Reviewer’s report

Title: Associations between sport participation and knee symptoms: a cross-sectional study involving 3,053 undergraduate students

Version: 0 Date: 02 Jan 2020

Reviewer: Brooke Patterson

Reviewer's report:

General Comments to Authors
We commend the authors on their study, and ability to gain >3000 returned surveys. Overall, this manuscript will need a moderate grammatical workup and language corrections to improve readability and flow. Suggest a more succinct writing style (e.g. especially when reporting previous literature there no need to state authors each time)

The main areas of attention required are the definitions for sports participation, knee symptoms, and use of consistent terminology and ordering throughout the manuscript. Please see specific comments below.

Specific comments:

TITLE AND ABSTRACT
Background: Suggest including type of sports in the aims. I.e. type/number of sports engaged in

Methods: The term "knee symptoms" is adequate to use in the abstract. Would prefer to replace "musculoskeletal symptoms of the knee region" with "knee symptoms (current, previous week, previous year, or lifetime)" Inclusion of current will make results make more sense.

Results: Define "regularly" by regularly (brief definition i.e. >2 x week)

Results: Define / replace word "popular". ? Most frequently participated in

Results: Point prevalence -needs to be defined in methods, as per suggestion above, and use consistent terminology. I.e. decide current or point prevalence. Prefer current for clinical reader.

Results: "Presence of knee symptoms" does this mean current knee symptoms. As per above comment, need to define in methods and then use same term.

Results: "Sustaining knee symptoms" does this mean lifetime prevalence, current or previous 7 days? As per above comment, need to define in methods and then use same term.

Results: "High level competitive sports participants" - does this correspond with "competitive" (from the options they were asked)? I would drop the "high level" from the question you have asked it is just competitive sport, high level makes it sound like national / elite type competitions.

Or if you are trying to say it includes "mainly competitive" as well as "competitive, then this sentence should read "higher" levels of self-perceived competitiveness
Conclusion: Last sentence needs rewording. Sounds like need to do preventative measures or engage in sports of high competitive levels.
".....to reduce their risk of developing knee symptoms, particularly when participating in, XXX, XXX, XXX, or competitive sports.

INTRODUCTION:
The authors have otherwise constructed the introduction in a logical manner which describes the problem, and then the factors of interest - hours (paragraph 2), type/number (paragraph 3), competitive level (paragraph 4). However, the introduction could be more succinct and focus on the novel features and strengths of this study -number of sports, hours of participation per week, and competitive level of sport.

Page 3, first paragraph.
There is repetition regarding the benefits of sports participation.
- Given the well-known physical and mental health benefits of sports participation (Refs), universities have introduced….

Page 4, second paragraph
Again, could be more succinct as describing these studies in detail takes away from the purpose of this paragraph- to say knee pain / injury is a problem in sport, as hours/exposure increases as does the risk/severity of knee pain, and it has long term consequences. E.g. two sentences
- knee pain often persists… Rathleff study
- knee pain/joint injury increases the risk of worse function, quality of life and osteoarthritis

Need to be careful with using the terms knee pain and knee injury - as Whittaker (ref 9) does not report on adolescent knee pain - it reports on youth knee joint injury. Reword/join with previous sentence or find more appropriate reference to link knee pain and OA

Page 4-5, third paragraph
This paragraph describes the limitations in the previous literature well. The only part that is not clear is the last sentence (Line 17 - 19). Particularly this part "the results were largely affected by the number of people performing a given sport attending the clinics"
Do you mean there were small numbers participating in each individual sport which limited their analysis? Make this clear, as this is a strength of the current study, and emphasise need to evaluate type, and number of sports to inform injury prevention strategies

Page 5, fourth paragraph
Need to be careful in this paragraph that don't focus on specialisation too much as the current study didn't evaluate sports specialisation and risk of knee symptoms.
I.e. did you evaluate those single-sport and competitive specifically? (I don't think so - apologies if so). This would be an interesting analysis rather in addition to single vs multiple sports.

Could also be more succinct in the previous literature description of sports specialisation and risk of musculoskeletal injuries and overuse knee injuries.

Page 5-6, fifth paragraph/aims
These could be reworded to be consistent and similar to the abstract:
- Sports participation- hours, type/number of sports, competitiveness
METHODS:
The authors should be commended on conducting this large-scale survey.

Page 7, Line 1-4: Definition of knee symptoms
If this definition could have included an acute knee injury (i.e. ACL, MCL), was this made clear to the participant? It isn't clear initially until read some aspects of the introduction and discussion that the definition included acute knee injuries. If a clinician reader does not fully read the manuscript, they may be led to believe knee symptoms refers to overuse type injuries.

Page 7, Line 5-10: Definition of sports participation
Was their participation related to their current participation? Or did it ask about lifetime, previous 12 months, previous week and current, as per the knee symptoms? This has implications for the interpretation of the results or should be acknowledged in the limitations

Page 7, Line 11-15: Definition of sports participation
Was participation in gym-based activities (i.e. cross fit) included? Is this included in cross-training? If so, define this in legend of Appendix 4 or in manuscript.

Page 8, Line 1
With and without knee pain. Does this refer to current knee pain? Or all types (lifetime, previous 12 months, previous week)

Page 8, Line 3-4
"Presence of knee symptoms". Again, needs to be clear what this is referring to: current, lifetime, previous 12 months, previous week. This is mentioned in the next sentence - so it appears all analysis were only conducted using current symptoms?

