Journal of Clinical and Translational Research
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The effects of sleep disturbance and chronotype on baseline vestibular/ocular motor screening in collegiate athletes

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Handling editor:
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Ref.: Ms. No. JCTRes-D-22-00101
The Effects of Sleep Disturbance and Chronotype on Baseline Vestibular/Ocular Motor Screening in Collegiate Athletes
Journal of Clinical and Translational Research

Dear Dr. Moran,

Reviewers have now commented on your paper. You will see that they are advising that you revise your manuscript. If you are prepared to undertake the work required, I would be pleased to reconsider my decision.

For your guidance, reviewers' comments are appended below.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript. Also, please ensure that the track changes function is switched on when implementing the revisions. This enables the reviewers to rapidly verify all changes made.

Your revision is due by Nov 02, 2022.

To submit a revision, go to https://www.editorialmanager.com/jctres/ and log in as an

Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

Yours sincerely

Nicholas G Murray, Ph.D.
Editorial Board Member
Journal of Clinical and Translational Research

Reviewers' comments:

Editorial Comments:
Ryan - thank you for submitting your work to JCTRes. I apologize for the delayed review, however, it was difficult getting the 2nd reviewer. Please respond to the comments below, however, I believe nearly all are addressable. Reviewer #1 would like to see a your edits before providing additional comments on discussion or other elements of the manuscript. After reading it and the comments provided from Reviewer #3, I am very confident you can adjust the manuscript easily.

Reach out withy any questions!
Nic

Reviewer #2: Abstract

Background
-VOMS is Vestibular/Ocular Motor Screening (VOMS); not Screen. Please correct to align with title
-Please swap Vestibular/Ocular for either VOMS performance or vestibular and ocular performance
-Baseline testing is a topic of much contention. I don't believe there the VOMS was developed to utilize baseline to post-injury scoring but rather "pre-test" to post-item scores.
-In the background section you stated that the influence of sleep should be considered but you also say it may affect performance. I would change the tone to reflect something along the lines that it warrants investigation; then you performed a study to address your curiosity.
-What does influence mean?

Aim
-Consider changing "influenced" (too vague) to a more technical term like sleep difficulties were a risk factor or something of that nature

Methods
-Maybe worth adding "pre-season" before baseline across the paper?

Results
-Is the first line reporting the p values for the overall model and then the second sentence is post hoc tests?
-SDS group differences revealed? The model/contrasts/post hoc tests revealed differences. Please consider revising this section so that it is clear what p values are being reported. I prefer including the data with p values for greater clarity (45 ± 10 vs. 22±5; p = 0.02). A

bunch of p values in an abstract doesn't tell the reader much. I will leave that to the editor.

Conclusions
-Clarify if other testing was not vestibular or oculomotor.
-You are suggesting changing clinical practice. Reporting an effect size in the results would support this statement.

Relevance to patients
-Same comment as above.
-Also, in the current design, unless testing to see if a good night's sleep improved a person's scores, you can't say for certain that sleep would improve scores. This cross-sectional approach does not demonstrate causality.

Key words
-I believe there are more technical terms for "sleep difficulties"? I think there is an ICD-10 code for sleep dysregulation. Maybe sleep homeostasis? What have other papers used? Also, that ICD-10 code might require a specific assessment like a sleep study or something so that might not be appropriate. Just consider looking into it a bit further since that will impact who and how much reads your paper.

Body

Introduction
Page 5; Line 97: Change "The literature" for Recent research or something else. What is rising risk? Like every year more college SAs get losing sleep? Or The same amount of SAs are getting less and less sleep?
Page 5; Line 99: I am not sure concussion history can be considered a health outcome
Page 5; Line 100-102: We need a little bit more lead in before you directly connect sleep, baseline testing and concussions. Maybe also move the last sentence back one sentence?
Page 5; Line 106: I think it should be assessments. Also, please revise the sentence. Poor flow and unclear what you are saying about baseline vs post-injury.
Page 5; Line 110-11: Screening, not screen. Also; try adding to the sentence commonly used[,] valid and reliable. I also think you may be overstating the capability of the VOMS by saying "any".
Page 5; Line 112-13: Maybe consolidate the vestibular and oculomotor sentences for better flow then mention the VOMS. Thoughts seem disjointed as it reads now.
Page 5; Line 114-15: No transition sentence; how do preexisting factors modify baseline concussion assessment. Consider revising?
Page 5; Line 115-17: What are problems? attention/learning disorders? Deficits?; what is a mental health factor? Anxiety? Depression?
Page 5; Line 117-119: with [a] preexisting migraine diagnosis… what are worse scores? Change scores? (i.e., provocation) or total scores?
Page 6; Line 119-21: You mix in a symptom checklist in the middle of VOMS studies. I suggest reorganizing this entire paragraph. Maybe even splitting it into VOMS-related studies and then another related to symptoms in general.
Page 6; Line 134-35: I believe Polysomnography is the gold standard for diagnosing sleep disorders. You use the term common at least 3 times in a single paragraph. Consider revising.
Page 6; Line 138-39: Revise wording of the sentence; poor flow.

