and finalised by SS. All authors read
37
38 304 and approved the final manuscript.
39

40
41 305 **Authors' information**
42

43
44 306 SS- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
45
46 307 Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, VIC, Australia 3004.
47

48
49 308 RR- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
50
51 309 Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, VIC, Australia 3004.
52

53
54
55 310 LR- The Ian Potter Library, Ground Floor, AMREP Building, The Alfred, Commercial Road, Melbourne,
56
57 311 VIC, Australia 3004.
58
59
60

1
2
3 312 SME- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
4
5 313 Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, VIC, Australia 3004.

6
7 314

8
9 315 **Acknowledgements**

10
11
12 316 We would like to thanks Capital Markets Cooperative Research Centre and Transport Accident
13
14 317 Commission for financial support.

15
16
17 318 **References**

- 18
19 319 1. World Health Organisation. World report on road traffic injury prevention. Washington D.C.:
20 World Health Organisation 2004.
21 320
22 321 2. World Health Organisation. World report on road traffic injury prevention Geneva.
23 322 Switzerland.2004.
24 323 3. Casey PP, Feyer AM, Cameron ID. Identifying predictors of early non-recovery in a
25 324 compensation setting: The Whiplash Outcome Study. *Injury*. 2011;42(1):25-32.
26 325 4. Peden M, Sminkey L. World Health Organization dedicates World Health Day to road safety.
27 326 *Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention*.
28 327 2004;10(2):67.
29 328 5. Casey PP, Feyer AM, Cameron ID. Course of recovery for whiplash associated disorders in a
30 329 compensation setting. *Injury*. 2015;46(11):2118-29.
31 330 6. Adams H, Ellis T, Stanish WD, Sullivan MJ. Psychosocial factors related to return to work
32 331 following rehabilitation of whiplash injuries. *J Occup Rehabil*. 2007;17(2):305-15.
33 332 7. Atherton K, Wiles NJ, Lecky FE, Hawes SJ, Silman AJ, Macfarlane GJ, et al. Predictors of
34 333 persistent neck pain after whiplash injury. *Emergency Medicine Journal*. 2006;23(3):195-201.
35 334 8. Buitenhuis J, de Jong PJ, Jaspers JP, Groothoff JW. Work disability after whiplash: a
36 335 prospective cohort study. *Spine*. 2009;34(3):262-7.
37 336 9. Crutebo S, Nilsson C, Skillgate E, Holm LW. The course of symptoms for whiplash-associated
38 337 disorders in Sweden: 6-month followup study. *J Rheumatol*. 2010;37(7):1527-33.
39 338 10. Holm LW, Carroll LJ, Cassidy JD, Skillgate E, Ahlbom A. Expectations for recovery important in
40 339 the prognosis of whiplash injuries. *PLoS Med*. 2008;5(5):e105.
41 340 11. Côté P SH, Ameis A, Carroll L, Mior M, Nordin M and the OPTIMa Collaboration. Enabling
42 341 recovery from common traffic injuries: A focus on the injured person. . In: *Rehabilitation U-*
43 342 *CCftSoDPa*, editor. Canada January 31, 2015.
44 343 12. Gopinath B, Jagnoor J, Harris IA, Nicholas M, Maher CG, Casey P, et al. Comparison of health
45 344 outcomes between hospitalised and non-hospitalised persons with minor injuries sustained in a road
46 345 traffic crash in Australia: a prospective cohort study. *Bmj Open*. 2015;5(9).
47 346 13. Berecki-Gisolf J, Collie A, McClure R. Reduction in health service use for whiplash injury after
48 347 motor vehicle accidents in 2000-2009: results from a defined population. *J Rehabil Med*.
49 348 2013;45(10):1034-41.
50 349 14. Craig A, Tran Y, Guest R, Gopinath B, Jagnoor J, Bryant RA, et al. Psychological impact of
51 350 injuries sustained in motor vehicle crashes: systematic review and meta-analysis. *BMJ Open*.
52 351 2016;6(9):e011993.
53 352 15. Sullivan MJ, Stanish W, Sullivan ME, Tripp D. Differential predictors of pain and disability in
54 353 patients with whiplash injuries. *Pain Research & Management*.7(2):68-74.
55 354 16. Lopes MC, Whitaker IY. [Measuring trauma severity using the 1998 and 2005 revisions of the
56 355 abbreviated injury scale]. *Revista da Escola de Enfermagem da U S P*. 2014;48(4):640-7.

- 1
2
3 356 17. Lesko MM, Woodford M, White L, O'Brien SJ, Childs C, Lecky FE. Using Abbreviated Injury
4 357 Scale (AIS) codes to classify Computed Tomography (CT) features in the Marshall System. BMC
5 358 medical research methodology. 2010;10:72.
6 359 18. Rosenbloom BN, Khan S, McCartney C, Katz J. Systematic review of persistent pain and
7 360 psychological outcomes following traumatic musculoskeletal injury. J Pain Res. 2013;6.
8 361 19. Svestkova O. International classification of functioning, disability and health of World Health
9 362 Organization (ICF). Prague Med Rep. 2008;109(4):268-74.
10 363 20. Gopinath B, Jagnoor J, Nicholas M, Blyth F, Harris IA, Casey P, et al. Presence and predictors
11 364 of persistent pain among persons who sustained an injury in a road traffic crash. Eur J Pain.
12 365 2015;19(8):1111-8.
13 366 21. Gopinath B, Harris IA, Nicholas M, Casey P, Blyth F, Maher CG, et al. A comparison of health
14 367 outcomes in older versus younger adults following a road traffic crash injury: a cohort study. PLoS
15 368 One. 2015;10(4):e0122732.
16 369 22. Berecki-Gisolf J, Collie A, McClure R. Work disability after road traffic injury in a mixed
17 370 population with and without hospitalisation. Accid Anal Prev. 2013;51:129-34.
18 371 23. Derrett S, Samaranayaka A, Wilson S, Langley J, Ameratunga S, Cameron ID, et al. Prevalence
19 372 and predictors of sub-acute phase disability after injury among hospitalised and non-hospitalised
20 373 groups: a longitudinal cohort study. PLoS One. 2012;7(9):e44909.
21 374 24. Giummarra MJ, Ioannou L, Ponsford J, Cameron PA, Jennings PA, Gibson SJ, et al. Chronic
22 375 Pain Following Motor Vehicle Collision: A Systematic Review of Outcomes Associated With Seeking
23 376 or Receiving Compensation. Clin J Pain. 2016;32(9):817-27.
24 377 25. Harris IA, Young JM, Jalaludin BB, Solomon MJ. The effect of compensation on general health
25 378 in patients sustaining fractures in motor vehicle trauma. J Orthop Trauma. 2008;22(4):216-20.
26 379 26. Murgatroyd DF, Casey PP, Cameron ID, Harris IA. The effect of financial compensation on
27 380 health outcomes following musculoskeletal injury: systematic review. PLoS One.
28 381 2015;10(2):e0117597.
29 382 27. Ozegovic D, Carroll LJ, Cassidy JD. What influences positive return to work expectation?
30 383 Examining associated factors in a population-based cohort of whiplash-associated disorders. Spine
31 384 (Phila Pa 1976). 2010;35(15):E708-13.
32 385 28. Collie A, Gabbe B, Fitzharris M. Evaluation of a complex, population-based injury claims
33 386 management intervention for improving injury outcomes: study protocol. BMJ Open.
34 387 2015;5(5):e006900.
35 388 29. Engel GL. The need for a new medical model: a challenge for biomedicine. Science.
36 389 1977;196(4286):129-36.
37 390 30. Cochrane data abstraction form accessed December 2016. Available from:
38 391 <http://epoc.cochrane.org/epoc-specific-resources-review-auth>.
39 392 31. Scottish Intercollegiate Guidelines Network for RCT CaCCs. Accessed December 2016.
40 393 Available from: <http://www.sign.ac.uk/methodology/checklists.html>.
41 394 32. Hannes. Supplementary Guidance for Inclusion of Qualitative Research in Cochrane
42 395 Systematic Reviews of Interventions. In: Noyes J BA, Hannes K, Harden A, Harris J, Lewin S, Lockwood
43 396 C editor. Critical appraisal of qualitative research: Cochrane Collaboration Qualitative Methods
44 397 Group; 2011.
45 398 33. Schroll JB, Moustgaard R, Gotzsche PC. Dealing with substantial heterogeneity in Cochrane
46 399 reviews. Cross-sectional study. BMC medical research methodology. 2011;11.

