Reviewer's report

Title: Effect of leisure time physical activity on severe knee or hip osteoarthritis leading to total joint replacement: a population-based prospective cohort study

Version: 1 Date: 13 January 2012

Reviewer: Jennifer Hootman

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Major Compulsory Revisions

1. Leisure-time physical activity measurement. Reference #14 refers to the original paper on the MLTPA questionnaire. It is unclear exactly how the original instrument was modified and if its reliability and validity had been established. It seemed like there were significant modifications of the MLTPA such as the original instrument asked 64 different activities versus 18 in the modified and the modified version asked about activities during 4 seasons versus the original asks them for each of the 12 months. Looking at reference #15 also does not explain how and why the valid and reliable MLTPA was modified. Although there is a small reference to what seems to be a reliability/reproducability coefficient, it was done only with persons reporting exceptionally high rates of physical activity in the baseline survey and it is unclear the time period between the 2 administrations. The reader needs more information on the psychometrics of this physical activity measure. There is also a vague reference to validity mentioned in discussion paragraph #10. But I think this information should be moved up to the methods section and more details provided on the reliabiility and validity of the modified questionnaire.

2. The measure of leisure-time PA does take into account the frequency, duration and intensity of the activity, the intensity is based on the cardio-respiratory effects (I assume some type of MET value was used for intensity) and does not take into account the joint loading forces of the activity. For example, running 4.0 mph is a 6.0 MET activity and swimming at moderate effort is a 5.8 MET activity. These 2 activities have similar MET values (e.g., energy expenditure) but the forces subjected to the knee joint are very different. While there is no standardized compendium for joint loading forces as there is for MET values, there have been several attempts at capturing joint loading in the PA exposure in the arthritis and bone literature. I suggest that the authors consider some type of analysis that takes into account joint loading. This could be as simple as doing subanalyses of persons only reporting low (e.g., walking, swimming, cycling), moderate (lawn and garden) and high (downhill skiing, soccer, etc.) joint loading activities. Or they may consider using one of the methods reported in the literature or make their own joint loading index variable that can be used to adjust the regression models. They speak vaguely to this issue in discussion paragraph #11, but I suggest bringing in the studies that have attempted to include joint loading in their measure of PA exposure.
Two examples of methods used to "weight" PA data according to joint loading forces are already in your reference list. References # 24 and #29. There are other studies from the bone literature that have attempted to create "bone loading units" too.

Minor Essential Revisions
1. Definitions of knee and hip OA:
   a. hip OA was defined as the first hip replacement with a comcomitant diagnosis of OA. However, someone could have had an OA diagnosis, but actually had a hip replacement due to a hip fracture and not necessarily due to end-stage hip OA. Can you clarify if hip replacements due to fracture were excluded?
   b. There is a considerable amount of time (~6 years) from the latest censor data (December 31, 2005) and now. If data are available from a hospital discharge registry regarding joint replacement, then why were additional cases not included after 2005? It seems the mortality and emigration information should also be available betw3een 2005 and 2011.
   c. It seems you have the exact date of "failure" or censor because you have the date of surgery, date of death or emigration. But this should be explicitly stated as the Cox model used would not be appropriate if you have interval censored data.

2. Discussion, paragraph 3: Can you speculate the mechanisms for this protective effect among women for hip replacement? Could it be something to do with Q-angle, or the different activity patterns among women (women may choose lower impact activities)? Also, I disagree with the last sentence in this paragraph. A relative risk of 0.66 equates to a 34% lower risk. I would consider that important, particularly at the population level because OA is so prevalent.

3. Discussion, paragraph 8: While the authors appropriately discuss the limitation that they did not control for previous injury history, this is a pretty major limitation. Do you have any data on what the most common activities that were reported by the subjects? For instance some sports like (soccer, handball, etc.) have high rates of knee injuries while walking does not. So is there a way you can expand on this limitation a little?

4. Discussion paragraph #12: Again, taking into account the joint loading aspects of different activities may not require a special questionnaire, but may require developing and validating "scoring mechanisms" for existing questionnaires that allow for the incorporation of the joint loading aspects of activities into the exposure measurement.

Discretionary Revisions
1. Background, paragraph 2: there is a second paper related to reference #7 (Cheng et al 2000) which is referenced later (ref # 29). In the follow-up paper the authors took into account joint stress related to physical activity in their exposure measurement and also controlled for previous injury which the Cheng paper did not. Suggest moving reference #29 up with reference #7.
2. Discussion, paragraph 1, sentence 3: suggest inserting "a possible gender difference".

3. Discussion, paragraph 4, sentence 3. I would consider joint replacement a "severe" OA outcome, so your outcomes are representing only the "tip of the iceberg".

4. Discussion, Paragraph 9: In addition to reference #17, regarding the combined high occupational with leisure activity increases the risk of knee replacement, Dr Felson's work in the Framingham Study also supports this finding for incident OA. Also, I think the last sentence in this paragraph is off topic and not needed.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

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.