Page 6; Line 139-141: you have used sleep quality and sleep behavior when talking about measurement tools. Are they the same thing? Later you mention sleep difficulties. Would be nice to use consistent terminology for the readers.
Page 6; Line 141-143: Test-retest reliability is often reported as intraclass correlation coefficient (ICC), not Pearson Product moment correlation (r).
Page 7; Line 144-150: I think you could cut this down and merge it with the end of the prior paragraph.

Materials and Methods
Page 7; Line 153-55: All participants that provided consent completed the study? (i.e., no dropouts?)
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Page 7; Line 157-158: Was the order of testing documented? Was the time of day recorded? These factors could affect the symptom scores.
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Page 7; Line 162: again, consistency with terminology. Sleep difficulty, quality, problems, etc.
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Page 9; Line 203-4: High internal consistency, not higher, right? Also, it is important to clearly state that the validity of the tool is for identifying concussion, not identifying vestibular/oculomotor dysfunction.
Were there other baseline tests done during the study visit and you guys carved out the VOMS? It would be good to know what each participant did and the order in which they completed it.

Statistical Analysis
Page 9; Line 208-209: I think you mean a series of Shapiro-wilk tests since you were looking at ASSQ and VOMS, right?
Page 9; Line 209-213: How many groups were being compared across the listed outcome variables? Its not clear if there was a high and low, or like the abstract states, moderate + severe vs. no SDS symptoms. Why were the SDS groups collapsed? Why a Man Whit U for recent sleep and chronotype when they appear to be dichotomous? I am not following the stats in the section. Which variables were dichotomous, ordinal, or continuous? Was SDS score the only independent variable?

Review stopped at results.

Reviewer #3: Great manuscript. There are a few areas that need minor revision, but once addressed, this will be a very timely and influential piece in the field.

There is additional documentation related to this decision letter. To access the file(s), please click the link below. You may also login to the system and click the 'View Attachments' link in the Action column.

Authors' response

Dear Dr. Murray, Editorial Office, and Reviewers,

Thank you for the review of our manuscript, JCTRes-D-22-00101, “The effects of sleep disturbance and chronotype on baseline vestibular/ocular motor screening in collegiate athletes.” We have addressed each of the reviewer’s comments/revisions using track changes and have provided a response to those changes below. Thank you again and we look forward to your decision as well as the future manuscript review from Reviewer #1.

Reviewers' comments:

Reviewer #2: Abstract

Background
-VOMS is Vestibular/Ocular Motor Screening (VOMS); not Screen. Please correct to align with title
PI Response: Corrected as recommended.

-Please swap Vestibular/Ocular for either VOMS performance or vestibular and ocular performance
PI Response: Corrected as recommended.

-Baseline testing is a topic of much contention. I don't believe there the VOMS was developed to utilize baseline to post-injury scoring but rather "pre-test" to post-item scores.
PI Response: Corrected as recommended, and removed baseline for administration, reflecting multiple time points of screening.

-In the background section you stated that the influence of sleep should be considered but you also say it may affect performance. I would change the tone to reflect something along the lines that it warrants investigation; then you performed a study to address your curiosity.
PI Response: Corrected as recommended.

-What does influence mean?
PI Response: We deleted “influence” and left with the need for investigation.

Aim
-Consider changing "influenced" (too vague) to a more technical term like sleep difficulties were a risk factor or something of that nature
PI Response: We have replaced influences to modifies as sleep is being purported to be a modifying factor.

Methods
-Maybe worth adding "pre-season" before baseline across the paper?
PI Response: Corrected as recommended in the abstract, intro, and methods where appropriate.

Results
-Is the first line reporting the p values for the overall model and then the second sentence is post hoc tests?
PI Response: No this was individuals who reported yes on the ASSQ to having sleep difficulties on the road. We have edited to make this clearer.

