

INPLASY

Prevalence of cervical spine related symptoms following sport-related concussion

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2023110001

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 01 November 2023 and was last updated on 14 November 2023.

INTRODUCTION

Review question / Objective The objective of this scoping review is to map the literature reporting on the prevalence of cervical spine related symptoms following sport-related concussion (SRC). This scoping review will follow commonly employed scoping review methods [1,2]. The scoping review will also follow the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews) reporting guideline [3]. The review protocol will be registered through INPLASY (International Platform of Registered Systematic Review and Meta-analysis Protocols) (www.inplasy.com).

Background Symptoms attributed to concussion are non-specific and commonly reported by individuals with non-concussion conditions [4,5]. The biomechanical mechanism of many SRC injuries presents the possibility that cervical musculoskeletal injury may co-occur with, or

mimic concussion-linked symptoms [4,5], making it difficult to determine the true origin of symptoms in the absence of a focused clinical examination following a concussive event. Musculoskeletal impairments relating to soft tissues of the cervical spine may serve as the main driver of neck pain, headache, dizziness, and imbalance symptoms following a SRC [4,5], particularly when these symptoms persist for more than 10 days [4]. Failure to appropriately address these cervicogenic musculoskeletal impairments has been hypothesized to contribute to delayed symptom resolution and persistent post-concussion symptoms (PPCS) [6].

Rationale In their 2021 systematic review, Cheever et al. [7] found the prevalence of cervicogenic symptoms following all types of concussion ranged from 7 to 69% in the acute stage and increased to 90% in those with PPCS. The prevalence of cervicogenic symptoms following SRC is unclear. To our knowledge, this association has not been adequately studied,

mapped, or summarized in the literature. Our research question is ‘What is known from the existing literature about the prevalence of cervical spine related symptoms following sport-related concussion?’ (Arksey and O’Malley Stage 1).

METHODS

Strategy of data synthesis

This scoping review will follow recommended scoping review methods by Arksey and O’Malley (2005) [1] and Levac et al. (2010) [2].

The following electronic databases will be searched from inception until November 3, 2023: MEDLINE (OVID), EMBASE (OVID), CINAHL (EBSCO), SPORTDiscus (EBSCO), Index to Chiropractic Literature (ICL). A health sciences librarian will define the search strategy in collaboration with the research team. The database search will be conducted in all languages published, with non-English language literature excluded later on in the screening process. Reference checking of eligible full-text articles will be performed to identify additional studies that may meet the inclusion criteria.

The following is a sample search strategy applied to MEDLINE (OVID):

1. exp Neck/
2. Neck Pain/
3. exp Neck Injuries/
4. exp Cervical Vertebrae/
5. Whiplash Injuries/
6. Neck Muscles/
7. exp Brachial Plexus Neuropathies/
8. Torticollis/
9. Dizziness/
10. exp Postural Balance/
11. Headache/
12. exp Headache Disorders/
13. (cervical* or neck* or cervicogenic* or cervicothoracic* or cervico-thoracic* or craniocervical* or atlantoaxial* or c-spine* or c-spinal* or c-1 or c-2 or c-3 or c-4 or c-5 or c-6 or c-7).mp.
14. whiplash*.ti,ab.
15. brachial plexus neuropath*.ti,ab.
16. cervicalg*.ti,ab.
17. cervicodyn*.ti,ab.
18. (neck-ache* or neckache* or neck ache*).ti,ab.
19. WAD.ti,ab.
20. torticollis*.ti,ab.
21. (dizziness or dizzy* or balance* or imbalance*).ti,ab.
22. (headache* or migrain*).ti,ab.
23. (persist* adj3 symptom*).mp.
24. ((musculoskeletal* or msk) adj3 impair*).mp.
25. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19

- or 20 or 21 or 22 or 23 or 24
26. Brain Concussion/
27. Brain Injuries, Diffuse/
28. Head Injuries, Closed/
29. Post-Concussion Syndrome/
30. concuss*.ti,ab.
31. brain-concuss*.ti,ab.
32. ((mild adj2 (brain* adj2 injur*)) or (minor* adj2 (brain* adj2 injur*))).ti,ab.
33. (head adj2 impact).ti,ab.
34. mTBI.ti,ab.
35. (post-concuss* or postconcuss*).ti,ab.
36. sport-concuss*.ti,ab.
37. sports-concuss*.ti,ab.
38. persistent post concussion symptom*.ti,ab.
39. ppcs.ti,ab.
40. 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
41. exp sports/ or exp athletes/ or boxing/ or football/ or hockey/ or martial arts/ or rugby/ or soccer/ or wrestling/
42. (sport* or athlet* or ((aussie* or australian*) adj1 rule*) or archery* or badminton* or baseball* or basketball* or biath* or bmx* or bobsle* or boccia* or boxing* or boxer* or bowling* or bowler* or broomball* or canoe* or cheerlead* or cricket* or crossfit* or cross-fit* or curling* or (cross adj1 country*) or cross-country or cycling* or cyclist* or diving* or diver or divers or equest* or fencing* or fencer* or (field adj1 hockey*) or (figure adj1 skat*) or football* or golf* or goalball* or gymnast* or hockey* or judo* or karate* or kayak* or kickbox* or kick-box* or lacrosse* or (lawn adj1 bowl*) or luge* or (martial* adj2 art*) or muay thai or (mountain* adj1 bik*) or racquet* or ringette* or rower* or rowing* or rugby* or runner* or running* or sailing* or sailor* or soccer* or skiing* or skier* or skating* or skater* or sledding* or snowboard* or softball* or speed-skat* or (speed* adj1 skat*) or squash* or swim* or surfing* or surfer* or taekwondo* or tennis* or (track adj1 field) or triath* or volleyball* or wakeboard* or (water adj1 polo*) or wrestling* or wrestler* or weightlift* or (weight adj1 lift*) or jiu jitsu* or jiu-jitsu* or ju-jitsu* or jogging* or jogger* or kendo* or kung fu* or kung-fu* or mountaineer* or qigong* or (tai adj1 ji) or (tai adj1 chi*) or taiji* or taichi*).ti,ab.
43. 41 or 42
44. 25 and 40 and 43
45. exp Animals/
46. exp Humans/
47. 45 not 46
48. 44 not 47
49. case reports.pt.
50. (case series or case-series).ti.
51. (case adj1 report*).ti.
52. 49 or 50 or 51
53. 48 not 52

54. (comment or clinical conference or congress or consensus development conference or editorial or letter).pt.
55. 53 not 54.

Eligibility criteria Eligible studies will report on symptoms related to cervical musculoskeletal dysfunction following SRC. Studies will be included for analysis if the following criteria are satisfied:

- (1) The study reports on cervical spine related symptoms including neck pain, headache, dizziness, and/or imbalance following concussion;
- (2) the study relates to concussions sustained during sport-related activities;
- (3) the study reports on the prevalence of symptoms following sport-related concussion; and
- (4) the study is a clinical research study or literature review published in a peer-reviewed journal.

Studies will be excluded if:

- (1) they are not full-text original articles (i.e., editorials or letters to the editor, abstract only);
- (2) they are not published in peer-reviewed journals;
- (3) they are case reports or case series;
- (4) the full text article is not available in the English language; and/or
- (5) they do not relate to cervical region injuries and sports-related concussion.

Source of evidence screening and selection Data will be extracted from the selected full-text articles into a Microsoft Excel spreadsheet consisting of variables pertinent to the objective of this review. This spreadsheet will be developed by the study team and used to extract relevant data from each included, full-text publication. The following information will be extracted from the included studies:

- Authors' names and year of publication
- Country/Countries of origin
- Study design and aim(s) of study
- Study methods
- Study population
- Study intervention and comparators
- Outcome measures
- Pertinent results
- Conclusions
- Study limitations

A pilot test of the data extraction process will be conducted for the first five sources to further refine the process and ensure the alignment with the research objective and suitability of the data extracted.

Data management Following search execution, a complete list of deduplicated citations will be loaded into EndNote, and exported to Covidence

for study selection. Title and abstract screening will begin with a calibration exercise on a random sample of five titles/abstracts. Two reviewers (J.O. and A.P.) will independently review the selected titles/abstracts and determine which meet the selection criteria. Selection criteria will be judged acceptable based on an 80% agreement threshold, with further refinement of criteria if necessary, using a second set of five titles/abstracts.

Upon successful completion of the calibration exercise, two reviewers (J.O. and A.P.) will independently conduct title and abstract screening from the search to identify studies that meet the selection criteria. Any disagreements will be resolved through weekly discussion and consensus, with a third reviewer (K.S.) serving as a referee if necessary.

Following that, subsequent full-text review will be conducted by the same two reviewers. Articles deemed acceptable after full-text review will comprise the final pool of articles for data extraction and subsequent analysis.

Reporting results / Analysis of the evidence

Given the broad objective of this scoping review in mapping the literature on cervical spine-related symptoms following SRC, neither a risk of bias nor sensitivity analysis is planned but may be carried out if time and resources allow. The presentation of results will consider the breadth of literature reporting on cervical spine-related symptoms following SRC. The authors will present both numerical and thematic analyses of the included corpus of literature, with additional relevant information reported, as appropriate. Summary charts of included articles will be presented.

Language restriction No language restrictions will be imposed on the search. Limits to English language only manuscripts will be performed in the screening process.

Country(ies) involved This scoping review will be conducted in Canada and the United States.

Other relevant information The authors of this review combine expertise from several different academic research programs, including Canadian Memorial Chiropractic College, University of South Florida, and Parker University.

Keywords Prevalence, Concussion, Sport, Sport Related Concussion, Cervicogenic, Neck, Cervical, Musculoskeletal, Symptoms.

Dissemination plans A manuscript will be prepared and submitted to be considered for publication in a peer-reviewed journal.

Presentations of the review's findings at relevant conferences will also be considered. Notices, blog posts, and social media posts in relevant channels and professional associations will be used to increase awareness of the final publication.

Contributions of each author

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