Reviewer's report

Title: Injury Rates and Injury Risk Factors Among Federal Bureau of Investigation New Agent Trainees

Version: 2 Date: 26 September 2011

Reviewer: Daniel William Trone

Reviewer's report:

Declaration: I, the reviewer (Dr Dan Trone), know the primary author and two co-authors professionally.

(Following are the Reviewer’s First Comments; the Author’s Replies; and Reviewer’s responses)

Major compulsory revisions for the record:

1. Reviewer’s First Comments - The authors use the term ‘tend’ or ‘tended’ when referring to statistical comparisons that did not achieve the desired p-value<0.05. Delete the term, or the sentences, and clarify there was no statistically significant association.

Reply: We did not set an arbitrary “statistical significance” level at p<0.05 as the reviewer suggests. While many investigators do this we feel this is an older and potentially outmoded practice that goes back to a time when it was difficult to calculate exact p-values and investigators had to use tables in the back of textbooks that only had statistical test “thresholds” of p=0.05 or p=0.01. Now that computers are available that can provide exact p-values, these should be provided in all scientific work. More to the reviewer’s point, we have considerable experience with data of this type, dealing with injuries in relation to fitness and lifestyle variables. Rather than depend on a single point estimate (the p-value) we also look at a number of other factors in considering the “importance” of a finding. We have more conviction in a finding if the confidence intervals are small, the risk is large (i.e., in this case the hazard ratio), the finding is supported by similar findings in the literature, and the finding has biological plausibility. Of course, all of these conditions are seldom met but they are all considered in our analyses. We feel it is legitimate to draw the reader’s attention to findings that fulfill these criteria with the word “tend” or “tended”. We will note any finding that has a p<0.05 but this is not our sole criterion. We have consulted with at least four statisticians (Judy Cuthie, Charles Rhoads, Robin Lee, and Karen Deaver) in the past and they generally agree with this approach.

Reviewer response: The authors bring up a good point, and this might be a topic for an entire issue. What is a small CI? What is a large risk? What was the criterion to determine similar findings in the literature - a statistical significance test set at a specific alpha level?
Not setting a statistically significant p-value seems to be an arbitrary determination in itself. It is reasonable to define statistical significance in the Methods if using the term in the manuscript. It’s also reasonable to delete "significant" with respect to statistics and risk throughout the manuscript, or describe what p-value was set to determine significance.

Add the following in the Methods section, Data Analysis:

A statistically significant p-value was not determined however p-values were provided. Rather than depend on a single point estimate (the p-value) a number of other factors were considered to determine the importance of a finding; small confidence intervals, the risk is large (i.e., in this case the hazard ratio), the finding is supported by similar findings in the literature, and the finding has biological plausibility. All these conditions did not have to be met to determine the importance of the finding. Findings that fulfill these criteria are qualified by the word “tend”.


Reply: As the reviewer suggested, we have now removed the word “tended” and just stated at the risk was elevated. In this case, the p=0.05 but there was no “systematic” association between BMI and injury risk. There was only an increase at a single quartile while risks at the levels above and below this quartile were lower, relative to the baseline. Past literature indicates that either high or low BMI can be associated with injury. We did not want to ignore this finding but it is somewhat anomalous given past literature and the hypotheses that we and others have developed in the past relating to the association between high and low BMI and injury risk. That is, individual with low BMI might have less bone and muscle mass and be more susceptible to injury for this reason. Individuals with high BMI likely have more fat mass which increases the “dead weight” they carry and they more be more susceptible to injury because of greater joint impact, in addition to greater energy expenditure because of the additional mass.

Reviewer response:

The authors explain BMI was examined according to NIH guidelines (pg 6) yet analyzed by data-driven quartiles for men and women, and presenting the low category as the reference which is contradictory to the author’s comment that low or high BMI has been be associated with injury in the literature. As the authors stated, and for external validity, the BMI should be categorized using NIH established cut-points: low (<18.5), normal (18.5–24.9), overweight (25.0-29.9), and obese (#30.0) with normal BMI as the reference group.

