Reviewer's report

Title: Aetiology and risk factors of musculoskeletal disorders in physically active conscripts: a one-year follow-up study in the Finnish Defence Forces

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Reviewer: Joseph Knapik

Reviewer's report:

GENERAL COMMENTS: The article examines injury incidence, injury rates, and injury risk factors in two groups of Finnish conscripts over 6-months of their active duty. The paper is generally well written, well referenced, and authors have generally given proper credit and referencing for past work. However, there are a number of variables that are not clearly defined, a number of definitional problems, and the statistical analysis could benefit from some modification as discussed in the Specific Comments.

Authors cite the tables out of sequence and this should be corrected.

The authors have a series of additional files (Additional files 2, 2, 3, 4 [note that two files are both labeled “Additional File 2”]). These are the univariate results which should be integrated into the paper to increase understanding of the data. They, in fact, show that the adjustment for age, company, smoking, alcohol intake, baseline medical conditions, school success, father’s occupation, and prior physical activity have little influence on most (but not all) of the HRs.

SPECIFIC COMMENTS:

Abstract

1. The title implies a one-year study. Yet, there were 2 cohorts followed for 6 months each. Is this not a 6-month study of 2 cohorts?

2. Line 14 and 17 - Define CI (confidence interval), and HR (hazard ratio) on first use.

3. Line 18 – “Abdominal Obesity” is not the measure. Waist circumference is the measure?

4. Line 21 – “Poor school success” is not well understood by the reader at this point. This should be better defined in the abstract (perhaps combined educational level plus grades?)

5. Line 24 – I assume the authors mean “…improve aerobic and muscular fitness prior to conscript training”.

Background
6. The Background is generally well written and to the point.

7. Page 3, Line 11-12 – Is this correct? 94/1000 per year would mean that 9.4% of conscripts were hospitalized every year.


9. Page 4, Line 6 – Also include here References 1,3,4,6,7,10,14,15,16,18,19,20,25,35 and probably others. Include a few of these.

10. Page 4, Line 8 – I am not sure what “content of military service” means

11. Page 4, Line 12-13 – The general hypothesis seems limited give the number of other intrinsic risk factors obtained in the study (tobacco use, drinking, education, self-assessed soldier demands, etc.)

Methods

12. Page 4, Bottom; Page 5, Top – While most companies are well understood by military observers, Private Company is not. Define this.

13. Page 5, Line 15 – Remove “(ref R06063)”.

14. Page 6, Line 4-5 – The authors say the conscripts had 19 hours/week physical training. Assuming 6 days of training/week, this is 3.2 hours/day. Is this correct?

15. Page 6, Line 6 – Despite the fact that the data was collected over 1 year, the 2 cohorts were only followed for 6 months. Is this correct? If so, it is a 6 month and not 1-year study.

16. Page 6, Line 11-13 – What is the difference between “type” and “diagnosis”?

17. Page 6, Line 19-22 and beyond – The use of the term “musculoskeletal disorder (MSD) is somewhat problematic. There are some injuries listed here that do not involve muscles or the skeleton. Sprains generally involve ligaments, cartilage, and other structures; wounds are dermatological. Many authors use this but it can be somewhat misleading.

18. Page 6, Line 22; Page 7, Line 1 - What is the difference between a sprain (involving the knee) and a “knee ligament rupture”?

19. Page 8, Lines 2-3 – These figures can be eliminated as the tests are well known. Provide a general description of each test (e.g. For the push-up, a conscript was required to lower his body in a generally straight line to a point where his upper arm was parallel to the ground, and then return to the starting point with elbows fully extended. For sit-up...”).

20. Page 8, Lines 4-6 – It is not clear how the MFI is calculated. How are “individual muscle test points” acquired? (e.g., scaled, # of the repetitions on
each test, etc.)

21. Page 8, Lines 7 – Check the grammar here. The sentence makes no sense and the formula in Table 1, footnote 6 provides the calculation much better.


23. Page 8, Line 17 – Body composition was not measured in this study. Body composition is usually taken to mean (at a minimum) body fat and fat-free mass (usually measures from skinfolds, anthropometry, densitometry, or dual X-ray absorptometry).

24. Page 8, Line 20 – Reference the fact that WC is a “mark of abdominal obesity and excessive visceral fat”, or leave out.

25. Page 8, Last Line – Table 3 is cited before Table 2. Tables should be in sequence.

26. Table 3 – Correct the “)” and uppercase the “2” in “Body mass index (BMI=(kg) / (m)\]^2\). Columns 4-7 should also be labeled “HR” (also in Tables 4-6).

27. Page 9, Pre-information Questionnaire – Two variables are not well defined. These are health and health behavior. Provide a better definition of these, similar to the one provided for “school success”. But, even “school success” has some vagueness. For example, Lines 13-15 say “Conscripts who attended [certain schools] and reported excellent or good school success were categorized as having excellent school success”. The use of “school success” twice is confusing. Is the first “school success” grades or something else? If grades, what grades constitute excellent or good?