400

401

402

403
404
405
406
407

Table 1: Description of the population, intervention, comparison and outcome (PICO) of the Systematic Review

SI#	PICO	Descriptions
1	Population	<ul style="list-style-type: none"> Injured people who were involved in a transport accident and have sustained one or more minor injuries (e.g. whiplash, contusion, sprain, strain, abrasion, and laceration)
2	Intervention	<p>The main phenomena of interest are articles identifying biopsychosocial factors impacting recovery (3, 6, 12, 24, and 48 months post-accident) with following inclusion and exclusion criteria:</p> <p>Articles will be included if they were:</p> <ul style="list-style-type: none"> Describing minor transport-related injuries Describing either biological, psychological and social factors impacting recovery Identifying related health outcomes using one or more BPS models or tools <p>Articles will be excluded if they were:</p> <ul style="list-style-type: none"> Written in a language other than English Written prior to 1st January 2006 or after 05th December 2016 Describing work-related injury, articles on moderate and severe or fatal transport-related injuries Investigating other type of outcomes (e.g. compensation outcomes, cost-associated outcomes) or the impact on cost and quality of compensation systems.
3	Comparison	<p>Comparators:</p> <ul style="list-style-type: none"> Articles on factors facilitating recovery and health outcomes

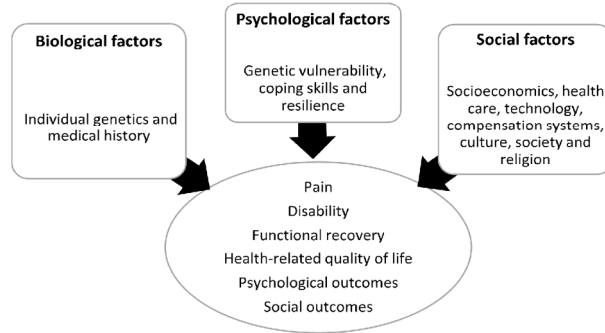
		<ul style="list-style-type: none"> • Studies without a comparator will be considered for inclusion
4	Outcome	<p>Primary outcome measure is:</p> <ul style="list-style-type: none"> • Pain • Disability <p>Secondary outcome measures are:</p> <ul style="list-style-type: none"> • Functional recovery • Health-related quality of life • Psychological outcomes (Depression, anxiety, PTSD, sleeping disorders, fear of movement, coping skills, pain catastrophizing) • Social outcomes (RTW, return to usual daily activities, self-reported driving difficulty, and procedural, interactional and informational justice)

408

409

410

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



Conceptual framework
146x197mm (300 x 300 DPI)

Search strategy

Concept A

Minor injuries (Musculoskeletal and soft tissue)

▼ Search History (24)		
# ▲	Searches	Results
1	arm injuries/ or forearm injuries/ or wrist injuries/ or back injuries/ or fractures, cartilage/ or hand injuries/ or finger injuries/ or lacerations/ or leg injuries/ or ankle injuries/ or foot injuries/ or knee injuries/ or neck injuries/ or whiplash injuries/ or soft tissue injuries/ or "sprains and strains"/ or tendon injuries/ or contusions/	93240
2	exp Musculoskeletal System/in [Injuries]	86430
3	exp Whiplash Injuries/	338
4	((neck* or shoulder* or arm* or forearm* or wrist* or hand* or finger* or upper limb* or upper extremity* or back* or pelvis* or pelvic* or leg* or knee* or foot* or ankle* or feet* or lower limb* or lower extremity* or toe*) adj3 (injur* or contusion* or abrasion* or laceration* or sprain* or strain*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	95455
5	whiplash*.mp.	348
6	(minor adj (injur* or contusion* or abrasion* or laceration* or sprain* or strain*)).mp.	183
7	1 or 2 or 3 or 4 or 5 or 6	18369

Concept B

Transport-related accident/injury

8	Accidents, Traffic/	3957
9	((car or cars or truck or trucks or automobile* or cyclist* or cycling* or cycle* or pedestrian* or passenger* or driver* or motor* or vehicle* or vehicul* or transport* or traffic*) adj3 (accident* or collision* or crash* or smash*)).mp.	4899
10	8 or 9	4899
11	7 and 10	87

Concept C

Types of studies including limitations to English language and year 2000 – current

12	epidemiologic studies/ or case-control studies/ or retrospective studies/ or cohort studies/ or follow-up studies/ or longitudinal studies/ or prospective studies/ or cross-sectional studies/	2060898
13	qualitative research/	33890
14	case control.mp.	263597
15	((follow up or followup) adj (study or studies)).mp.	602425
16	(observational adj (study or studies)).mp.	85293
17	((observational or prospective or retrospective) adj (study or studies)).mp.	1188696
18	Cross sectional.mp.	310974
19	(cohort adj (study or studies)).mp.	272736
20	(qualitative adj (study or studies)).mp.	23495
21	12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20	2275656
22	11 and 21	2418
23	limit 22 to (english language and humans and yr="2006 -Current")	1110

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification	1a	Identify the report as a protocol of a systematic review YES Line 57-59 Page 3
Update	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number YES Line 279-281 Page 12
Authors:		
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author YES Page 1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review YES Line 294 Page 13
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments
Support:		
Sources	5a	Indicate sources of financial or other support for the review YES Line 312-314 Page 14
Sponsor	5b	Provide name for the review funder and/or sponsor YES Line 312-314 Page 14
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol YES
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known YES Line 134 Page 6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO) YES Line 409 Page 16
METHODS		
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review YES Line 151 Line 160 Page 7
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage YES Line 196 Page 8
Search strategy	10	Present draft of search strategy to be used for at least one electronic database including planned limits, such that it could be repeated YES Appendix 1
Study records:		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review YES Line 228 Page 10

Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis) YES Line 213 Page 9
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators YES Line 218 Page 9
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications YES Line 218 Page 9
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale YES Line 185 Page 8
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis YES Line 232 Page 10
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised YES Line 249 Page 11
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2 , Kendall's τ) YES Line 255 Page 11
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression) YES
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned YES Line 241 Page 10
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies) YES
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE) YES Line 233 Page 10

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

BMJ Open

Biopsychosocial factors associated with non-recovery after a minor transport-related injury: protocol for a systematic review

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2017-016314.R2
Article Type:	Protocol
Date Submitted by the Author:	28-Jul-2017
Complete List of Authors:	Samoborec, Stella; Monash University Faculty of Medicine Nursing and Health Sciences, Department of Epidemiology and Preventive Medicine Ruseckaite, Rasa; Monash University Faculty of Medicine Nursing and Health Sciences, Department of Epidemiology and Preventive Medicine Romero, Lorena ; The Ian Potter Library, Ground Floor, AMREP Building, The Alfred Evans, Sue; Monash University, Department of Epidemiology and Preventive Medicine
Primary Subject Heading:	Rehabilitation medicine
Secondary Subject Heading:	Public health, Epidemiology
Keywords:	EPIDEMIOLOGY, PREVENTIVE MEDICINE, TRAFFIC ACCIDENTS, INJURY

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1 **Title page**

2 Biopsychosocial factors associated with non-recovery after a minor transport-related injury: protocol
3 for a systematic review

4 **Corresponding author**

5 Stella Samoborec BBMed, MBMedSc - Epidemiology

6 Department of Epidemiology and Preventive Medicine (DEPM)

7 School of Public Health and Preventive Medicine, Monash University,

8 553 St Kilda Road, Melbourne, VIC, Australia 3004

9 Phone +61399030021

10 Fax +61399030556

11 Email: stella.samoborec@monash.edu

12 **Authors:**

13 Rasa Ruseckaite, BSc, MSc, PhD, Senior Research Fellow, DEPM, School of Public Health and
14 Preventive Medicine, Monash University,

15 553 St Kilda Road, Melbourne, VIC, Australia 3004.

16 rasa.ruseckaite@monash.edu

17

18 Lorena Romero, BA, MBIT, Senior Medical Librarian, The Ian Potter Library, Ground Floor, AMREP

19 Building, The Alfred, Commercial Road, Melbourne, VIC, Australia 3004.

20 L.Romero@alfred.org.au

21

22 Sue M Evans, BN, Master Clinical Epidemiology, PhD FAAQHC, Associate Professor, Head, Clinical

23 Registry Unit

1
2
3 24 Associate Director, CRE in Patient Safety, DEPM, School of Public Health and Preventive Medicine,
4
5 25 Monash University,
6
7 26 553 St Kilda Road, Melbourne, VIC, Australia 3004.
8
9 27 sue.evans@monash.edu
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

1
2
3 50 **Abstract:**

4
5 51 **Introduction:** Globally, road transport accidents contribute substantially to the number of deaths
6
7 52 and also to the burden of disability. Up to 50 million people suffer a transport-related non-fatal
8
9 53 injury each year, which often leads to long-term disability.

10
11 54 It has been shown that substantial number of people with minor injuries struggles to recover and
12
13 55 the reasons are still not well explored.

14
15 56 Despite the high prevalence, little is known about the factors hindering recovery following minor
16
17 57 traffic-related injuries. The aim of this paper is to present a protocol for the systematic review
18
19 58 aiming to understand biopsychosocial factors related to non- recovery and identify current gaps in
20
21 59 the literature.

22
23 60 **Methods and analysis:** The review will be conducted in compliance with the Preferred Reporting
24
25 61 Items for Systematic Reviews and Meta-Analyses (PRISMA -P) guidelines. A search of the electronic
26
27 62 databases, MEDLINE, EMBASE, Cochrane Central Register of Controlled trials (CENTRAL), will be
28
29 63 undertaken, in addition to Google Scholar and grey literature to identify studies in period from 2006
30
31 64 to 2016. Quantitative and qualitative research articles describing and identifying biopsychosocial
32
33 65 factors associated with non-recovery and health outcomes such as pain, disability, functional
34
35 66 recovery, health-related quality of life, post-traumatic stress disorder, depression, anxiety, and
36
37 67 return to work will be included. A conceptual framework developed to identify biopsychosocial
38
39 68 factors will be applied to assure defined criterion.

40
41 69 At present, there is little anticipation for meta-analyses due to the heterogeneity of factors and
42
43 70 outcomes assessed. Therefore, a narrative synthesis based on study findings will be conducted

44
45 71 **Ethics and dissemination:** Ethical approval is not required as primary data will not be collected.
46
47 72 Review results will be published as a part of thesis, peer-reviewed journal and conferences.