-SDS group differences revealed? The model/contrasts/post hoc tests revealed differences. Please consider revising this section so that it is clear what p values are being reported. I prefer including the data with p values for greater clarity (45 ± 10 vs. 22±5; p = 0.02). A bunch of p values in an abstract doesn't tell the reader much. I will leave that to the editor.
PI Response: We have removed the SDS group differences aspect of this sentence to reflect individual group differences. We would prefer to leave P value and allow that to direct the reader to means and additional data to decrease the length of the abstract as well as clarification as mean VOMS items remain near 0. We will defer to the editor and fix again on future revisions.

Conclusions
-Clarify if other testing was not vestibular or oculomotor.
PI Response: Clarified symptom and neurocognitive data.

-You are suggesting changing clinical practice. Reporting an effect size in the results would support this statement.
PI Response: We would argue that we are not changing clinical practice. We are merely identifying a modifying factor that may alter performance on the clinical measures that may need to be considered by clinicians. Like sex differences, the care itself is not necessarily changing, rather the awareness that performance may vary because of those factors.

Relevance to patients
-Same comment as above.
PI Response: Same PI response as above.

-Also, in the current design, unless testing to see if a good night's sleep improved a person's scores, you can't say for certain that sleep would improve scores. This cross-sectional approach does not demonstrate causality.
PI Response: We have clarified that there may be benefit, to not indicate causality.

Key words
-I believe there are more technical terms for "sleep difficulties"? I think there is an ICD-10 code for sleep dysregulation. Maybe sleep homeostasis? What have other papers used? Also, that ICD-10 code might require a specific assessment like a sleep study or something so that might not be appropriate. Just consider looking into it a bit further since that will impact who and how much reads your paper.
PI Response: Corrected from “sleep difficulties” to “sleep insufficiency”.

Body

Introduction
Page 5; Line 97: Change "The literature" for Recent research or something else. What is rising risk? Like every year more college SAs get losing sleep? Or The same amount of SAs are getting less and less sleep?
PI Response: Corrected as recommended. Have clarified poor sleep.

Page 5; Line 99: I am not sure concussion history can be considered a health outcome
PI Response: Corrected as recommended.

Page 5; Line 100-102: We need a little bit more lead in before you directly connect sleep, baseline testing and concussions. Maybe also move the last sentence back one sentence?
PI Response: Corrected as recommended. Last sentence moved as recommended.

Page 5; Line 106: I think it should be assessments. Also, please revise the sentence. Poor flow and unclear what you are saying about baseline vs post-injury.
PI Response: Corrected as recommended.

Page 5; Line 110-11: Screening, not screen. Also; try adding to the sentence commonly used[,] valid and reliable. I also think you may be overstating the capability of the VOMS by saying "any".
PI Response: Corrected as recommended.

Page 5; Line 112-13: Maybe consolidate the vestibular and oculomotor sentences for better flow then mention the VOMS. Thoughts seem disjointed as it reads now.
PI Response: Corrected as recommended.

Page 5; Line 114-15: No transition sentence; how do preexisting factors modify baseline concussion assessment. Consider revising?
PI Response: Corrected as recommended.

Page 5; Line 115-17: What are problems? attention/learning disorders? Deficits?; what is a mental health factor? Anxiety? Depression?
PI Response: Corrected as recommended.

Page 5; Line 117-119: with [a] preexisting migraine diagnosis… what are worse scores? Change scores? (i.e., provocation) or total scores?
PI Response: Corrected as recommended.

Page 6; Line 119-21: You mix in a symptom checklist in the middle of VOMS studies. I suggest reorganizing this entire paragraph. Maybe even splitting it into VOMS-related studies and then another related to symptoms in general.
PI Response: Corrected as recommended.

Page 6; Line 134-35: I believe Polysomnography is the gold standard for diagnosing sleep disorders. You use the term common at least 3 times in a single paragraph. Consider revising.
PI Response: We do not state that wearable technology is the gold standard, but rather a common strategy. We have removed the redundancy of the term common.

Page 6; Line 138-39: Revise wording of the sentence; poor flow.
PI Response: Corrected as recommended.

Page 6; Line 139-141: you have used sleep quality and sleep behavior when talking about measurement tools. Are they the same thing? Later you mention sleep difficulties. Would be nice to use consistent terminology for the readers.
PI Response: Clarified the purpose of the ASSQ based on its citation and previous literature.

Page 6; Line 141-143: Test-retest reliability is often reported as intraclass correlation coefficient (ICC), not Pearson Product moment correlation (r).
PI Response: Corrected as recommended. That was language from the article, which was reliability of the total score, which we have removed to only leave Cronbach alpha statistic.

Page 7; Line 144-150: I think you could cut this down and merge it with the end of the prior paragraph.
PI Response: Corrected as recommended.