RESULTS:
The definition of regular has not been defined and is used throughout the results

Page 9, Line 14
Suggest using another term other than popular. I.e. this could mean the most number of participants or most number of hours

Page 9, Line 9
Remove "approximately"

Page 10, Line 5-6
"point-prevalence of current knee symptoms" suggest using one term or the other/be consistent throughout. I am not sure whether this sentence (re prior history of knee symptoms associated with higher point prevalence) is best placed here. It is an important acknowledgement, and perhaps should go in previous paragraph with description of the cohort and risk factors. Especially, as it was not included in the model, it may be confusing here. The purpose of this paragraph should be to describe the influence of sports participation hours/type of sport.

To be consistent with order of results (i.e. hours, type/number, competitive) I would move Line 18-19 from next paragraph to this paragraph. Then the next paragraph is dedicated to competitive level
Page 10, line 15
What does the "number of sports participations" mean?
? number of sports participated in
? total number of hours

Page 10, Line 16
"sustaining current knee symptoms". Replace sustaining with better word. i.e. having

Page 10, Line 16
"competitive sports" As per previous comment in Abstract, which answers does this include? Mainly competitive and competitive? Define in methods

There is no analysis of the influence of sports participation on lifetime, 7-day and 12-month prevalence of knee symptoms? If this was limited by knowledge of sports participation in these time periods it should be raised in the discussion.

DISCUSSION:
Paragraph 1. Page 11 Line 3-4:
Consider including all variables of interest in this sentence:
I.e. ……evaluate the associations between the type, number, and competitive level of sports activities, and current knee symptoms among undergraduate students

Paragraph 1. Page 11 Line 6:
"experiencing knee symptoms" - this is misleading as sounds like lifetime prevalence. Please use current knee symptoms/consistent throughout.

Paragraph 2. Page 11 Line 15:
As per previous comment. Consistent terminology with use of current or point prevalence Also consistent with number of decimal places. 6.37% her, and 6.4% earlier

Paragraph 2. Page 11, Line 17-18
Suggest just reporting knee prevalence from previous study

Paragraph 2. Page 11, Line 19
Is the higher (12%) rate of knee symptoms in the USA study compared to the current study and Suka and Yoshida study not due to the latter being mixed sex, and the USA study being female only? Due to the known increased risk of anterior knee / patellofemoral pain in females?

Paragraph 5, Page 13, Line 2
Need to be careful in wording i.e. combat sports had the highest risk of knee symptoms compared to other sports, as the analysis performed did not evaluate this. I.e. > number of hours combat increased risk of current knee symptoms.

Paragraph 5
It should be acknowledged here that the current survey (or results that are presented) did not distinguish between acute knee injuries and knee symptoms. Therefore, there are limitations in drawing conclusions from the current study about combat sports - should the injury prevention strategies include those to target acute knee injuries or overuse injuries?? Did the prior study just evaluate acute knee injuries?
Yoga for Knee OA. "intervention for knee OA" - need to indicate whether successful intervention/and for what knee pain/function?

As per results, it would be easier for reader to keep consistent order of discussion of results i.e. hours, then type/number, then competitive level. Number of sports is placed in this paragraph Line 17-19. Join with previous or create own paragraph. Could also explore/link back to specialisation argument - multiple sports is better to expose to different types of load.

Explanation of why competitive sports higher risk. Here you could also add that the number of hours of participation were adjusted for in the model - so it wasn't due to higher exposure/hours. Were the competitive players more likely to participate in single sport only? As above this may be an interesting analysis / or just describe the proportion, and use in this discussion point.

Limitations section: Good here to acknowledge limitations of the survey in regards to type of injury. Should also acknowledge here the limitation (If true) of not knowing sports participation in past 7 days, or past 12 months.

Discussion general: Overall the message of the paper should not to deter undergraduate students from participating in sports activities, and as the authors have stated they should participate in injury prevention activities to reduce their risk. This should be raised in the discussion (not just in the conclusion in the abstract, and conclusion in the manuscript).

Authors could consider having a clinical considerations paragraph, so that the conclusion can be more related to the results of the current study rather than exploring new concepts of allocation of injury prevention resources.

CONCLUSION:
Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

No

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.
Yes

**Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?**

If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

**Quality of written English**

Please indicate the quality of language in the manuscript:

Needs some language corrections before being published

**Declaration of competing interests**

Please complete a declaration of competing interests, considering the following questions:

1. Have you in the past five years received reimbursements, fees, funding, or salary from an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

2. Do you hold any stocks or shares in an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

3. Do you hold or are you currently applying for any patents relating to the content of the manuscript?

4. Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript?

5. Do you have any other financial competing interests?

6. Do you have any non-financial competing interests in relation to this paper?

If you can answer no to all of the above, write 'I declare that I have no competing interests' below. If your reply is yes to any, please give details below.

I declare I have no competing interests

I agree to the open peer review policy of the journal. I understand that my name will be included on my report to the authors and, if the manuscript is accepted for publication, my named report including any attachments I upload will be posted on the website along with the authors' responses. I agree for my report to be made available under an Open Access Creative Commons CC-BY license ([http://creativecommons.org/licenses/by/4.0/](http://creativecommons.org/licenses/by/4.0/)). I understand that any comments which I do not wish to be included in my named report can be included as confidential comments to the editors, which will not be published.

I agree to the open peer review policy of the journal