48
49 73 **Systematic Review Trial Registration number:** Systematic review protocol was registered in
50
51 74 International Prospective Register for Systematic Reviews (PROSPERO) on 14 December 2016.
52
53 75 Registration number CRD42016052276.
54
55
56
57
58
59
60

1
2
3 76 **Strengths and limitations of the study**
4

5 77 This will be the first systematic review evaluating biopsychosocial factors associated with non-
6
7 78 recovery across the different types of minor transport-related injuries.
8

9 79 The review has distinct inclusion criteria and clearly outlines how the items will be selected and
10
11 80 abstracted.
12

13 81 The review aims to offer highest level of evidence on factors deterring recovery after minor traffic-
14
15 82 related injuries.
16

17 83 However, due to the variety of factors and relevant outcomes, comparison of the outcomes may not
18
19 84 be possible.
20

21 85 The potential issue of heterogeneity across the studies may affect the study results.
22
23

24 86 **Introduction**
25
26

27 87 Worldwide, road transport accidents contribute substantially to the number of deaths and also to
28
29 88 the burden of disability. The World Health Organisation (WHO) estimates that by 2020 road
30
31 89 accidents will be the third leading cause of disability (1). According to WHO data, deaths from road
32
33 90 traffic injuries account for around 25% of all deaths from injury (2).
34
35

36 91 Minor injuries are the most recurrently reported injuries following a transport-related accident (3).
37

38 92 While the number will fluctuate between countries, the literature suggest that the total incidence of
39
40 93 minor injuries (musculoskeletal and soft tissue) has increased in the last 30 years (4). Whiplash and
41
42 94 Whiplash Associated Disorder (WAD) are the most frequently reported minor injuries following a
43
44 95 transport accident (3, 5-10). Other minor injuries include contusions, skin abrasions, lacerations,
45
46 96 sprains and strains, as defined by Minor Injury Guidelines. The guideline defines a Minor injury as
47
48 97 follows: "minor injury means a sprain, strain, whiplash associated disorder, contusion, abrasion,
49
50 98 laceration or subluxation and any clinically associated sequelae. This term is to be interpreted to
51
52 99 apply where a person sustains any one or more of these injuries"(11). Despite a substantial amount
53
54
55
56
57
58
59
60

1
2
3 100 of WAD epidemiology and treatment research, understanding factors that hinder and obstruct
4
5 101 recovery for WAD and other minor injuries is scant (5).
6
7

8 102 The complexity, and heterogeneity of the profile, of those suffering minor traffic-related injuries are
9
10 103 reasons to explain why many people do not recover as expected (12). It has been estimated that
11
12 104 approximately half of the patients with minor injuries may never completely recover (13) and large
13
14 105 proportion of people with Whiplash Associated Disorder (WAD) would suffer psychological distress
15
16 106 for at least 3 years post-accident (14).
17

18
19 107 In Victoria, while preventive methods have been directed to patients with major injuries there are
20
21 108 no preventive recommendations and rehabilitative guidelines for patients with minor injuries. Yet, it
22
23 109 is believed that there is much to be achieved by understanding factors and interventions aimed at
24
25 110 reducing long-term disability, and improving recovery for those who have sustained minor injuries
26
27 111 (15). It is also important to note that there are various complexities in treating and managing
28
29 112 patients with minor injuries. Although it is expected that not everyone who sustains a minor injury
30
31 113 will develop persistent symptoms, cautious consideration is required to understand and identify in a
32
33 114 timely manner those patients with minor injuries who are at high risk of protracted recovery.
34
35

36 37 115 **Minor transport-related musculoskeletal injuries**

38
39
40 116 The severity of injuries between different groups and patients are compared according to different
41
42 117 scales. Numerous injury severity scales exist in practice and in the literature. However, the
43
44 118 assessment of motor vehicle injuries relies mainly on the Abbreviated Injury Scale (AIS) (16). AIS is
45
46 119 the first broadly implemented injury severity scale used in practice and is primarily an anatomical
47
48 120 measure of injury severity. It classifies severity on the basis of the region of the body injured and the
49
50 121 degree of the injury in that particular body region. For example, an AIS score of 1 interprets a minor
51
52 122 injury, while an AIS score of 6 is considered as a non-survivable injury. It is important to note that the
53
54 123 scores from 1 to 6 do not reflect an interval scale, and comparable AIS scores may not be similar
55
56
57
58
59
60

1
2
3 124 across different body regions. In summary, a higher severity score indicates a gradually more severe
4
5 125 injury (17).
6
7

8 126 The most common types of minor transport-related injuries are musculoskeletal and/or soft tissue
9
10 127 injuries (18). Musculoskeletal injuries refer to those which affect muscles, bones, joints, tendons,
11
12 128 ligaments, cartilage and spinal discs. Soft tissue injuries can arise in any soft tissue in the body. If
13
14 129 they occur in the skin they are known as contusions, in the muscle they are identified as strains, and
15
16 130 in the tendons and ligaments they are recognized as sprains (19). While some of these injuries are
17
18 131 benign and do not require complex treatments, others may lead to chronic and persistent challenges
19
20 132 (20, 21). The cause of protracted symptoms are thought to be complex and multifactorial. According
21
22 133 to the literature, these conditions are often shown to be painful and require medical intervention.
23
24 134 Minor injuries are usually treated in primary health care. However some require specialist
25
26 135 intervention, treatment and, in some cases, hospitalisation (22). It is to note that there is no current
27
28 136 evidence of types and number of medical treatments which would be most beneficial for patients
29
30 137 with minor traffic-related injuries.
31
32

33 34 138 **Rationale and objectives** 35 36

37 139 There is still paucity of research into predictors and determinants of recovery following minor
38
39 140 injuries. In clinical practice there remains a lack of recognition that patients with minor injury may
40
41 141 have a slow recovery and long-term adverse biopsychosocial consequences (3). Previous research
42
43 142 demonstrates differences in patient's recovery outcomes and identifies a number of factors leading
44
45 143 to long-term disability and poor health outcomes (23-27). However, the results are not consisted
46
47 144 and generalisable to larger population. It is evident that more research is needed to understand and
48
49 145 investigate whether early identification of the most predictive factors could reduce chronicity and
50
51 146 long-term disability. It is also believed that the quality of management of the most common types of
52
53 147 minor injuries should be improved (28). In conclusion, these patients should be identified as early as
54
55 148 possible in their injury trajectory so that active support and management can be provided.
56
57
58
59
60

1
2
3 149 The objectives of the proposed systematic review are to identify and assess biopsychosocial factors
4
5 150 and relevant predictors of non-recovery and determine the benefits of using biopsychosocial model
6
7 151 (BPS) or approach on identifying health outcomes after minor transport-related injury.
8
9

10 152 **Methods and analyses:**

11
12
13 153 A detailed description on population, intervention, comparison and outcome (PICO) of the
14
15 154 systematic review is outlined in Table 1 and described below:
16

17
18 155 **Inclusion criteria:**

19
20
21 156 Articles will be included if they are:

- 22
23 157 • Investigating patients sustained minor transport-related injury
24
25 158 • Assessing biological, psychological and social factors as defined by biopsychosocial model of
26
27 health (29)
28
29 159 • Using biopsychosocial model of health as a core model or approach for identifying health
30
31 outcomes
32
33 160 • Published in English language
34
35 161 • Published in the last decade (from 1st January 2006 to 05th December 2016).
36
37
38

39 164 **Exclusion criteria:**

40
41
42 165 Articles will be excluded if they were:

- 43
44
45 166 • Published in a language other than English
46
47 167 • Published prior to 1st January 2006 or after 05th December 2016
48
49 168 • Describing work-related injury
50
51 169 • Not using validated tools to measure recovery outcomes
52
53 170 • Involving children and describing paediatrics injuries
54
55
56
57
58
59
60

- 1
2
3 172 • Describing moderate and severe or fatal transport-related injuries (based on Abbreviated
4 Injury Scale scores of 2-6)
5 173
6
7 174 • Investigating other type of outcomes (e.g. compensation outcomes such as cost, time to
8 claim closure, impact on cost and quality of compensation systems or services)
9 175
10
11 176 • Unpublished manuscripts, dissertations, books and book chapters, conference proceedings,
12 meeting abstracts, and guideline statements will be excluded.
13 177
14

178 **Study design**

179 Quantitative (e.g. cohort, longitudinal, case studies, prospective and retrospective) and qualitative
180 studies (e.g. ethnography, phenomenological, grounded theory and case report) exploring
181 biopsychosocial factors impacting recovery and related health outcomes in patients with minor
182 transport-related injury will be included. Mixed methods research articles will also be included in the
183 review.
184

184 **Comparator(s)/control**

185 Comparators such as positive factors and factors enabling recovery after minor transport-related
186 accident will be considered for inclusion.
187

187 **Context**

188 Studies conducted in the clinical environments such as acute care (emergency departments), and
189 sub-acute care (primary health care, pain clinics, rehabilitation centres) will be included. Settings
190 such as insurance databases and registries will also be included.
191

191 **Outcome measure/outcome of interest**

192 The following outcomes will be investigated:

- 193 • Functional recovery (e.g. return to pre-accident level of functionality, or independence, or
194 usual activities)

- 1
2
3 195 • Disability (e.g. temporary, long-term, permanent)
4
5 196 • Pain intensity (e.g. low, moderate, severe)
6
7 197 • Health-related quality of life (e.g. poor, good)
8
9 198 • Psychological outcomes (e.g. depression, fear, sleep disorder, anxiety, PTSD)
10
11 199 • Social outcomes (e.g. socioeconomics, return to work, family and community support,
12
13 quality of health care)
14
15
16
17
18

201

202 **Search methods**

203 The database records and details of how the search was undertaken will be maintained at each stage
204 of the review process. A senior medical librarian (LR) will assist in the final draft of the search
205 strategy.

206 The suggested review will search the following electronic databases: MEDLINE, EMBASE, Cochrane
207 Central Register of Controlled Trials (CENTRAL), and the Google Scholar. If relevant, grey literature
208 such as government reports may also be included. The search strategy will be developed in Medline
209 and then adopted to the other databases. It will include the subject headings (MeSH) specific to each
210 database and a free text word specific to review inclusion criteria. The complete search strategy can
211 be seen in Appendix 1. Databases containing the results of the searches will be created using
212 EndNote X7.

213 **Study screening and selection**

214 A three-phase screening process will be applied. In phase one, an experienced medical librarian (LR)
215 and a researcher (SS) will conduct the initial search. In a second phase, two researchers (SS, SME) will
216 independently screen the titles and abstracts of all articles identified in the search strategy to
217 determine eligibility and classify studies as relevant, possibly relevant and irrelevant. During the last
218 phase, the researchers (SS, RR) will independently review the full text to make a final determination

219 of eligibility. Any disagreements that arise between the reviewers will be resolved through a
220 discussion and consensus. The PRISMA-P methodology, checklist and standard search strategy using
221 pre-defined inclusion and exclusion criteria and structured data abstraction tools will be used.

222 **Data extraction**

223 Data from the relevant articles will be assessed based on the Cochrane data abstraction form (30).
224 The data will be extracted by two reviewers (SS, RR) and any inconsistencies arising will be identified
225 and resolved through discussion with a third reviewer. Evidence will be synthesised based on the
226 following information:

- 227 • Study period (start and end date)
- 228 • Study population (number of participants)
- 229 • Type of study (quantitative or qualitative)
- 230 • Injury studied (type and severity of injury)
- 231 • The outcomes/s of interest
- 232 • Tools used to identify outcomes
- 233 • The type of factors (biological, psychological and social)
- 234 • The effect and directions of biopsychosocial factors on outcome/s (prediction and impact)
- 235 • Limitations of study
- 236 • Key findings and recommendations

237 **Data management**

238 The relevant review documentation and search results will be uploaded and saved in Faculty-
239 allocated network storage ("S-drive") located in Monash University and will be backed up on Faculty-
240 allocated network storage. The data will be accessed only by the reviewers.

241 **Study quality and assessing risk of bias**

1
2
3 242 A critical appraisal for quantitative studies will be made using the Scottish Intercollegiate Guideline
4
5 243 Network (SIGN) tool to assess risk of bias for individual quantitative studies included in the review
6
7 244 (31). SIGN provide checklists to assess the quality of: systematic reviews and meta-analyses,
8
9 245 randomised-control trials, cohort studies, case-control studies, diagnostic studies, and economic
10
11 246 studies. This criteria will assist with the evaluation of the impact of detection, selection,
12
13 247 performance, information bias, and confounding on study results. Two review authors (SS, RR) will
14
15 248 independently appraise the methodology of the included studies and categorise the study as being
16
17 249 of high (++), acceptable (+) or unacceptable (0) quality. Qualitative studies will be assessed based on
18
19 250 the Cochrane guidance for inclusion of qualitative research in systematic reviews (32). Core
20
21 251 elements of credibility, transferability, dependability and confirmability will be assessed and
22
23 252 reported. The Standards for Reporting Qualitative Research (SRQR) (33) tool covers all the
24
25 253 recommended criteria for assessing risk of bias in qualitative studies and will be used for critically
26
27 254 appraising methodology of qualitative studies. Any discrepancies arising will be discussed between
28
29 255 the reviewers.
30
31
32