Materials and Methods
Page 7; Line 153-55: All participants that provided consent completed the study? (i.e., no dropouts?)
PI Response: Correct, there were no dropouts.

Page 7; Line 155-157: Is academic class by year in school or progress in their degree program?
PI Response: Clarified by adding “in school”, to reflect academic class and not reflective of “red shirt years”. It is not using towards degree to prevent misunderstanding with students who are in entry level masters programs that may begin in their true junior year.

Page 7; Line 157-158: Was the order of testing documented? Was the time of day recorded? These factors could affect the symptom scores.
PI Response: Clarified that the order was counterbalanced. Testing was not time stamped, so it is unclear how many were completed at specific times, but following collegiate scheduling, all were completed from mid-morning to late afternoon. If the editor would like this added as a limitation, we can include in future revisions.

Page 7; Line 158-160: Not sure if this sentence adds value.
PI Response: Deleted as recommended.

Page 7; Line 162: again, consistency with terminology. Sleep difficulty, quality, problems, etc.
PI Response: Changed to disturbance and dysfunction to align with the literature.

Page 7-9; Line 162-192: Consider reorganizing the presented information about the ASSQ. A suggested order would be basic item information; factor structure, scoring
PI Response: We have moved the SDS categorization later in the paragraph to reflect your recommendation.

Page 9; Line 203-4: High internal consistency, not higher, right? Also, it is important to clearly state that the validity of the tool is for identifying concussion, not identifying vestibular/oculomotor dysfunction.
PI Response: Corrected as recommended.

Were there other baseline tests done during the study visit and you guys carved out the VOMS? It would be good to know what each participant did and the order in which they completed it.
PI Response: We added above that those 2 assessments were delivered in a counterbalanced manner.

Statistical Analysis
Page 9; Line 208-209: I think you mean a series of Shapiro-wilk tests since you were looking at ASSQ and VOMS, right?
PI Response: Yes, we have corrected as recommended.

Page 9; Line 209-213: How many groups were being compared across the listed outcome variables? Its not clear if there was a high and low, or like the abstract states, moderate + severe vs. no SDS symptoms. Why were the SDS groups collapsed? Why a Man Whit U for recent sleep and chronotype when they appear to be dichotomous? I am not following the stats in the section. Which variables were dichotomous, ordinal, or continuous? Was SDS score the only independent variable?
PI Response: We added that the ASSQ #11, 12, 9, and self-reported sleep were dichotomous variables, which further mimics sex differences (male or female) literature for VOMS with dichotomous variables and use of non-parametric analyses. VOMS data is ordinal as it is likert scale rating in a set rate, while SDS category was dichomtous between the 3 categories (non, mild, moderate + severe). Again, this follows previous VOMS literature. Mann Us were needed to address the results of K-W tests.

Review stopped at results.
PI Response: Thank you for your review. We have addressed the comments and suggestions above and look forward to your feedback to the remainder of the results and discussion, as your feedback has been very valuable in improve the quality of this manuscript.

Reviewer #3: Great manuscript. There are a few areas that need minor revision, but once addressed, this will be a very timely and influential piece in the field.
PI Response: Thank you for your review, comments, and suggestions. We have addressed each of your items and look forward to your follow-up feedback, based on this revision and any future revisions/reviews.

Overall
This is a very interesting manuscript and important information to be published. One overall critique would be to include a sentence or two emphasizing the importance of accurate baselines, either in the introduction (perhaps near lines 105-108) or the discussion. This will emphasize the clinical relevancy of this article.
PI Response: Thank you. We have added a statement on accuracy and clinical decision making.

Abstract
Methods - L60: Explain what the possible chronotypes are. This is not necessarily general knowledge
PI Response: Corrected as recommended. We also clarified this in the methods.

Introduction
L106: Baseline and pre-injury assessment are typically used interchangeably. Consider changing this to post-injury or omitting one of the terms.
PI Response: Corrected as recommended from above too, using Pre-season baseline the first time.

L106-108: It is stated that baseline and pre-injury assessment should include objective measures, then goes on to speak about self-reported symptoms. Self-reported symptoms are typically classified as subjective.
PI Response: Corrected as recommended.

L116: Consider removing one of the and's in the sentence
PI Response: Corrected as recommended and ADHD was removed as that was included twice accidentally, first as attention problems.

L147: This sentence reads as though the ASSQ will evoke VOMS symptoms. Perhaps writing if there is a relationship or correlation between the two, or something of that nature, will improve the clarity.
PI Response: We have deleted this sentence as recommended above.

