



A SCOPING REVIEW OF TRAINING-RELATED INJURIES AMONG FEMALES IN THE MILITARY

Prepared by: Brian Hutton, Candyce Hamel, Danielle Rice, Chantelle Garritty, Becky Skidmore, Kevin Semeniuk, Krista Adamo

Contact: Brian Hutton

E: bhutton@ohri.ca

T: 613-737-8899 ext. 73842

Review title and timescale

1 Review title:
A scoping review of training-related injuries among females in the military

2 Anticipated or actual start date:
February 11, 2019

3 Anticipated completion date:
June 15, 2019

4 Stage of review at time of this submission:

This review has not yet started

Review stage (Please check all that apply)	Started	Completed
Preliminary searches	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Piloting of the study selection process	<input type="checkbox"/>	<input type="checkbox"/>
Formal screening of search results against eligibility criteria	<input type="checkbox"/>	<input type="checkbox"/>
Data extraction	<input type="checkbox"/>	<input type="checkbox"/>
Risk of bias (quality) assessment	<input type="checkbox"/>	<input type="checkbox"/>
Data analysis	<input type="checkbox"/>	<input type="checkbox"/>

Provide any other relevant information about the stage of the review here: Not applicable

Review team details

5 Named contact
Brian Hutton

6 Named contact email
bhutton@ohri.ca

7 Named contact address
501 Smyth Road, Ottawa, ON K1H 8L6

8 Named contact phone number
613-737-8899 ext. 73842

9 Organisational affiliation of the review
University of Ottawa

10 Review team members and their organisational affiliations
Give the title, first name and last name of all members of the team working directly on the review. Give the organisational affiliations of each member of the review team.

Title	First name	Last name	Affiliation
Dr.	Samantha	Cukier	Ottawa Hospital Research Institute
Ms.	Fatemeh	Yazdi	Ottawa Hospital Research Institute
Mr.	Alan	Michaud	Ottawa Hospital Research Institute
Mrs.	Chantelle	Garritty	Ottawa Hospital Research Institute
Dr.	Brian	Hutton	Ottawa Hospital Research Institute
Mrs.	Becky	Skidmore	Independent consultant
Mr.	Kevin	Semeniuk	University of Ottawa
Dr.	Kristi	Adamo	University of Ottawa

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11 Funding sources/sponsors

Canadian Department of National Defence

12 Conflicts of interest

None

Review methods

13 Review question(s):

In females in the military aged 18-55 years:

1. What anthropometric (e.g. measures of size/shape/composition of the body), physiological (e.g. fitness level, flexibility, blood pressure, EEG/ECG measures) and biomechanical (e.g. lifting technique, movement efficiency) factors have been identified that impact musculoskeletal injuries?
2. What risk factors for musculoskeletal injury have been observed/reported in the literature?
3. What injuries are occurring and what are the causes of these injuries?

14 Literature Search:

- 1 Military Personnel/ (67519)
- 2 Armed Forces.tw,kf. (11807)
- 3 defen#e force?.tw,kf. (2279)
- 4 militar*.tw,kf. (104478)
- 5 ((airborne or assault* or battle* or combat* or warfare) adj3 train*).tw,kf. (1399)
- 6 combat arms.tw,kf. (106)
- 7 combat-centric.tw,kf. (6)
- 8 combat-related.tw,kf. (3444)
- 9 (army or armies or naval or navy or navies or airforce* or air force* or soldier* or sailor* or submarine* or infantry* or infantries).tw,kf. (78390)
- 10 (marines or marine corps or marine personnel).tw,kf. (2164)
- 11 conscript*.tw,kf. (3690)
- 12 reservist?.tw,kf. (455)
- 13 militia?.tw,kf. (162)
- 14 special forces.tw,kf. (438)
- 15 green beret?.tw,kf. (8)
- 16 or/1-15 [MILITARY] (191914)
- 17 exp Musculoskeletal System/in [Injuries] (88854)
- 18 exp Musculoskeletal System/ and Occupational Injuries/ (1109)
- 19 ((musculoskeletal* or musculo-skeletal* or muscle?) adj3 (damag* or disorder? or fractur* or injur* or ruptur* or tear* or trauma*)).tw,kf. (72860)
- 20 exp Fractures, Bone/ (477063)
- 21 ((break* or damag* or diastas* or fractur* or injur*) adj3 (ankle? or arm or arms or back or bone? or cartilage or clavicle? or coccyx? or elbow? or femur? or femoral or fibula? or foot or feet or finger? or forearm? or hand? or hip or hips or humerus or humeral or knee? or kneecap? or leg or legs or limb or limbs or lower extremit* or metatarsal? or neck? or patella? or pelvic or pelvis or radius or radial or rib or ribs or scapula* or shoulder? or skull? or spine? or spinal or tailbone? or tibia? or toe or toes or ulna? or upper extremit* or vertebra* or wrist?)).tw,kf. (499591)
- 22 (fracture? adj3 (avulsion or dislocat* or closed or comminute* or compound or compression* or crush* or fatigue or march or micro or multiple or open or spontaneous* or sprain* or stress*)).tw,kf. (92508)
- 23 microfractur*.tw,kf. (3903)
- 24 exp Joint Dislocations/ (40477)
- 25 ((joint? or shoulder?) adj3 (damag* or dislocat* or displac* or injur* or subluxation?)).tw,kf. (42365)
- 26 exp Spinal Injuries/ (67542)
- 27 exp "Sprains and Strains"/ (2211565)
- 28 sprain*.tw,kf. (12718)

