Title: Can pre-season fitness measures predict time to injury in varsity athletes?: a retrospective case control study

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Author’s response to reviews: see over
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Dear Sports Medicine, Arthroscopy, Rehabilitation, Therapy and Technology Editorial Board,

Please find attached our revised manuscript entitled: Can pre-season fitness measures predict time to injury in varsity athletes?: a retrospective case control study. We believe we have addressed all the reviewer comments and made the associated changes to the manuscript.

Sincerely,

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Response to Reviewers Comments

1. The method of time measurement needs to be clarified (photocell or hand chronometer).
   - This has been clarified. (we used a stopwatch)

2. The main shortcoming of the article is of being "retrospective". The authors are strongly recommended to clarify this issue and discuss.
   - We have added a few sentences to clarify the reasons for the retrospective analysis of the injury. It is noted that this was the only “retrospective” as aspect of the project and was used for the reasons stated in the “limitations” section of the manuscript.
   - We rephrased the design section of the methods to clarify:
     “All participants (eligibility defined in participants) completed a battery of preseason fitness tests during the month preceding their competitive season starting. Exposure data was estimated retrospectively based on available data and expert assessment to determine the amount of time athletes were exposed to the possibility of injury in practice or competition. Injury data was obtained retrospectively using a self-administered injury report survey completed by participants at post-season team meetings for which attendance of all athletes (injured or not) was mandatory.”
   - We rephrased the limitation section of the discussion to clarify:
     “Accounting for and documenting practice and game exposure when predicting injury is a novel aspect of this study. The collection of the measurement of the potential predictors of injury was collected before the exposure. However, injury information was collected retrospectively with a risk or recall bias. For feasibility reason, we based the injury data
survey on the NCAA Injury Surveillance System modified so that an athlete could complete the survey retrospectively. A member of the research team was present to answer questions or clarify items when the survey was administered. Furthermore, practice and competition schedules were used to help athletes remember injury dates and to reduce any recall bias that may have occurred. Others have shown that retrospective tracking of injuries is sufficiently accurate in athletes.(48) Our injury survey also ensured that we captured all injuries including those that may not have been reported to athletic therapy staff in a prospective injury tracking system because we asked the athletes themselves.”

3. The exposure time should be 1000 hours of play or competition/match, not the number of athletes.
   - We have added the reference from the NCAA methods paper which states that the units of exposure are practice or game and is expressed in “athlete exposure” not hours.
   (Background end of first paragraph)

4. The subjects are from different sports and genders. This poses a problem of making comment as they have different backgrounds in terms of training (also previous injuries). Thus, a statistical analysis is questionable as the mean of parameters may not have a homogenous distribution. This is quite apparent from the result that there is no correlation, except only one (upper extremity endurance).
   - We have clarified that our goal was to search for a set of predictors of injuries that could have been used in predicting time to injuries in sports from our varsity program involving both upper and lower extremity involvement. We now highlight in the discussion that our lack of finding a predictors serving that purpose suggest that it will be relevant to conduct gender and sport specific analyses in the future and we have explained the rationale why this may be needed. Because we were searching for predictors that would have worked for multiple sport we believe our analysis strategy is acceptable but we concur that our research suggests that sport and gender specific analyses are needed in the future.
   - We believe the analysis combining sports and gender in these sports using both upper and lower extremities is justified as it provides novel evidence that gender and sports are key predictors of time to injury in varsity sport. To our knowledge this information was lacking from the literature as analysis of predict of time to injury are rare in the Varsity sport literature.
   - In the participant section of the methods we added the following sentence to justify examining this mixed sample of teams and gender: “This sample of varsity teams includes sports where sport participation involves use of both the upper and lower extremities where both genders are involved.”
   - In opening the discussion we rephrased as:
   - “This study sought to develop a predictive model for injury in varsity athletes from sports where both upper and lower extremities are used using preseason performance measures.”
   - In the second paragraph on limitations we rephrased as follows: “However, the intent was to assess the ability of the preseason measures to identify athletes at risk of any injuries in sports involving both upper and lower extremity activities.”
   - Added a new paragraph in the limitation section to address your comment: “Alternatively, because we found differences between genders and between sports, we recommend focussing on only one gender and one sport when planning future studies on predictions of shorter time to injuries. Males and females practicing different sports may have different backgrounds in terms of training, and previous injuries. Further, different sports include different activities. Poor scores on fitness measures may predict shorter time to injuries when exposed to risky activities more prevalent in a given sport than another. Nevertheless, our results show that the preseason measures selected in the present study were not strong predictors of short time to injuries over and above gender and sport in sports that were selected because they involved both upper and lower extremity use . Likely this means that a different predictor set will be required for different sport even though for simplicity varsity programs may have benefited from using a common dataset for all sports and genders.”
5. Page 2 line 3-5. Please remove: "Although our study did not support the hypothesis that baseline performance measures predict time to injury, they should not be discounted for their utility in estimating the athletic performance of varsity athletes," from the abstract. This sentence is not the conclusion to the study, but rather an opinion from the authors.
   - Done.

6. Page 2 line 7: Please add "sports injury" to the key words.
   - Done.

7. Page 5 line 15: "all participants" please state how many were included in the study.
   - This is restated and explained in detail in Participants section. We added 86 to the sentence: “All 86 participants provided written informed”…

8. Page 6 line 7: please refer to the table (1) of the demographic information of the included subjects here. Please also include BMI as a variable.
   - Done. BMI added to Table 1

9. Page 18 line 15-16: please remove the sentence: "Nevertheless, preseason measures may still be relevant for estimating the athletic performance of varsity athletes." This is not a conclusion, but an opinion of the authors. You can state this in the discussion section where it would be more appropriate.
   - This was removed completely.

10. Table 2: some of the data are not recorded for all subjects. Please explain the reason of the missing data in the "limitations" section of the paper.
    - This has been explained in detail in the limitations section of the manuscript.
    - “Missing data may have influenced the results. Due to a scheduling conflict men’s hockey did not complete the Modified Illinois Agility test. Other missing fitness measures (<3 per measure) were due to either scheduling conflict or exclusion of invalid result due to instructions not being followed.”