Materials and Methods
L153-160: This section could be enriched by including information about which sports were included and how many participants participated in each sport. This could be combined with age and academic year information into a demographics table.
PI Response: Unfortunately, we did not collect this information. We agree that this may be valuable in the future, especially if exploring sport type, such a contact, collision, non-contact variables.

L169-171: When mentioning further assessment is recommended, please indicate if the athletes in this study received further assessment.
PI Response: We did not, but we have added this to the limitation section.

L174-192: This section may be clearer if there was a table of all possible ASSQ questions, or all questions included/referenced in this manuscript. If a table is not feasible, perhaps explaining each question included may be beneficial (word count permitting). For instance, line 187 mentions specific sections of the ASSQ that have not been previously explained. Comprehension of the scoring system would be improved if readers knew which questions were used to calculate the scores.
PI Response: We have added these items as Table 1 as recommended and shifted each subsequent Table # down.

Discussion

L299-300: Is this suggesting their self-reported sleep be monitored by sports-medicine staff for the entirety of the athletic season? Please clarify.
PI Response: Clarified as recommended.

L338-339: The validity of this study would increase if participants were asked even just to self-report history of sleep disorders. Sleep disorders are a large cofounder to sleep disturbance, therefore it is now unknown which athletes of your sample are reporting sleep disturbance due to sleep disorders that are constant disturbances in their lives.
PI Response: Clarified as recommended.

L344-347: It was previously mentioned that all athletes were tested prior to start of their respective athletic season (L157-159), and this section is confusing given that information. Collegiate sports do start at different times of the year, so it makes sense that their pre-season

testing was conducted at different times, however these sentences are seemingly implying it was based on availability and not pre-season data.
PI Response: We have deleted this sentence for clarity as they were test at one time point at pre-season, but were completed on different days by different teams, based on availability. For example, 1 team/group may have completed it one-time on Monday while another did on Tuesday. They were both 1 time, pre-season time points, but on different days.

2nd Editorial decision
10-Nov-2022

Ref.: Ms. No. JCTRes-D-22-00101R1
The Effects of Sleep Disturbance and Chronotype on Baseline Vestibular/Ocular Motor Screening in Collegiate Athletes
Journal of Clinical and Translational Research

Dear author(s),

Reviewers have submitted their critical appraisal of your paper. The reviewers' comments are appended below. Based on their comments and evaluation by the editorial board, your work was FOUND SUITABLE FOR PUBLICATION AFTER MINOR REVISION.

If you decide to revise the work, please itemize the reviewers' comments and provide a point-by-point response to every comment. An exemplary rebuttal letter can be found on at http://www.jctres.com/en/author-guidelines/ under "Manuscript preparation." Also, please use the track changes function in the original document so that the reviewers can easily verify your responses.

Your revision is due by Dec 10, 2022.

To submit a revision, go to https://www.editorialmanager.com/jctres/ and log in as an Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

Yours sincerely,

Nicholas G Murray, Ph.D.
Editorial Board Member
Journal of Clinical and Translational Research

Reviewers' comments:

Reviewer #2: Thank you for taking the time to address the reviewers' comments, and I believe the manuscript is in better shape than the original draft. I have some additional feedback for Revision 1

ABSTRACT

Results
-VOR needs to be spelled out before using the abbreviation.
-There is a lot of information here to digest. It is currently organized as: omnibus travel

disturbance differences; post hoc SDS differences; hours of sleep (no p value reported) and chronotype (no p value reported). Thoughts on switching the post hoc results to the overall model (i.e., omnibus) and adding p values for hours of sleep and chronotype.

TEXT

Introduction

Line 107-109: The sentence references 2 sets of authors with conflicting viewpoints but one citation.
Line 112: to those who were [a] morning chronotype
Line 119-120 : …..assessment and needs to be accurate to better make clinical decisions and post-injury comparisons. Would the sentence flow better if you tried this …. "Pre-season baseline testing is considered to be an important aspect of concussion management, and accurate testing can improve clinical decision-making following injury."
Line 124-128: The VOMS is not validated as a vestibular and ocular motor tool. It is validated as a concussion diagnostic tool. Clinicians can use it for other purposes, but that is not how it has been established. Consider revising this sentence for accuracy and flow. The language you use later in the paper closely mirrors the original Mucha paper language "The VOMS was developed to assess vestibularand ocular motor impairments via patient-reported symp-tom provocation after each assessment."