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29 strain*.tw,kf. (1467867)
30 exp Tendon Injuries/ (44771)
31 (tendon* adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kf. (23923)
32 (ligament* adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kf. (27476)
33 ((achilles* or lumbar or fascia? or hamstring? or rotator cuff? or rotatorcuff?) adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kf. (24839)
34 ((bicep? or quadricep? or tricep?) adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kf. (3574)
35 or/17-34 (4158658)
36 16 and 35 [MILITARY - MSIs] (25985)
37 Female/ (17088776)
38 exp Women/ (8666397)
39 (female? or wom#n*).tw,kf. (4663986)
40 or/37-39 (17918807)
41 36 and 40 [MSI - MILITARY - FEMALE/WOMEN] (6644)
42 exp Animals/ not Humans/ (16933721)
43 41 not 42 [ANIMAL-ONLY REMOVED] (4007)
44 (comment or editorial or news or newspaper article).pt. (1868335)
45 (letter not (letter and randomized controlled trial)).pt. (2059241)
46 43 not (44 or 45) [OPINION PIECES REMOVED] (3976)
47 46 use medall [MEDLINE RECORDS] (1413)
48 sailor/ (39719)
49 soldier/ (69807)
50 Armed Forces.tw,kw. (11415)
51 defen#e force?.tw,kw. (2283)
52 militar*.tw,kw. (104966)
53 ((airborne or assault* or battle* or combat* or warfare) adj3 train*).tw,kw. (1409)
54 combat arms.tw,kw. (106)
55 combat-centric.tw,kw. (6)
56 combat-related.tw,kw. (3456)
57 (army or armies or naval or navy or navies or airforce* or air force* or soldier* or sailor* or submarine* or infantry* or infantries).tw,kw. (76636)
58 (marines or marine corps or marine personnel).tw,kw. (2161)
59 conscript*.tw,kw. (3701)
60 reservist?.tw,kw. (457)
61 militia?.tw,kw. (162)
62 special forces.tw,kw. (447)
63 green beret?.tw,kw. (8)
64 or/48-63 [MILITARY] (194436)
65 exp musculoskeletal injury/ (427107)
66 exp musculoskeletal system/ and occupational accident/ (1914)
67 ((musculoskeletal* or musculo-skeletal* or muscle?) adj3 (damag* or disorder? or fractur* or injur* or ruptur* or tear* or trauma*)).tw,kw. (74373)
68 ((break* or damag* or diastas* or fractur* or injur*) adj3 (ankle? or arm or arms or back or bone? or cartilage or clavicle? or coccyx? or elbow? or femur? or femoral or fibula? or foot or feet or finger? or forearm? or hand? or hip or hips or humerus or humeral or knee? or kneecap? or leg or legs or limb or limbs or lower extremit* or metatarsal? or neck? or patella? or pelvic or pelvis or radius or radial or rib or ribs or scapula* or shoulder? or skull? or spine? or spinal or tailbone? or tibia? or toe or toes or ulna? or upper extremit* or vertebra* or wrist?)).tw,kw. (501293)
69 (fracture? adj3 (avulsion or dislocat* or closed or comminute* or compound or compression* or crush* or fatigue or march or micro or multiple or open or spontaneous* or sprain* or stress*)).tw,kw. (93138)
70 microfractur*.tw,kw. (3982)
71 ((joint? or shoulder?) adj3 (damag* or dislocat* or displac* or injur* or subluxation?)).tw,kw. (42451)
72 sprain*.tw,kw. (13005)
73 strain*.tw,kw. (1469996)
74 (tendon* adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kw. (24001)

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75 (ligament* adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kw. (27841)

76 ((achilles* or lumbar or fascia? or hamstring? or rotator cuff? or rotatorcuff?) adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kw. (25145)

77 ((bicep? or quadricep? or tricep?) adj3 (damag* or disorder? or injur* or ruptur* or tear*)).tw,kw. (3605)

78 or/65-77 (2356610)

79 64 and 78 [MILITARY - MSIs] (11440)

80 Female/ (17088776)

81 (female? or wom#n*).tw,kw. (4778698)

82 80 or 81 (17945296)

83 79 and 82 [MSIs - MILITARY - FEMALE] (3313)

84 exp animal/ or exp animal experimentation/ or exp animal model/ or exp animal experiment/ or nonhuman/ or exp vertebrate/ (49878007)

85 exp human/ or exp human experimentation/ or exp human experiment/ (38481524)

86 84 not 85 (11398162)

87 83 not 86 [ANIMAL-ONLY REMOVED] (3152)

88 editorial.pt. (1068511)

89 letter.pt. not (randomized controlled trial/ and letter.pt.) (2059067)

90 87 not (88 or 89) [OPINION PIECES REMOVED] (3138)

91 90 use emczd [EMBASE RECORDS] (1710)

92 Military Personnel/ (67519)

93 armed forces.ti,ab,kw. (11398)

94 defen#e force?.ti,ab,kw. (2282)

95 militar*.ti,ab,kw. (104734)

96 ((airborne or assault* or battle* or combat* or warfare) adj3 train*).ti,ab,kw. (1404)

97 combat arms.ti,ab,kw. (106)

98 combat-centric.ti,ab,kw. (6)

99 combat-related.ti,ab,kw. (3440)

100 (army or armies or naval or navy or navies or airforce* or air force* or soldier* or sailor* or submarine* or infantry* or infantries).ti,ab,kw. (76455)

101 (marines or marine corps or marine personnel).ti,ab,kw. (2158)

102 conscript*.ti,ab,kw. (3696)

103 reservist?.ti,ab,kw. (457)

104 militia?.ti,ab,kw. (161)

105 special forces.ti,ab,kw. (447)

106 green beret?.ti,ab,kw. (8)

107 or/92-106 [MILITARY] (192657)

108 exp Musculoskeletal System/in [Injuries] (88854)

109 exp Musculoskeletal System/ and Occupational Injuries/ (1109)

110 ((musculoskeletal* or musculo-skeletal* or muscle?) adj3 (damag* or disorder? or fractur* or injur* or ruptur* or tear* or trauma*)).ti,ab,kw. (74008)

111 exp Fractures, Bone/ (477063)

112 ((break* or damag* or diastas* or fractur* or injur*) adj3 (ankle? or arm or arms or back or bone? or cartilage or clavicle? or coccyx? or elbow? or femur? or femoral or fibula? or foot or feet or finger? or forearm? or hand? or hip or hips or humerus or humeral or knee? or kneecap? or leg or legs or limb or limbs or lower extremit* or metatarsal? or neck? or patella? or pelvic or pelvis or radius or radial or rib or ribs or scapula* or shoulder? or skull? or spine? or spinal or tailbone? or tibia? or toe or toes or ulna? or upper extremit* or vertebra* or wrist?)).ti,ab,kw. (500153)

113 (fracture? adj3 (avulsion or dislocat* or closed or comminute* or compound or compression* or crush* or fatigue or march or micro or multiple or open or spontaneous* or sprain* or stress*)).ti,ab,kw. (92920)

114 microfractur*.ti,ab,kw. (3967)

115 exp Joint Dislocations/ (40477)

116 ((joint? or shoulder?) adj3 (damag* or dislocat* or displac* or injur* or subluxation?)).ti,ab,kw. (42283)

117 exp Spinal Injuries/ (67542)

118 exp "Sprains and Strains"/ (2211565)

- 119 sprain*.ti,ab,kw. (12937)
- 120 strain*.ti,ab,kw. (1469213)
- 121 exp Tendon Injuries/ (44771)
- 122 (tendon* adj3 (damag* or disorder? or injur* or ruptur* or tear*)).ti,ab,kw. (23927)
- 123 (ligament* adj3 (damag* or disorder? or injur* or ruptur* or tear*)).ti,ab,kw. (27798)
- 124 ((achilles* or lumbar or fascia? or hamstring? or rotator cuff? or rotatorcuff?) adj3 (damag* or disorder? or injur* or ruptur* or tear*)).ti,ab,kw. (25089)
- 125 ((bicep? or quadricep? or tricep?) adj3 (damag* or disorder? or injur* or ruptur* or tear*)).ti,ab,kw. (3596)
- 126 or/108-125 (4159420)
- 127 107 and 126 [MILITARY - MSIs] (26206)
- 128 Female/ (17088776)
- 129 exp Women/ (8666397)
- 130 (female? or wom#n*).ti,ab,kw. (4773144)
- 131 or/128-130 (18006035)
- 132 127 and 131 [MSI - MILITARY - FEMALE/WOMEN] (6675)
- 133 132 use coch,cctr,clhta,dare [COCHRANE RECORDS] (129)
- 134 47 or 91 or 133 [ALL DATABASES] (3252)
- 135 remove duplicates from 134 (2149) [TOTAL UNIQUE RECORDS]
- 136 135 use medall [MEDLINE UNIQUE RECORDS] (1407)
- 137 135 use emczd [EMBASE UNIQUE RECORDS] (711)
- 138 135 use coch [COCHRANE DSR UNIQUE RECORDS] (2)
- 139 135 use cctr [CENTRAL UNIQUE RECORDS] (27)
- 140 135 use clhta [HTA DATABASE UNIQUE RECORDS] (0)
- 141 135 use dare [DARE UNIQUE RECORDS] (2)

