Reviewer’s report

Title: Kinematics of fast cervical rotations in persons with chronic neck pain: a cross-sectional and reliability study

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Reviewer: Ottar Vasseljen

Reviewer’s report:

This cross-sectional study investigated cervical movement patterns in healthy individuals and subjects with chronic neck pain of unspecific origin. The primary aim was to explore whether subjects with and without pain present different movement pattern in terms of movement speed and smoothness and in associated or conjunct movement when performing fast cervical rotations. The authors conclude that cervical axial rotation speed was reduced in subjects with chronic neck pain and that the test may be useful for evaluation purposes. The authors should be complemented for their effort to advance knowledge in kinematic characteristics of neck pain patients. The study present a number of different and challenging analyses that raises som questions.

Major Compulsory Revision

1. The theoretical rationale for the fast axial rotation test needs to be clarified. Is the test designed to investigate motor control, function, fear, attribution etc? What may this test add for classification or evaluation purposes that is not already available through more conventional tests, e.g. ROM, TSK etc. Also, given the cross-sectional design, I think the cause-effect limitations should be mentioned explicitly.

2. It represents a challenge to present data from two different samples and a number of different analyses (reliability, group comparisons, univariate correlations and multivariate regression analysis) in a coherent and readable manner. Table 3 is a mixture of different results from different samples. Table 3 should be revised and split in two tables, one giving the test-retest results from sample I and the reliability estimates, the other giving the equivalent test results for the combined sample, including the sensitivity and specificity data. T-tests are of little relevance in reliability studies and can be removed.

3. Peak Speed differentiated between controls and neck pain subjects and it is interesting that fear of movement was not associated with speed. Is it possible that other variables could explain the difference, such as ROM and age since the controls were younger with greater ROM? Were age and ROM controlled for in the regression analyses? Last para on page 21 discusses ROM but I think you should mention explicitly that these group differences could have affected the Peak Speed results.

4. You conclude that the cervical rotation test seems reliable for “assessment of neck disorders and evaluation of treatment effects in clinical practice and
research.” (p.22), also mentioned in the conclusion of the abstract and p.17 and 19 of discussion. Although the test may be reasonably reliable for research (group data), the measurement errors are large (MD column in Table 3). The repeatability coefficient (MD) represents the 95 CI for measurement error that can be expected in 95% of two repeated measurements within an individual. In spite that the measurements represent the average of 6 repeated trials, the MDs span well into the values for the control group, including their mean in most cases. Thus, the test does not seem particularly reliable if applied on an individual level in the clinic. The limitations of the rotational test on individual subjects should be acknowledged and reliability statements refined and modified accordingly throughout the manuscript.

5. Page 11, 8th line: It is unclear how the COND was recorded. What does “within the 10% window of Peak Speed” mean? Was COND only measured at peak speed or throughout the rotational movement? This needs to be defined more clearly. The negative ICC for the NS subjects (Table 3) indicates to my understanding that the within-subject variance exceeded the between group variance. I suspect this may indicate that the axial rotation test is not ideal for testing conjunct motion. Alternatively, does it question the validity of conjunct motion as a test of motor control, function etc.?

Minor Essential Revisions

6. You mention on page 6 “subjects reporting dizziness and balance disturbances…”. Did you attempt to differentiate these subjects from those without dizziness on the kinematic variables? In case, please provide results.

7. Page 10, 2nd para: Was ROM recorded from the start of the movement or from the 10% threshold value of Peak Speed. Could this have influenced the ROM and consequently the Peak speed results?

8. Page 11, 1st para: To me it seems like the SID and COND share some commonality or underlying dimension related to conjunct motion. However, there is a total lack of correlation between SID and COND (Table 4), which should be discussed? I think COND is a strange expression, why not use conjunct motion which is already established?

9. It is difficult to interpret the sensitivity and specificity values without the discriminant analysis function. Please, provide the models with the discriminant function coefficients for Peak Speed and CONT.

10. I suggest you delete t-tests related to reliability issues as it is of little relevance when the aim is to test agreement and not differentiation.

11. Page 12, para 2, 2nd sentence: I disagree with these interpretations of relative and absolute reliability, e.g. ranks relate to Kappa and both tests address measurement error in repeated measurements.

12. Page 12, para 2, 5th sentence: The SEM is equivalent to SD, while a 95% CI based on SEM (as you mentioned in first line page 13) is normally required to use the phrase “boundaries around which a true value is likely to lay.” Rephrase or delete.
13. Page 12, para 2, 6th sentence: I don’t understand why the data were appropriate for CV but had to be log-transformed for SEM. Neither do I understand why Pearson is appropriate to test heteroscedacity (next page). Please provide a reference.

14. Does O-PLS have a limitation in number of independent variables that can be put into the model relative to number of subjects? I think 43 independent variables seem a bit too many.

15. Table 3 indicates that Peak Speed data were skewed which may affect the ICC (most likely boosting the coefficient). How serious was the departure from normality and how could this effect the results?

16. Page 14, last para: I don’t think CV’s around 20% are “low”.

17. Page 15, para 1, 6th sentence (Therefore, the residuals…): Please rephrase for better clarity. Does this mean you controlled for age in the analyses of group differences?

18. Page 17, 2nd sentence: Please provide the results, not just the p-values.

19. Page 17, 2nd para, line 10: delete the phrase after the comma; “implying that they explained most of the difference…” You didn’t test for difference, only discriminatory function.

20. Page 20, 3rd sentence: If the major portion of Peak Speed variation is unrelated to pain and function how can you conclude in the manuscript that the test is feasible or useful in the clinical setting? Needs to be modified.

21. Table 3 should be revised as recommended above, for better clarity and also allowing the reader to view the results of sample 1 and 2 combined.

22. Table 4. You do not need to duplicate the correlation coefficients. Why is there a total lack of correlation between NPA and Speed when NPA was extracted from speed? How do you interpret the validity of the constructed kinematic variables based on Table 4?

23. Table 5. It is difficult to interpret how these variables relate to Peak Speed, e.g. car driving, running, head rotation (in terms of “more” or “less”). R² would be more informative than r.

24. I think there is room for shortening the discussion, e.g. para 1, 3, 7.

Discretionary Revisions

25. Abstract: Last line in methods; “nature” seems a better word than “shape”

26. Abstract: Results, 2nd sentence: give results for peak speed.

27. Data processing (page 9, last sentence): What is the T (in superscript) in the equation?

28. Page 10, 5th line: “body position” seems a more appropriate term than “body attitude”

29. Page 10, 4th to last line: what is the “history of the profile”?

30. Page 12, 3rd line: I do not understand the term “leave one out
cross-validation"
31. Page 16, 2nd to last line: what does R2X indicate?
32. Page 17, First para in Discussion, line 11-13; I don’t think you have provided these results anywhere.
33. Page 20, last para, 3rd sentence: Please provide the VIP value for TSK.
34. Figure 1; put (A) and (B) annotation in the figure (as referred in the legend)
35. Table text to table 3; Remove “Move Time” and “TTP” as they are not presented in the table.

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

Quality of written English: Needs some language corrections before being published

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