Line 142-143: If there was a low effect size of sleep on symptoms, wouldn't that weaken the argument that sleep assessments are needed at baseline?
Line 146-149: athletes with [a] preexisting migraine diagnosis; you could add abbreviations for VOR and VMS here for later use.
Line 162-163: I don't think including Cronbach's alpha to this sentence adds to the message since your just saying that the surveys measure the same kind of constructs. Can you combine the 2 sentences to say that the ASSQ valid and reliable and developed for specific purposes? Also, was the scaled compared to Polysomnography?

Line 166-168: "symptom provocation performance" seems confusing and redundant. Consider revising
Materials and Methods
Line 184: I have seen sleep difficulty, dysfunction, and disturbance. Is that intentional?

Line 197-199: "For this study, we included an additional variable titled "self-reported sleep quantity", which categorized answers into less than 7 hours and 7 or more hours of sleep.

I believe the comma needs to be moved into the quotation of "self-reported sleep quantity" and this entire sentence should be moved to the end of the section since it is not actually part of the ASSQ.

Line 201-203: "For this study, we included an additional variable titled "chronotype category", with categorized responses as either morning or evening type." Sounds like you guys created another variable that is not official part of the ASSQ and should be placed at the end of the section.

Line 209-210: "These categories 209 include: none (SDS of 0-4), mild (SDS of 5-7), moderate (SDS of 8-10), and severe (SDS of 11-17)." Mild _____??? What dysfunction, disturbance, problems? Or is it a sleep dysfunction/disturbance/problems category?

Line 231-232: There is a lot of data available on the VOMS' internal consistency.
https://doi.org/10.1177/0363546514543775
https://doi.org/10.1177/0363546516632754
https://doi.org/10.1177/0363546518756979
https://doi.org/10.1016/j.jsams.2020.08.012
https://doi.org/10.1097/jsm.0000000000000767

Line 234: "(i.e., means, SDs, frequencies)" can be removed.

Line 236-240: I don't think Mann Whitney U tests are appropriate for dichotomous sleep data. I believe it examines differences between two groups on a continuous or ordinal dependent variables. For dichotomous variables, you can compare proportions of yes/no with Fisher's Exact Tests or chi-square test of homogeneity.

Results

Line 281-282: Might be worth mentioning that there were no differences for symptom provocation on the remaining VOMS items and NPC distance.

Line 291-298: Was the Dunn's method used to perform all pairwise comparisons? Was the alpha level adjusted via Bonferroni, Benjamini-Hochberg, Hochberg, Holm, Hommel, etc. adjustment? If an adjustment wasn't made, this needs to occur and the results need to be re-evaluated as it could completely change the study results for the data related to Table 4

I did not see any effect size calculations reported. Non-parametric effect sizes are not readily available but they are possible.

Discussion

What is the prevalence of sleep disturbance for athletes in other studies? Any idea how the participants' sleep was the night before the data collection? Do people in the rocky mountain region get about the same level of sleep as other regions? Does higher altitude affect sleep? How does this cohort compare?

Interesting that Table 2 and Table 3 tell almost different stories. One shows more oculomotor dysfunction (Table 3) and the other shows mostly vestibulocular dysfunction (Table 2). Then you have Table 4 that is entirely vestibulocular dysfunction. Is it that these sleep classifications aren't measuring the same constructs?

Were any mental health data collected? It appears that "night owls" exhibited higher rates of depression than early and intermediate chronotypes. What is driving the higher symptom provocation? Sleep disturbance or mental health disorders?
https://pubmed.ncbi.nlm.nih.gov/29860110/

Line 345: consider swapping "greater" baseline symptoms to "higher" or "more"

Limitations and Future Research

Line 364-366: Need to address subjective sleep surveys vs. objective sleep measurements. Also, your sleep surveys did not measure sleep; sleep quality/disturbances/etc. were reported by the participants.

Line 372: …or concussions that occurred and went unreported.

Line 376-377: might be worth also looking at night after competitions (high stress; heavy exertion) vs. "off days" vs. practice days.

Conclusions
Line 386: swap baseline for preseason like it was swapped throughout the paper.

Reviewer #3: Great article! I do not believe any major revisions are necessary at this point. Very timely and important research

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Authors' response

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Reviewers' comments:

Reviewer # 2

Reviewer #2: Thank you for taking the time to address the reviewers' comments, and I believe the manuscript is in better shape than the original draft. I have some additional feedback for Revision 1
PI Response: Thank you for your feedback. We hope that we have addressed all of your edits appropriately.

ABSTRACT

Results
-VOR needs to be spelled out before using the abbreviation.
PI Response: Corrected as recommended.

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omnibus travel disturbance differences; post hoc SDS differences; hours of sleep (no p value reported) and chronotype (no p value reported). Thoughts on switching the post hoc results to the overall model (i.e., omnibus) and adding p values for hours of sleep and chronotype.
PI Response: We wanted to capture the main individual aspects in the abstract for reader clarity and concise findings. We will defer to the editor.