33 34 256 **Analysis**

35 36 37 257 **Descriptive analysis**

38
39
40 258 The conceptual framework has been developed to identify biopsychosocial factors impacting
41
42 259 recovery and relevant health outcomes (Figure 1). The Cochrane data abstraction criteria (30) will be
43
44 260 used to synthesise the results of the included studies.
45
46

47 261 **Figure 1:** Conceptual framework for identifying factors impacting recovery after traffic-related
48
49 262 accident.
50

51 52 263 **Statistical analysis**

53
54
55 264 Unavoidably, number of different studies brought together will differ and high variability is expected
56
57 265 for the proposed review. It is anticipated that there will be limited capacity to undertake a meta-
58
59
60

1
2
3 266 analysis because of the range and the heterogeneity of the factors, outcomes and profile of those
4
5 267 who have sustained a minor transport-related injury. However, careful consideration will be
6
7 268 undertaken involving a consultation with a systematic review experts based on the attributes of the
8
9 269 included studies. If a decision is made to conduct a meta-analysis, reviewers will consider
10
11 270 recommendations on selecting an appropriate method for dealing with heterogeneity in meta-
12
13 271 analysis outlined by Schroll et al (34). We will likely consider random effect meta-analysis as it is
14
15 272 highly unlikely that all studies will be functionally equal. If we determined that heterogeneity is too
16
17 273 large and decide not to pursue meta-analysis, we will present descriptive analyses of the included
18
19 274 studies.
20
21

22 23 275 **Discussion**

24
25
26 276 The proposed review aims to improve understanding of non-recovery after minor injuries and its
27
28 277 associated factors. It intends to assess the best available evidence of the biopsychosocial factors
29
30 278 hindering recovery following a minor transport-related accident. The review main aim is to provide a
31
32 279 detailed description of a range of biological, psychological and social factors and explain why some
33
34 280 people with minor injuries do not recover as expected.
35
36

37 281 The results of this study should form the basis to better understand recovery after minor injury and
38
39 282 inform health policy and clinical management about current evidence in the literature.
40
41

42 283 However, it is to note that there will be challenges in the review process and also in interpreting
43
44 284 findings. Firstly, the evaluation of the primary outcomes will depend on the intervention and tools
45
46 285 used to identify these outcomes. Secondly, as some minor injuries do not require hospitalisation,
47
48 286 less physical proof will be available for this group. Thirdly, data on social outcomes may not be
49
50 287 representative as it may not be reported in a sufficient number of studies.
51
52
53
54
55
56
57
58
59
60

1
2
3 288 In conclusion, the proposed systematic review will aim to identify gaps in the current knowledge and
4
5 289 provide a detailed summary of factors deterring recovery at different time points after traffic-related
6
7 290 injury based on the biopsychosocial model of health.
8
9

10 291 **Ethics and Dissemination:** Ethical approval is not required as primary data will not be collected.
11
12 292 Review results will be published as a part of thesis, peer-reviewed journal and conferences.
13

14
15 293 **Supplementary documents:**

- 16
17
18 294 1. Search strategy (Appendix1)
19
20 295 2. Figure 1: Conceptual framework
21

22
23 296 **Ethics Approval and Dissemination:**

24
25 297 Ethics approval is not required for systematic review as primary data will not be collected. The
26
27 298 review results will be published as a part of thesis, peer reviewed journal and conference.
28
29

30
31 299 **Funding**

32
33 300 SS, Monash ID 26381494 has received CMCRC/TAC living allowance for conducting this study. No
34
35 301 funding bodies had any role in study design, data collection and analysis, decision to publish, or
36
37 302 preparation of the manuscript.
38
39

40
41 303 **Competing Interests**

42
43
44 304 All the authors declare that they have no competing interests
45

46
47 305 **Authors' contributions**

48
49 306 SS, SME, and RR have contributed in developing the idea and methodology for systematic review. SS
50
51 307 registered the protocol with PROSPERO and drafted the first manuscript which was reviewed by all
52
53 308 the authors. The constructive feedback was given from SME and RR and encompassed in the final
54
55
56
57
58
59
60

1
2
3 309 version. The final version was critically revised by all the authors and finalised by SS. All authors read
4
5 310 and approved the final manuscript.
6
7

8 311 **Authors' information**

9
10
11 312 SS- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
12
13 313 Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, VIC, Australia 3004.
14
15

16 314 RR- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
17
18 315 Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, VIC, Australia 3004.
19

20
21 316 LR- The Ian Potter Library, Ground Floor, AMREP Building, The Alfred, Commercial Road, Melbourne,
22
23
24 317 VIC, Australia 3004.
25

26 318 SME- Department of Epidemiology and Preventive Medicine (DEPM), School of Public Health and
27
28 319 Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, VIC, Australia 3004.
29

30
31 320

32 321 **Acknowledgements**

33
34
35
36 322 We would like to thanks Capital Markets Cooperative Research Centre and Transport Accident
37
38 323 Commission for financial support.
39

40
41 324

42
43 325

44
45
46 326

47 48 49 327 **References**

50
51 328 1. World Health Organisation. World report on road traffic injury prevention. Washington D.C.:
52
53 329 World Health Organisation 2004.

54 330 2. World Health Organisation. World report on road traffic injury prevention Geneva.
55
56 331 Switzerland.2004.
57
58
59
60

- 1
2
3 332 3. Casey PP, Feyer AM, Cameron ID. Identifying predictors of early non-recovery in a
4 333 compensation setting: The Whiplash Outcome Study. *Injury*. 2011;42(1):25-32.
5
6 334 4. Peden M, Sminkey L. World Health Organization dedicates World Health Day to road safety.
7
8 335 *Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention*.
9 336 2004;10(2):67.
10
11 337 5. Casey PP, Feyer AM, Cameron ID. Course of recovery for whiplash associated disorders in a
12 338 compensation setting. *Injury*. 2015;46(11):2118-29.
13
14 339 6. Adams H, Ellis T, Stanish WD, Sullivan MJ. Psychosocial factors related to return to work
15 340 following rehabilitation of whiplash injuries. *J Occup Rehabil*. 2007;17(2):305-15.
16
17 341 7. Atherton K, Wiles NJ, Lecky FE, Hawes SJ, Silman AJ, Macfarlane GJ, et al. Predictors of
18 342 persistent neck pain after whiplash injury. *Emergency Medicine Journal*. 2006;23(3):195-201.
19
20 343 8. Buitenhuis J, de Jong PJ, Jaspers JP, Groothoff JW. Work disability after whiplash: a
21 344 prospective cohort study. *Spine*. 2009;34(3):262-7.
22
23 345 9. Crutebo S, Nilsson C, Skillgate E, Holm LW. The course of symptoms for whiplash-associated
24 346 disorders in Sweden: 6-month followup study. *J Rheumatol*. 2010;37(7):1527-33.
25
26 347 10. Holm LW, Carroll LJ, Cassidy JD, Skillgate E, Ahlbom A. Expectations for recovery important in
27 348 the prognosis of whiplash injuries. *PLoS Med*. 2008;5(5):e105.
28
29 349 11. Côté P, Shearer H, Ameis A, Carroll L, Mior M, Nordin M. Enabling recovery from common
30 350 traffic injuries: A focus on the injured person. UOIT-CMCC Centre for the Study of Disability
31 351 Prevention and Rehabilitation, 2015.
32
33 352 12. Gopinath B, Jagnoor J, Harris IA, Nicholas M, Maher CG, Casey P, et al. Comparison of health
34 353 outcomes between hospitalised and non-hospitalised persons with minor injuries sustained in a road
35 354 traffic crash in Australia: a prospective cohort study. *Bmj Open*. 2015;5(9).
36
37 355 13. Berecki-Gisolf J, Collie A, McClure R. Reduction in health service use for whiplash injury after
38 356 motor vehicle accidents in 2000-2009: results from a defined population. *J Rehabil Med*.
39 357 2013;45(10):1034-41.
40
41 358 14. Craig A, Tran Y, Guest R, Gopinath B, Jagnoor J, Bryant RA, et al. Psychological impact of
42 359 injuries sustained in motor vehicle crashes: systematic review and meta-analysis. *BMJ Open*.
43 360 2016;6(9):e011993.
44
45 361 15. Sullivan MJ, Stanish W, Sullivan ME, Tripp D. Differential predictors of pain and disability in
46 362 patients with whiplash injuries. *Pain Research & Management*.7(2):68-74.
47
48 363 16. Lopes MC, Whitaker IY. [Measuring trauma severity using the 1998 and 2005 revisions of the
49 364 abbreviated injury scale]. *Revista da Escola de Enfermagem da U S P*. 2014;48(4):640-7.
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 365 17. Lesko MM, Woodford M, White L, O'Brien SJ, Childs C, Lecky FE. Using Abbreviated Injury
4 366 Scale (AIS) codes to classify Computed Tomography (CT) features in the Marshall System. BMC
5 367 medical research methodology. 2010;10:72.
6
7
8 368 18. Rosenbloom BN, Khan S, McCartney C, Katz J. Systematic review of persistent pain and
9 369 psychological outcomes following traumatic musculoskeletal injury. J Pain Res. 2013;6.
10
11 370 19. Svestkova O. International classification of functioning, disability and health of World Health
12 371 Organization (ICF). Prague Med Rep. 2008;109(4):268-74.
13
14 372 20. Gopinath B, Jagnoor J, Nicholas M, Blyth F, Harris IA, Casey P, et al. Presence and predictors
15 373 of persistent pain among persons who sustained an injury in a road traffic crash. Eur J Pain.
16 374 2015;19(8):1111-8.
17
18 375 21. Gopinath B, Harris IA, Nicholas M, Casey P, Blyth F, Maher CG, et al. A comparison of health
19 376 outcomes in older versus younger adults following a road traffic crash injury: a cohort study. PLoS
20 377 One. 2015;10(4):e0122732.
21
22 378 22. Berecki-Gisolf J, Collie A, McClure R. Work disability after road traffic injury in a mixed
23 379 population with and without hospitalisation. Accid Anal Prev. 2013;51:129-34.
24
25 380 23. Derrett S, Samaranayaka A, Wilson S, Langley J, Ameratunga S, Cameron ID, et al. Prevalence
26 381 and predictors of sub-acute phase disability after injury among hospitalised and non-hospitalised
27 382 groups: a longitudinal cohort study. PLoS One. 2012;7(9):e44909.
28
29 383 24. Giummarra MJ, Ioannou L, Ponsford J, Cameron PA, Jennings PA, Gibson SJ, et al. Chronic
30 384 Pain Following Motor Vehicle Collision: A Systematic Review of Outcomes Associated With Seeking
31 385 or Receiving Compensation. Clin J Pain. 2016;32(9):817-27.
32
33 386 25. Harris IA, Young JM, Jalaludin BB, Solomon MJ. The effect of compensation on general health
34 387 in patients sustaining fractures in motor vehicle trauma. J Orthop Trauma. 2008;22(4):216-20.
35
36 388 26. Murgatroyd DF, Casey PP, Cameron ID, Harris IA. The effect of financial compensation on
37 389 health outcomes following musculoskeletal injury: systematic review. PLoS One.
38 390 2015;10(2):e0117597.
39
40 391 27. Ozegovic D, Carroll LJ, Cassidy JD. What influences positive return to work expectation?
41 392 Examining associated factors in a population-based cohort of whiplash-associated disorders. Spine
42 393 (Phila Pa 1976). 2010;35(15):E708-13.
43
44 394 28. Collie A, Gabbe B, Fitzharris M. Evaluation of a complex, population-based injury claims
45 395 management intervention for improving injury outcomes: study protocol. BMJ Open.
46 396 2015;5(5):e006900.
47
48 397 29. Engel GL. The need for a new medical model: a challenge for biomedicine. Science.
49 398 1977;196(4286):129-36.
50
51
52
53
54
55
56
57
58
59
60

- 399 30. Cochrane data abstraction form accessed December 2016. Available from:
 400 <http://epoc.cochrane.org/epoc-specific-resources-review-auth>.
- 401 31. Scottish Intercollegiate Guidelines Network for Cohort and Case Control studies [Accessed
 402 February 2017]. Available from: <http://www.sign.ac.uk/checklists-and-notes.html>.
- 403 32. Hannes. Supplementary Guidance for Inclusion of Qualitative Research in Cochrane
 404 Systematic Reviews of Interventions. In: Noyes J BA, Hannes K, Harden A, Harris J, Lewin S, Lockwood
 405 C editor. Critical appraisal of qualitative research: Cochrane Collaboration Qualitative Methods
 406 Group; 2011.
- 407 33. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative
 408 research: a synthesis of recommendations. Academic medicine : journal of the Association of
 409 American Medical Colleges. 2014;89(9):1245-51.
- 410 34. Schroll JB, Moustgaard R, Gotzsche PC. Dealing with substantial heterogeneity in Cochrane
 411 reviews. Cross-sectional study. BMC medical research methodology. 2011;11.

