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

Version: 1 Date: 24 February 2010

Reviewer: Monika Wahi

Reviewer's report:

Major Compulsory Revisions

1. Page 3 “Given that 80% of young men complete their military service in Finland, the high number of MSDs affects public health.” I am unsure what this sentence means. I believe you are trying to say that military service is compulsory in Finland for young men, and that 80% of them stay in Finland during and after military service, thus injuries as part of military service affect Finland’s overall public health. In the US, where military service is voluntary currently, accession into the military is done quite differently, and therefore, affects background public health quite differently. The point you are making might be extremely important, and may be worth explaining in more detail.

2. Page 4, top: I would change your hypothesis to, “The general hypothesis is that low levels of physical fitness and sedentary lifestyle prior to conscription are associated with MSDs during training”, or something like this statement, which is more specific than what you have. It is an established fact that low levels of physical fitness and sedentary lifestyle are associated with MSDs in general. Your study is specific to the condition in which conscripts with a history of low levels of physical fitness and a sedentary lifestyle enter an environment of high physical activity and suffer subsequent MSDs that may affect both them and the military for years. I feel you should emphasize this unique and important contribution in your hypothesis statement.

3. You describe how you obtain injury information on the study participants, and how you classify it once it is identified, on pages 6-7. Although you provide a lot of information, it’s not exactly clear to me. It appears that you used some sort of search terms to identify injury-related visits from electronic medical records. Did you use ICD10 codes? I do not understand where the following sentence comes into play: “After careful clinical examination, necessary diagnostic tests and radiological graphs, the most accurate diagnosis was selected by a physician according to the 10th Revision of the International Classification of Diseases and Related Health Problems (ICD-10).” Is that before or after you search the electronic medical records? If you are using ICD-10 codes as a way of initially identifying MSD injuries in a search, please list the codes you used.

4. Page 10: The statistical analysis approach is beautifully described. However, I still have two questions: (1) Did you test the assumptions behind proportional hazards modeling and find that this is the approach you should be using? I am
imagining that most of the MSD happen in the first two weeks, and I am unsure whether your modeling approach can properly evaluate the relative impact of when the MSD occurs (early vs. late in training). Perhaps ones that happen earlier are more likely to turn into long-term problems? (2) Please describe how you censored people who did not get events. I am also wondering if you actually removed people from the analysis after they got their first MSD, or if you continued to include them so they could get repeated MSDs. A description of your censoring approach would be extremely helpful.

5. Overall methods section: I am having trouble understanding the study timeline/design. This is what I believe:

In July 2006, 359 new conscripts were invited for recruitment, and in January 2007, 603 were invited. The first two weeks (of July 2006 for the first group, and of January 2007 for the second group), medical data were gathered about these groups. For the first 8 weeks (roughly July-August 2006 for the first group, and January-February 2007 for the second group), there was 17 hours per week of military training which was physical, and increased in intensity over the 8 weeks. The next 4 months (Sept-Dec 2006 for the first group, and March-May 2007 for the second group) were spent in individual training programmes, but the programmes were comparable in terms of high-intensity physical training.

I see in the middle of Page 6, under “Musculoskeletal disorder registration”, that you say “The data was collected between July 2006-July 2007”. Do you mean that this is the period of follow-up — meaning that all injuries in this study occurred between those two dates? If this is true, are you counting injuries after the training period (e.g., after Dec 2006 but before August 2007 for the first group, and after May 2007 but before August 2007 for the second group)? If not, follow-up for the second group is quite a bit shorter than the first group.

You also say on page 5, “All subjects were followed for six months starting from the first day of service.”

I am also now noticing in your abstract that you say, “During the one-year study period...” The phrase “one-year follow-up study” is in your title. Did I count wrong, and the training actually lasts a year?

You also classify severity of MSD by days of limited duty. Are you only counting these in the time period that they were in training (July-Dec 2006 for the first group, and Jan-May 2007 for the second)?

Your study is well done, but due to the timing involved, it can be difficult to describe the study design. Consider using a flow diagram, table, or some other presentation to clarify the design, follow-up periods, and the study flow. It may efficiently communicate a multitude of ideas while freeing up space in the text for other information.

6. I thought a lot about your data presentation, and while it is comprehensive and very well done, I feel like your story is getting lost. I feel like you need to look at how low baseline fitness is a risk factor for MSDO after adjustment for everything
else that needs to be taken into account.

In this sense, you would be first determining some way of quantifying a “fitness” exposure – either using one of the physical fitness tests given to the conscripts, or using some composite score from several of them. If you prefer the former, you could choose more than one, and develop slightly different models. You mention in your discussion that Cooper’s test and the standing long jump test seemed to be the best predictors; perhaps you could consider these in your fitness variable.

You have already chosen outcome variables; you could then model a chosen fitness variable against the outcome variables, and use the other variables (BMI, waist circumference, self-reported health, etc.) to introduce into the model. You could still construct univariate and conceptual models for your fitness/MSDO model, but you would also add a final model, adjusted for everything you feel it needs, and could report HRs for all of the covariates in the final model (as well as HRs for those covariates where they may fall in other models, as well, including the covariates already provided in the conceptual models).