15 URL to search strategy:

N/A

16 Condition or domain being studied:

Training-related musculoskeletal system/injuries

17 Participants/Population:

Studies including active members of the military (i.e., full members or reserves) aged 18-55 years of age. Studies must include female military members (i.e., studies that include only males will be excluded).

18 Intervention(s)/Exposure(s):

Studies that aim to identify differences (e.g., anthropometric, physiological, biomechanical), risk factors, and causes of musculoskeletal injuries among females in the military are of interest. In studies that capture/assess the fitness level of recruits prior to or immediately upon entering service, the baseline level of fitness for women entering the services will be of interest. Self-assessed fitness level will also be included.

19 Comparator(s)/Control(s):

Expected comparators are males in the military and uninjured females in the military, although all other relevant comparators will be considered.

20 Types of study to be included initially:

Systematic reviews, randomized controlled trials, quasi-randomized controlled trials, and observational studies (i.e., cohort and case-control), and cross-sectional studies will be included. Relevant institutional reports will also be included.

21 Context:

Studies in basic military training and in combat will be included. There is no restriction on geographical location.

- 22 Primary outcome(s):**
Musculoskeletal injury; Anthropometric, physiological or biomechanical differences
- 23 Secondary outcome(s):**
Risk factors for injury; Causes of injury
- 24 Data extraction (selection and coding):**
A standardized data charting form implemented for recording key items. A pilot exercise of three relevant studies was performed in Microsoft Excel (version 2016) to help develop the draft data charting form. Data charting will be performed by one reviewer and verification will be carried out by a second reviewer. A list of draft data variables includes general study characteristics (e.g., author and publication year), study population characteristics (e.g., age, % female), measurement characteristics (e.g., test name, method of testing), nature of comparator group, and outcomes collected. The approach for further refining and developing the data extraction form will depend on the volume and extent of the diversity of the included studies. Once the included studies have been identified, we will further pilot the draft form on a select number of studies (5-10) that represent perceived diversity in concepts and variables. The extent of extraction may depend on the feasibility according to the volume of included studies and resources to complete the work.
- 25 Risk of bias (quality) assessment:**
As this scoping review is being conducted to provide an overview of the existing evidence, regardless of methodological quality or risk of bias, a risk of bias assessment of the individual studies will not be undertaken.
- 26 Strategy for data synthesis:**
Study characteristics (e.g., author, year, country, number of participants) and population demographics (e.g., age, physical fitness levels) will be presented in tabular form. Organizing data first by injury type will allow for all anthropometric, physiological, and biomechanical factors to be identified, as an injury could be caused by one or several factors. Results will be presented using tables and visual representations (e.g., maps, radar charts, bar charts), as appropriate. A narrative summary will be used to further describe the results from the tables and charts. Other risk factors (as identified in the literature), incidence and causes of each injury will also be presented, with any similar and/or contradictory results highlighted.
- 27 Analysis of subgroups or subsets:**
Subgroup analyses will depend on comparator (e.g., males, uninjured women).

Review general information

- 28 Type of review**
Select one of the following:
- | Review Type | |
|--------------------|-------------------------------------|
| Scoping review | <input checked="" type="checkbox"/> |
| Rapid review | <input type="checkbox"/> |
| Systematic review | <input type="checkbox"/> |
| Other: _____ | <input type="checkbox"/> |
- 29 Language**
English
- 30 Country**
Canada
- 31 Other registration details**
None.

32 Reference and/or URL for published protocol

The protocol will be posted to Open Science Framework once it is finalized.

33 Dissemination plans:

Results will be provided to the knowledge users. We are currently waiting for our primary end users (Adamo, Seminiuk) to complete a discussion with their funders from the Canadian Department of National Defence to establish any other dissemination plans of specific interest to them to suit their needs.

If there are sufficient funds, we intend to publish the results in an open-access peer-reviewed journal.

Do you intend to publish the review on completion?

Yes

No

34 Keywords

Musculoskeletal injuries, females in the military, anthropometric measurements, physiology, biometric measurements

35 Details of any existing review of the same topic by the same authors.

None that have been identified.

36 Current review status

The review has not begun, though preliminary search strategies have been developed.

37 Any additional information:

None.

38 Details of final report/publication(s):

None.