Reviewer’s report

Title: Reliability and validity of a Novel Kinect-based Software Program for Measuring a Single Leg Squat.

Version: 0 Date: 14 Jan 2020

Reviewer: Kody Campbell

Reviewer's report:

Overall Impressions:
The authors of this study executed a well-designed study that assessed the reliability and construct validity of a novel Kinect-based software program for measuring a single leg squat. The reviewer appreciated the detail level describing the reliability assessment including the type of ICC used. A major concern I have is if the ICC's were run with non-normal data. The authors' presented summary data using medians and IQRs and used non-parametric analyses for testing single leg squat measures from the Kinect based software between test sessions. The authors, however, do not indicate if the data were non-normally distributed and ran the ICC analyses on the data without indicating if the data had been transformed to satisfy normality assumptions. Without this critical information it is difficult to interpret the ICCs, SEMs and SDCs in this study. This needs to be addressed by the authors on any resubmission along with the correct reliability analyses for normal, non-normal, or transformed data.

The authors came to the correct conclusions based on the results of their study and don't recommend using the Kinect based software for assessing frontal knee angles while performing a single leg squat. According to their construct validity analysis, when someone performs a single leg squat and their knee is over their foot the software has a 94% chance of correctly identifying that movement. In my opinion the software does not add anything substantial to a clinical assessment of a single leg squat done by a clinician. More of these points or a section of this nature should appear in the discussion (see specific comments for the authors). Otherwise, I was quite satisfied and impressed with the execution and presentation of this data.

Specific Comments for Authors:

Abstract Line 21: Change cannot to should not

Background:

Background: The background could be separated into 3 paragraphs. Split the first paragraph where it introduces objective measures of movement quality. This new second paragraph could be bolstered with further information on the need for refined and reliable measures of movement quality in order to assess injury risk.

Page 4 lines 10-11: It would be important to include some of the reliability of assessing knee medial to foot during a SLS to show there is some reliability in a subjective assessment and it helps to rationalize why you used this for the construct validity.

Page 6 Line 4: Is the best discriminative ability of the Qinematic software to discriminate between knee over foot and otherwise? Please include this as the discriminative criteria in this line.
Methods:

Page 6 line 9 : Why did the authors choose to evaluate the SLS 6 to 7 days between sessions?

Page 6 Line 14: Please add what information on what the software is trying to discriminate similar to the comment on page 6 line 4.

Page 6 Line 17: Could a sex mismatched subject pool contribute to the results? Males exhibited smaller ML knee displacement than women in your 5th reference. Would the reliability results change if you removed the males from this study?

Page 6 Line 20-21: Does your exclusion criteria also include total knee replacement?

Figure 1: A drawback of the using the Kinetic System is the necessary space and stable background. Not all clinics may afford those setups. This language would be beneficial in the discussion along with the points that the Kinect system does not add anything substantial to a single leg squat assessment that a clinician can observe already.

Page 8 line 24: Was there a minimum depth needed to achieve a valid trial?

Page 9 Line 11: Did the reviewers watch both the sagittal and coronal plane videos together or separately?

Page 9 line 12-14: What were the rating criteria used on how to assess the tests? Could the authors provide a table on these criteria and how the criteria contributed to the construct validity. What were the outcomes the reviewers were assessing on the single leg squat?

Page 9 Lines 14 -15: Were these videos restricted to the first session or second session or across all sessions?

Page 9 Lines 15-16: Can the authors clarify if all 11 videos were individually assessed or all videos of all subjects were assessed (i.e. 37 if only 1st session or 74 for both sessions)?

Page 10 lines 7 -8: Are there any practical reasons why the construct validity analysis was limited to "the way down"?

Page 10 lines 11-12: Move "fail/pass" immediately after dichotomized.

Page 11 lines 5-7: Move these lines to the beginning of the paragraph and state if the data were normally distributed. My assumption is that they weren't based on the median, IQR and Wilcoxon sign-rank test.

Page 11 Lines 9 -10: The reviewer noticed that the authors used medians and IQRs as there descriptive and used Wilcoxon signed-rank tests to test for differences between test sessions 1 and 2. The authors should specify if they had non-normal data for the ICCs. If they had non-normal data were the data transformed and did the transformed data satisfy assumptions for normality? Otherwise it is difficult to interpret the ICCs presented in this study.

Page 11 Lines 20-21: It would be helpful to include the bland altman plots in a supplementary section for readers to review.
Results:

Page 12 Line 24: I am assuming that (#28 are the number of measures that were performed on easy mode on the first of second test session. Consider using a fraction (28/32) for clarity and consider this approach for the paragraph. Were any measures tested on easy mode during the second test session and how were those data handled?

Page 13 lines 5-6: Spelling - Numerics should not start a sentence.

Page 13 lines 7-8: Is this indicating that the software did not match a video on one of the subjects? Please clarify.

Table 2: Please clarify the n's in this table. Do they represent the number of subjects or measures?

Page 15 Line 2: Could the authors please indicate what positive and negative values indicate (are they medial and lateral deviations from the start position?)

Page 15 Lines 1-10: This information is redundant from the table. Please remove and consider referencing table 2 in the next paragraph.

Page 15 lines 13-14: Consider adding that these variables did not differ statistically between the two occasions and include the lowest p value.

Page 15 lines 18-20: Adding to my previous statement on page 11 supplying the Bland Altman plots as a supplementary file.

Page 16 lines 9 & 10: A similar comment to the table, why is a 15 and 17-degree cutoff being reported when cutoffs were applied over 20 degrees in 2 degree steps?

Discussion:

Page 17 Lines 16-18: Could the authors include some of those reliability results from the other studies with the caveat being differences in how the kinematics are calculated. It would help to frame the current studies results and provide some evidence if there it is a hardware or software limitation.

Page 18 Lines 8-9: Can the authors provide some examples of a simple and complex movements. My assumption is a single leg squat is a complex movement that the Kinect struggles with but what is a simple movement?

Page 19 Lines 8-9: This helps to address my previous comment in the methods about depth, but as you state it is clearly a drawback on your current study.

Page 22 Lines 7 - 8: The reviewer agrees with the lack of a 3D kinematic gold standard as important limitation in the current study and agrees that the construct validity assessment is the next logical choice. The discussion is missing a section on what the addition of this software brings to the clinic. If all the software can be good for is to assess that someone does
not have their knee go over their foot during a SLS then there is no need for this software in the clinic. A rater can visually inspect if the knee travels medial to the foot during a SLS descent. The software does not provide reliable and accurate kinematic data that may be needed for more refined kinematic analysis of injury risk. This language should appear more in the discussion.

Conclusions:

Page 22 Lines 15-16: consider re-wording to "reliability when measuring a SLS on the way down not at the way down.

Page 22 line 25: Could the authors include examples of additional tests, like the vertical drop test they mentioned earlier, that can be used to assess knee kinematic deficits.

Table 3: The methods described that pass/fails were quantified using 2-degree steps from 2 to 20 degrees. Why are the 14, 16, and 18-degree steps not included in this table and the 15 and 17 degree steps used?

Figure 2: Check spelling in figure legend.

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

Yes

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

No

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:

Acceptable
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