412

413

414

415

416

417 **Table 1: Description of the population, intervention, comparison and outcome (PICO) of the**418 **Systematic Review**

419

Sl#	PICO	Descriptions
1	Population	<ul style="list-style-type: none"> Injured people who were involved in a transport accident and have sustained one or more minor injuries (e.g. whiplash, contusion, sprain, strain, abrasion, and laceration)
2	Intervention	The main phenomena of interest are articles identifying biopsychosocial factors impacting recovery (3, 6, 12, 24, and 48 months post-accident) with following inclusion and

		<p>exclusion criteria:</p> <p>Articles will be included if they were:</p> <ul style="list-style-type: none"> • Describing minor transport-related injuries • Describing either biological, psychological and social factors impacting recovery • Identifying related health outcomes using one or more BPS models or tools <p>Articles will be excluded if they were:</p> <ul style="list-style-type: none"> • Written in a language other than English • Written prior to 1st January 2006 or after 05th December 2016 • Describing work-related injury, articles on moderate and severe or fatal transport-related injuries • Investigating other type of outcomes (e.g. compensation outcomes, cost-associated outcomes) or the impact on cost and quality of compensation systems.
3	Comparison	<p>Comparators:</p> <ul style="list-style-type: none"> • Articles on factors facilitating recovery and health outcomes • Studies without a comparator will be considered for inclusion
4	Outcome	<p>Primary outcome measure is:</p> <ul style="list-style-type: none"> • Pain • Disability <p>Secondary outcome measures are:</p> <ul style="list-style-type: none"> • Functional recovery • Health-related quality of life • Psychological outcomes (Depression, anxiety, PTSD, sleeping disorders, fear of movement, coping skills, pain catastrophizing) • Social outcomes (RTW, return to usual daily activities, self-reported driving difficulty, and procedural, interactional and informational justice)

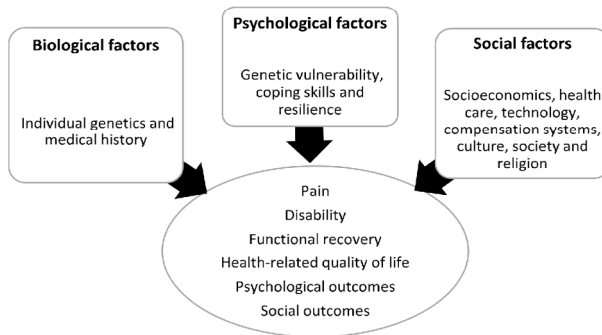
420

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 421
4
5 422
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



Conceptual framework
146x197mm (300 x 300 DPI)

Search strategy

Concept A

Minor injuries (Musculoskeletal and soft tissue)

▼ Search History (24)		Results
# ▲	Searches	
1	arm injuries/ or forearm injuries/ or wrist injuries/ or back injuries/ or fractures, cartilage/ or hand injuries/ or finger injuries/ or lacerations/ or leg injuries/ or ankle injuries/ or foot injuries/ or knee injuries/ or neck injuries/ or whiplash injuries/ or soft tissue injuries/ or "sprains and strains"/ or tendon injuries/ or contusions/	93240
2	exp Musculoskeletal System/in [Injuries]	86439
3	exp Whiplash Injuries/	3389
4	((neck* or shoulder* or arm* or forearm* or wrist* or hand* or finger* or upper limb* or upper extremity* or back* or pelvis* or pelvic* or leg* or knee* or foot* or ankle* or feet* or lower limb* or lower extremity* or toe*) adj3 (injur* or contusion* or abrasion* or laceration* or sprain* or strain*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	95455
5	whiplash*.mp.	3425
6	(minor adj (injur* or contusion* or abrasion* or laceration* or sprain* or strain*)).mp.	18369
7	1 or 2 or 3 or 4 or 5 or 6	18369

Concept B

Transport-related accident/injury

8	Accidents, Traffic/	39572
9	((car or cars or truck or trucks or automobile* or cyclist* or cycling* or cycle* or pedestrian* or passenger* or driver* or motor* or vehicle* or vehicul* or transport* or traffic*) adj3 (accident* or collision* or crash* or smash*)).mp.	48993
10	8 or 9	48993
11	7 and 10	8711

Concept C

Types of studies including limitations to English language and year 2000 – current

12	epidemiologic studies/ or case-control studies/ or retrospective studies/ or cohort studies/ or follow-up studies/ or longitudinal studies/ or prospective studies/ or cross-sectional studies/	2060898
13	qualitative research/	33890
14	case control.mp.	263597
15	((follow up or followup) adj (study or studies)).mp.	602425
16	(observational adj (study or studies)).mp.	85293
17	((observational or prospective or retrospective) adj (study or studies)).mp.	1188696
18	Cross sectional.mp.	310974
19	(cohort adj (study or studies)).mp.	272736
20	(qualitative adj (study or studies)).mp.	23495
21	12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20	2275656
22	11 and 21	2418
23	limit 22 to (english language and humans and yr="2006 -Current")	1110

For peer review only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification	1a	Identify the report as a protocol of a systematic review YES Line 57-59 Page 3
Update	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number YES Line 279-281 Page 12
Authors:		
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors, provide physical mailing address of corresponding author YES Page 1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review YES Line 294 Page 13
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments
Support:		
Sources	5a	Indicate sources of financial or other support for the review YES Line 312-314 Page 14
Sponsor	5b	Provide name for the review funder and/or sponsor YES Line 312-314 Page 14
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol YES
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known YES Line 134 Page 6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO) YES Line 409 Page 16
METHODS		
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review YES Line 151 Line 160 Page 7
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage YES Line 196 Page 8
Search strategy	10	Present draft of search strategy to be used for at least one electronic database including planned limits, such that it could be repeated YES Appendix 1
Study records:		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review YES Line 228 Page 10

Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis) YES Line 213 Page 9
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators YES Line 218 Page 9
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications YES Line 218 Page 9
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale YES Line 185 Page 8
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis YES Line 232 Page 10
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised YES Line 249 Page 11
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2 , Kendall's τ) YES Line 255 Page 11
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression) YES
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned YES Line 241 Page 10
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies) YES
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE) YES Line 233 Page 10

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.