Introduction

Line 107-109: The sentence references 2 sets of authors with conflicting viewpoints but one citation.
PI Response: Corrected as recommended.

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Line 119-120 : …..assessment and needs to be accurate to better make clinical decisions and post-injury comparisons. Would the sentence flow better if you tried this …. "Pre-season baseline testing is considered to be an important aspect of concussion management, and accurate testing can improve clinical decision-making following injury."
PI Response: Corrected as recommended.

Line 124-128: The VOMS is not validated as a vestibular and ocular motor tool. It is validated as a concussion diagnostic tool. Clinicians can use it for other purposes, but that is not how it has been established. Consider revising this sentence for accuracy and flow. The language you use later in the paper closely mirrors the original Mucha paper language "The VOMS was developed to assess vestibularand ocular motor impairments via patient-reported symptom provocation after each assessment."
PI Response: Corrected as recommended.

Line 142-143: If there was a low effect size of sleep on symptoms, wouldn't that weaken the argument that sleep assessments are needed at baseline?
PI Response: This was reported by those authors, but we agree it may and that further investigation is needed, to better understand statistical vs. clinical significance.

Line 146-149: athletes with [a] preexisting migraine diagnosis; you could add abbreviations for VOR and VMS here for later use.
PI Response: Corrected as recommended.

Line 162-163: I don't think including Cronbach's alpha to this sentence adds to the message since your just saying that the surveys measure the same kind of constructs. Can you combine the 2 sentences to say that the ASSQ valid and reliable and developed for specific purposes? Also, was the scaled compared to Polysomnography?
PI Response: Corrected as recommended.

Line 166-168: "symptom provocation performance" seems confusing and redundant. Consider revising
PI Response: Corrected as recommended.

Materials and Methods
Line 184: I have seen sleep difficulty, dysfunction, and disturbance. Is that intentional?
PI Response: We have corrected to only read disturbance.

Line 197-199: "For this study, we included an additional variable titled "self-reported sleep quantity", which categorized answers into less than 7 hours and 7 or more hours of sleep.
I believe the comma needs to be moved into the quotation of "self-reported sleep quantity" and this entire sentence should be moved to the end of the section since it is not actually part of the ASSQ.
PI Response: We have left this in its current place to emphasize it's supplement of that ASSQ item.

Line 201-203: "For this study, we included an additional variable titled "chronotype category", with categorized responses as either morning or evening type." Sounds like you guys created another variable that is not official part of the ASSQ and should be placed at the end of the section.
PI Response: We have left this in its current place to emphasize its supplement of that ASSQ item.

Line 209-210: "These categories 209 include: none (SDS of 0-4), mild (SDS of 5-7), moderate (SDS of 8-10), and severe (SDS of 11-17)." Mild _____??? What dysfunction, disturbance, problems? Or is it a sleep dysfunction/disturbance/problems category?
PI Response: Corrected to emphasize disturbance.

Line 231-232: There is a lot of data available on the VOMS' internal consistency.
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PI Response: We have added the additional citations in, as you also included the 2 originally cited in the literature.

Line 234: "(i.e., means, SDs, frequencies)" can be removed.
PI Response: Corrected as recommended.

Line 236-240: I don't think Mann Whitney U tests are appropriate for dichotomous sleep data. I believe it examines differences between two groups on a continuous or ordinal dependent variables. For dichotomous variables, you can compare proportions of yes/no with Fisher's Exact Tests or chi-square test of homogeneity.
PI Response: We believe that Mann Whitney U is appropriate here because the yes/no is independent variable, similarly to sex (male or female). We will defer to the editor.

Results

Line 281-282: Might be worth mentioning that there were no differences for symptom provocation on the remaining VOMS items and NPC distance.
PI Response: Corrected as recommended.

Line 291-298: Was the Dunn's method used to perform all pairwise comparisons? Was the alpha level adjusted via Bonferroni, Benjamini-Hochberg, Hochberg, Holm, Hommel, etc. adjustment? If an adjustment wasn't made, this needs to occur and the results need to be re-evaluated as it could completely change the study results for the data related to Table 4
PI Response: Previous VOMS studies have not used controls for multiple comparisons. Additionally, our analyses were run individually to not have to account for multiple comparisons. We will defer to the editor if updates to the H tests should be performed.

I did not see any effect size calculations reported. Non-parametric effect sizes are not readily available but they are possible.
PI Response: We did not include effect size as Cohen’s D is not a reliable method for non-parametric data.