Certainly, BMI, height, and waist circumference are somewhat co-linear; choices would have to be made so that the most parsimonious final model is constructed. The covariates that survive in the final model reported would then become the ones you report other information on, such as univariate results for just that covariate (e.g., univariate results for various categories of BMI). The other covariates that did not survive in the final model, and do not appear in the conceptual model, could then be presented in your additional files.

I think this would tighten up your story, and reduce the amount of data that needed to be presented to provide a clear picture. It would also allow you to look at interactions. Additionally, it will allow you to move a lot of your discussion to your background, and tighten the focus of your paper to the unique contribution to the question of fitness as a protective factor against injury provided by your study, and how your results create or settle contradictions with respect to the existing literature. For example, a hypothesis exists that in individuals with a high BMI, a high fitness level can counteract the risk conferred by the high BMI, and these individuals may not experience higher rates of injury as a result. Questions such as these could be addressed.

Currently, it seems both your background and discussion try to cover too much ground, and do not seem to follow a logical progression. Focusing on answering this one question would help organize the paper. Explorations of other important questions you try to cover, such as how low education may be a risk factor for injury, could be done in a different article.

7. On page 16, you say, “Higher waist circumference (WC), high BMI, earlier musculoskeletal symptoms and poor school success were all clearly associated with MSDs giving clarity for some equivocal findings.” I do not completely agree; I feel these items are confounded. For example, high BMI and higher waist circumference are co-linear – which one of them is the most explanatory of the outcomes you saw? Without a multivariate model modeling just the relationship
of fitness to the outcome (adjusted for necessary confounders), this is hard to claim.

8. In your conclusion, once you redo the analysis as I have described, I think it will be very easy for you to make concrete recommendations. For example, if you do find that low baseline fitness, after adjustment for all necessary confounders, is predictive of MSDO, you could propose a “pre-training” program for those who have low fitness at baseline (defined by your exposure variable, such as the Cooper’s test). The pre-training program could have the goal of getting the conscript to the point that he can score in a higher fitness category on the Cooper’s test. Once the conscript meets that goal, he can join the next training group. Currently, your conclusion does not have the impact it could.

Minor Essential Revisions

1. Additional files: Additional file 1 is identified as 2 on the heading of the document.

2. Page 4, top: replace “In spite of large number…” with “In spite of a large number…”

3. Page 6, middle: replace “The data was collected between…” with “The data were collected between…”

4. On page 12 you say…”and the person-based incidence was 7.1 (95% CI: 6.8–7.4), respectively.” 7.1 per how many people? 1,000? 7.1 per 1,000 would seem low to me, I would be expecting higher, given that the percentage of conscripts who got injured was 69%. I feel you need to contextualize your rates in the Discussion by comparing them to injury rates in other military studies.

Discretionary Revisions

1. Abstract: replace “The strongest factors associated with MSDs…” with “The strongest baseline factors associated with MSDs”. I think this emphasizes your intent on predicting MSDs at the time the training starts. Also, in the conclusion, you may want to restate “An appropriate intervention based on the present study would increase both aerobic and muscular fitness” adding “prior to the beginning of the training program” to the end of the sentence. I think this is what you mean…?

2. Page 5, top: “The baseline characteristics of the companies are presented in Table 1”. Also a reference to Table 1 on page 11: “There were statistically significant differences between companies in the baseline characteristics”. You also point the reader to results tables throughout your Methods section. I normally do not refer to results in the Methods section; this might be more appropriate as an opening for the Results section.

3. Table 1 – it would be helpful to include some assessment of person-days contributed by each company.

4. Table 1 or Table 2 – it would be helpful to include the absolute number of conscripts who suffered an MSD. I see on the headings of other tables that it is 652 for short term, 194 for long-term.
5. This is not a revision; rather, I want to make sure to note several strengths I see in your study design and analysis. Classifying acute vs. overuse MSD’s is challenging with medical records data. You handle this eloquently in your study design and discussion. You also very clearly describe how you classified clinic visits such that you could identify unique new injuries vs. follow-up for existing injuries. You provide a person-based as well as person-time-based event rate, which is extremely helpful in understanding your results. You categorize continuous variables into logical categories, rather than only modeling them continuously, which can provide a more useful picture when the continuous data do not have a strict linear relationship with the outcome. You very clearly describe your data presentation, and your tables are very clear and comprehensive.

6. Page 10 bottom: “The incidences with 95% confidence intervals (CI) were expressed per 1000 person-days.” I see your incidences in Table 2, but not the 95% CI, although those are reported in the text. Maybe they should be on the table?

7. On page 13, you say that in 12% of acute MSDs, the immediate cause remained unclear, and in 27% of overuse-related MSDs, the associated activity remained unclear due to the gradual onset of the MSD. From where were these data obtained – from an abstraction of the electronic medical record, or from some other way? Lacking immediate cause of acute MSDs in 12% seems high, unless the only source was the medical record, and this lacked that information.

Level of interest: An article of outstanding merit and interest in its field

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I declare that I have no competing interests.