3. Reviewer’s First Comments - Sentence 6: Injury risk tended.

Reply: In this case we considered that 1) risk was elevated in all cases where fitness was low (regardless of the p-value), 2) confidence intervals were relatively narrow around the higher risks (lower fitness levels), 3) previous literature supports the concept that low fitness is associated with higher injury risk, and 4)
the relationship has biological plausibility. The reader has the exact sample sizes, injury risks and p-values and can judge for himself/herself.

Reviewer response:
By convention, models are computed using cut-points and statistically meaningful values; the authors used a statistical method to move from univariate associations to multivariate model building. Of course the readers should be able to draw their own conclusions and take-home message after reviewing a manuscript in which models are presented and interpreted with respect to the model building strategy.

4. Reviewer’s First Comments - Fifteenth paragraph, sentence 1: limited activity tended to have. Fifteenth paragraph, sentence 2: pain in any of these areas tended to.

Reply: Sentence 1 is so structured because we found that injury risk was higher if an individual reported on our questionnaire that they had pain in the foot, knee, or back in the previous year. This is correct since in all cases risk was elevated regardless of an arbitrary level of “statistical significance”. In Sentence 2 we are careful to note that “This was statistically significant for foot and knee pain among the men and back pain among the women, but reported pain in any of these areas tended to increase injury risk”. Because we had not used this question in our past studies, and because we could find no past literature dealing with this or a similar issue, we were more cautious and cited the “statistical significance”. It does seem reasonable that pain in a particular body part could be indicative of an injury that could be exacerbated by activity, or that under particular situations pain could result in a less than optimal movement pattern (to lessen the pain) that could result in a subsequent injury. Although we are less certain of the importance of this finding, we still feel it is important to draw the reader’s attention to the relative consistency of the data. That is, the fact that a positive response to the pain questions were associated with elevated injury risk, although some did not reach a certain probability level.

Reviewer response:
It is reasonable to define statistical significance in the Methods if using the term in the manuscript.

5. Reviewer’s First Comments - The authors report an unreasonably higher injury risk was associated with having never smoked. There is no way to explain a ‘protective’ affect with smoking and injury. Briefly mention the ill-fitting association and delete the rest from the manuscript. Results. Second paragraph, second sentence: An unreasonably higher injury risk was associated with having never smoked.

Reply: We were perplexed by this relationship but, like all finding, we do not think that it appropriate to just note it and ignore it. On the contrary, we gave this relationship considerable thought and discussed it among ourselves. It is not consistent with past studies in Army, Air Force, and Marine basic training where (in all 3 cases) a history of smoking was associated with higher injury risk. There
is no clear biological explanation, as the reviewer notes. We do not postulate a “protective” effect, but rather that there may be an intermediary variable here. We address this in Paragraph 11 of the Discussion. The only studies where we have previously used questions relating to smoking history was military basic training, as noted above. One possible explanation for the discrepancy in the literature (and for the lower injury risk among former FBI new agent former smokers) is as follows. In the basic training studies, trainees were younger and most who reported a history of smoking were still smoking when they entered basic training. This was not the case among the older FBI new agents. Of the 74 individuals who had smoked at least 100 cigarettes in their lives, only 13 (18%) were current smokers (i.e., had smoked in the last 30 days). Unlike basic trainees, it was possible that these individuals had stopped smoking for health reasons and that beside smoking cessation these individuals had taken up other favorable health habits (i.e., more exercise, better sleep, regular medical check-ups) that could possibly affect injury rates in training. Again, we do not think it prudent to report and then ignore a finding, even if it does not correspond with the literature. It is more reasonable to attempt an explanation that might provide some guidance for future study. In this case, if FBI new agents were ever again involved in a study, some questions on why individual who were former smokers had stopped smoking might be appropriate.

Reviewer response: Add the following in the Results section, Univariate analysis of injury risk factors:

Paragraph on page 8 starting with - Table 5 shows the univariate associations between any injury and the questionnaire variables. Among the men, higher injury risk was associated with having never smoked, a lower self-rating of physical activity, and a lower frequency of aerobic exercise in the past 2 months. Of the 74 men who had smoked at least 100 cigarettes in their lives, 13 (18%) had smoked in the last 30 days (current smoker).

6. Reviewer’s First Comments - Please address combining acute and overuse injuries into a single outcome predictive model.

Results. Univariate analysis of injury risk factors, sentence 3: “There was little association between injury risk and physical characteristics.” Is a possible explanation that overuse and traumatic injuries were combined as a single outcome and do not have the same risk factors?

Reply: The reviewer is correct in that the any injury category combines individuals that have either an overuse or a traumatic injury (or both). Although this is a matter of some debate we think that this category has the greatest use for epidemiological purposes. One of the major problems with medical record reviews is the lack of strict diagnostic accuracy. The signs and symptoms used by various medical care providers to determine a diagnosis can differ considerably. Because of this, it is often difficult to categorize an injury as either overuse or traumatic, although we try to do so based on the diagnosis in the medical record. In this investigation, the number of injuries that we placed in the overuse category was only 14% with most injuries placed in the traumatic
category. In the past, using the “any injury” category we have been able to
demonstrate, in a broad epidemiological sense, that certain factors are
associated with injury and that these factors are repeatable when we look at
them in other studies. The power of this broad approach for examining risk
factors for injuries has been demonstrated numerous times in military populations
(e.g., see Jones, Med Sci Sports Exerc 25:197, 1993; Knapik, Med Sci Sports

More to the point, and to address the reviewer’s concern, we have separated the
injuries into overuse and traumatic categories for age, physical characteristics
and the fitness variables. Among the men, where the sample size is larger, it can
be seen that in most cases, both overuse injuries and traumatic injuries are
associated with the variables in a similar manner. That is, they follow the same
pattern, regardless of statistical significance. There is more variability (and wider
confidence intervals) among the women, presumably because of the smaller
number of cases. Given the similarity of the associations between the variables
and the overuse and traumatic injuries, separating the data into these two
categories only serves to dilute statistical power, as shown in the data below.

Reviewer response:

I appreciate the work to provide a Table separating the injuries into overuse and
traumatic categories for age, physical characteristics and the fitness variables.

Add the following in the Discussion section, page 15 Limitations after the first
paragraph:

The present study combines overuse or traumatic injury into a single outcome,
and it is possible that these injury types do not have the same risk factors;
however, the authors consider this combined category has the greatest use for
epidemiological purposes. One of the major problems with medical record
reviews is the lack of strict diagnostic accuracy. The signs and symptoms used
by various medical care providers to determine a diagnosis can differ
considerably. Because of this, it is often difficult to categorize an injury as either
overuse or traumatic, although we try to do so based on the diagnosis in the
medical record. In this investigation, 14% of the injuries were definitively placed
in the overuse category, 68% in the traumatic category, and 18% were
indiscernible.

Minor suggested revisions for the record:

1. Discussion, page 11, fifth line – delete ‘potential’. ‘Thus, the lower fitness level
   of the older individuals is not likely to account for the relationship between age
   and injury.’

2. Discussion, page 12, first line – add ‘in the multivariate model.’ ‘Somewhat
   perplexing in the multivariate model was the lower injury risk among men who
   reported smoking at some point in their lives compared with those who had never
   smoked. Specifically, there was lower injury risk among men who reported
   smoking at least 100 cigarettes in their lives and/or those who reported smoking
at some age.’

3. Discussion, page 12, first paragraph last line – The sentence was added in response to another reviewer’s comment – ‘It should also be noted that, contrary to the men in the present study, the women demonstrated a trend indicating lower injury risk among those who had smoked in the past.’ With respect to ‘tend’, there aren’t any strong univariate (Table 5) or multivariate (Table 6) associations between self-reported tobacco use and injury among women.

4. Add footnote to Table 2.

   Activity
   Physical Fitness Training *

   *Three activities, running, calisthenics and sprinting, account for over 67% of the injuries in this category.

5. Table 4. Body Mass Index – women; category 25.00-29.99 kg/m2 – p-value should read 0.87.

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

Quality of written English: Acceptable

Statistical review: Yes, but I do not feel adequately qualified to assess the statistics.

Declaration of competing interests:

Declaration: I, the reviewer (Dr Dan Trone), know the primary author and two co-authors professionally.