28. Page 10, Lines 14-16 – “Occurrence rate” is not a rate since it has no time interval. This is better called “MSD incidence” (see: Last JM, Abramson JH, Friedman GD, Porta M, Spasoff RA, and Thuriaux M (Eds.). A Dictionary of Epidemiology New York: Oxford University Press, 1995.)

29. Page 10, Lines 16-19 – “Person-based incidence” might be better termed “incidence rate”. The authors define this as the number of conscripts with a MSD/exposure time. Thus it is an incidence/time, and time makes it a rate.

30. Page 10, Lines 19-21 – “Event-based incidence” might be better termed “event-based incidence rate” for reasons similar to above.

31. Page 11, Lines 7-10 – MSDO might be better stated as musculoskeletal disorder incidence (MSDI).

32. Page 11, Line 13 and beyond – I have some concern about the statistical analysis. The authors say they took “known risk factors” into account in their analysis and they cite age, smoking, alcohol intake, baseline medical condition and other factors into account. Yet, they say in their introduction that the data on age is conflicting (I think the conflict is minor—in most studies, basic training older age is associated with higher risk) and they do not mention alcohol intake
(data on this is rare, although there are a few studies). Further, the footnotes to Tables 3-6 cite other variables that were controlled for that are not mentioned here. A much better approach would have been to run the univariate analysis, take those variables that were significant and put those variables into the multivariate model. Additional variables that have been reported to be significant in other studies (e.g., older age, cigarette smoking, physical inactivity, physical fitness [aerobic and muscular endurance]) could have been included regardless of significance.

Results

33. Page 12, Type and Anatomical Location... - Do not repeat data that is in Tables. Thus, the first sentence could be reworded: “Most MSD were in the lower extremities followed by the back, upper extremities (including shoulders), head, and other parts of the body (Table 2)”.

34. Page 13, Lines 13-17 – The “causes” of acute injuries the authors list amount to 63%. What were the other “causes” of acute injuries?

35. Page 13, Lines 17-22 – The “causes” of overuse injuries the authors list amount to 79%. What were the other “causes” of overuse injuries?

36. Page 14, Risk Factors of MSD, Paragraph 2 and beyond – Do not repeat data that is in tables. Thus, Paragraph 2 could simply read “For health, increased risk of MSDO was associated with high BMI, high WC, sports injury in the last month, and clear musculoskeletal symptoms. Increased risk of long term MSDO was associated with…” This provides the reader with a concise overview and the precise HRs and CIs can be obtained from the table. Also, describe the variables in the order presented in the tables to make it easier for the reader to follow. I had to constantly shift focus up and down the tables which was VERY time consuming.

37. Integrate univariate results (Additional Files) into the Results section.

38. Page 14, Paragraph 3 – The authors do not mention father’s unclear or unemployed status which was associated with MSD occurrence (incidence).

39. Page 15, Lines 1-8 – Physical activity and engagement in aerobic sports are likely to covary so it is not surprising that after controlling for physical activity there was little association.

40. Page 15, First Paragraph - The authors have not addressed last degree in school, self-assessed fitness and belongs to sports club which were also associated with injury.

41. Page 15, Lines 19-20 – The authors ignore in this sentence the Cooper test which also “after conceptual adjustment … maintained …significance for both outcomes”.

Discussion
42. Page 16, Line 11-14 - Consider another word or phrase modification for "respectable". Perhaps ...tests were highly associated with MSD."

43. Page 16, Lines 14-16 – Also previous studies show cigarette smoking, and physical fitness are associated with injury. The fitness association in this study was also a dose-relationship.

44. Page 16, Lines 16-19 – Also Company.

45. Page 16, Lines 20-23 – Also entry-level physical fitness is a modifiable risk factor.

46. Page 17, Lines 13-16 – Actually, the standing long jump measures leg power (the authors allude to this in the following sentences). Both tests were significantly associated with injury in the univariate analysis. These two tests represent separate and independent components of physical fitness and so it is not surprising that combining them resulted in a stronger association with injury risk.

47. Page 17 Lines 20-23. Top Page 18 – I think the authors could “correct” their run and leg power data using suggestions from Vanderburgh et al. (Ref 39) to see how that affects injury risk. This is not necessary but might add to the paper.

48. Page 18, Line 13-14 – Check grammar.

49. Page 19, Middle Paragraph – It may also be that the association between injuries and BMI is a “J” shape. That is, those with very low BMI are at risk, those of middle BMI at lowest risk and risk increases as BMI increases. Does high BMI eliminate a potential conscript from military service in the Finnish Army? If not, this may be why the authors could demonstrate the relationship while the results are not as clear as in US professional Army where entry level BMI is restricted.


51. Page 22, Line 3 – Define RCT.


**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being
published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests