

# Musculoskeletal Injuries (MSKi) Among Females in the Military: A Scoping Review

## Summary

Findings suggest that females are at an increased risk of MSKi and stress fractures compared to men. Female recruits are generally at a higher risk for stress fractures compared to female active military members. Being less physically fit, being heavier, later age at menarche, having history of injury and being Caucasian are one of many factors that influence MSK injury rates.

## Implications

The identified gaps in the evidence include lack of: robust study design, studies on female military personnel in Canada, and information on females who are postpartum. This review has also provided insight into factors that influence a woman's motivation to enlist and pursue a military career. The evidence will allow the development of training strategies to mitigate some of the barriers for recruitment and retention.

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**MSKi**– Musculoskeletal Injuries

**RCT**– Randomized Controlled Trial

\*Protocol available on Open Science Framework (<https://osf.io/mxtzj/>)

<sup>1</sup> Tricco, AC et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann. Intern. Med.* 169, 467-473 (2018).

## What is the current situation?

- In the military, females have a greater risk for injuries compared to males due to differences in strength, and female recruits are likely at greater risk for injuries due to rapid onset of physical demands during training. Exploring how this issue affects recruitment and retainment are important.

## What is the objective?

- To: (1) identify the types, and (2) causes of MSKi among females in the military, and (3) explore the various risk factors for MSKi which include anthropometric, physiological, and biomechanical risk factors.

## How was the review conducted?

- Following a protocol developed a priori\*, we conducted a scoping between March to June, 2019, for English language, peer-reviewed studies published from inception onwards. We searched major databases (e.g. MEDLINE) and additional grey literature sources to identify studies. Studies were included if the study population provided stratified MSK injury data for females (18-55yrs) in the military, or trainees and recruits. A PRISMA for Scoping Reviews checklist was used to guide the reporting of this report.<sup>1</sup>

## What did the review find?

- Out of 2,287 citations identified, 168 publications (144 unique studies) were included. Most were retrospective and prospective cohort studies, with very few (3%) from randomized controlled trials (RCTs). Studies were identified across 10 countries and published between 1977 and 2019. Most studies assessed both incidence/prevalence and risk factors (62.50%), with very few assessing cause (13.69%).
- **Incidence and Prevalence:** Stress fractures among female recruits were higher compared to female active military. For MSKi, the prevalence was highest amongst recruits (19.7% to 58.35% vs. 5.5% to 56.6%) but the incidence was lower compared to female active military (0.02% to 57.7% vs. 13.3% to 71.9%). These rates varied between military status when assessed by body part.
- **Anthropometric:** For both female military groups, increasing body fat was a predictor of MSKi but not stress fractures; **Physiological:** For both female military groups, being less physically fit, later menarche and having no or irregular menses were predictors of MSKi and stress fractures; **Biomechanical:** For female recruits, longer tibial length and femoral neck diameter increased risk of stress fractures, and low foot arch increased risk of an ankle sprain. For female active military members, differences in shoulder rotation and bone strength were associated with MSKi.
- Being female compared to male was associated with increased risk of MSKi, stress fractures and general injuries (which include MSKi) for both female military groups. This varied by affected body part. Other general risk factors for MSKi amongst females were being Caucasian, smoking, having lower education, history of injuries, and being of lower military rank.
- Consequences of MSKi included limited duties, time off and discharge for active military. For recruits, these included missed training days, limited duty days and discharge.

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