Discussion

What is the prevalence of sleep disturbance for athletes in other studies? Any idea how the participants' sleep was the night before the data collection? Do people in the rocky mountain region get about the same level of sleep as other regions? Does higher altitude affect sleep? How does this cohort compare?
PI Response: We were not able to identify similar data from the Rocky Mountain region specifically. We hope that our study may lead others to investigate these remaining literature gaps.

Interesting that Table 2 and Table 3 tell almost different stories. One shows more oculomotor

dysfunction (Table 3) and the other shows mostly vestibulocular dysfunction (Table 2). Then you have Table 4 that is entirely vestibulocular dysfunction. Is it that these sleep classifications aren't measuring the same constructs?
PI Response: We agree these are interesting findings and very preliminary data. It may be the case that the constructs are different but may also be that different types of sleep-related difficulties and the extent of them may modify certain vestibular and/or ocular tasks.

Were any mental health data collected? It appears that "night owls" exhibited higher rates of depression than early and intermediate chronotypes. What is driving the higher symptom provocation? Sleep disturbance or mental health disorders? https://nam11.safelinks.protection.outlook.com/?url=https%3A%2F%2Fpubmed.ncbi.nlm.nih.gov%2F29860110%2F&data=05%7C01%7Crnmoran%40ches.ua.edu%7C89ef7886c3bb45d1a01308dac3482b8b%7C2a00728ef0d040b4a4e8ce433f3fbca7%7C0%7C0%7C638037012274406794%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=AiPkt4qUMnepdH43%2FZVqhkYr%2FDCEDhmJK9npxDJ0kaY%3D&reserved=0
PI Response: Mental health data and outcomes were not collected. You may a valid argument that we may aim to collect this data in the future.

Line 345: consider swapping "greater" baseline symptoms to "higher" or "more"
PI Response: Corrected as recommended.

Limitations and Future Research

Line 364-366: Need to address subjective sleep surveys vs. objective sleep measurements. Also, your sleep surveys did not measure sleep; sleep quality/disturbances/etc. were reported by the participants.
PI Response: Corrected as recommended.

Line 372: …or concussions that occurred and went unreported.
PI Response: Corrected as recommended.

Line 376-377: might be worth also looking at night after competitions (high stress; heavy exertion) vs. "off days" vs. practice days.
PI Response: Corrected as recommended.

Conclusions
Line 386: swap baseline for preseason like it was swapped throughout the paper.
PI Response: Corrected as recommended.

Reviewer #3:

Overall
Thank you for reviewing and incorporating my feedback. I think the newly submitted edits have made substantial positive changes to the article. I do not have many concrete changes; however, I do have a few suggestions to improve the flow and comprehension of the manuscript.
PI Response: Thank you again for your review. We have addressed the below comments.

Introduction

Page 6 Line 120: Considering rewording “needs to be accurate to better make clinical…”. The sentence flow feels off.
PI Response: Corrected as recommended.

Page 7, Line 148: Consider defining “change scores”
PI Response: Corrected as recommended.

Methods
Page 9 Line 189: I appreciate that you have defined “chronotype” throughout the manuscript, however referring to an evening chronotype is confusing as it is unclear whether this means the athlete is fatigued at night or unusually awake at night. Please consider clarifying this
PI Response: Corrected as recommended.

Results
Page 13, Line 264: I believe this sentence is referring to Table 2 and not Table 1
PI Response: Corrected as recommended.

3rd Editorial decision
16-Nov-2022

Ref.: Ms. No. JCTRes-D-22-00101R2
The Effects of Sleep Disturbance and Chronotype on Baseline Vestibular/Ocular Motor Screening in Collegiate Athletes
Journal of Clinical and Translational Research

Dear authors,

I am pleased to inform you that your manuscript has been accepted for publication in the Journal of Clinical and Translational Research.

You will receive the proofs of your article shortly, which we kindly ask you to thoroughly review for any errors.
Please notify our assistant editor/production editor when you receive the proofs if your article should belong to a special issue specifying the issue's title.

Thank you for submitting your work to JCTR.

Kindest regards,

Nicholas G Murray, Ph.D.
Editorial Board Member
Journal of Clinical and Translational Research

Comments from the editors and reviewers:

Dear author

Thank you for your line by line edits. I feel that they are more than appropriate and the statistical questions raised by Reviewer #1 are not warranted nor needed for a revision.

Specifically, the use of the non-parametric tests are appropriate and no alpha corrections are needed given your planned comparisons.

Thank you for submitting to JCTRes!

Nic Murray