Author’s response to reviews

Title: Angle-specific analysis of isokinetic quadriceps and hamstring torques and ratios in patients after ACL-reconstruction

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Author’s response to reviews:

We’d like to thank both reviewers for their comments, which have led to an improvement of the manuscript. Below, we have addressed all comments point by point (A-answer)

Mario Lamontagne, Ph.D. (Reviewer 1):

General Comments

This study aims to investigate the effect of operated and non-operated leg at 60 degrees/s and 180 degrees/s on angle-specific isokinetic contraction of the quadriceps and hamstrings in patients after ACL-reconstruction. This method is very well structured using an original statistical approach (SPM) to determine over the ROM were the torque or HQ ratio are statistically different.

A - Thank you for this positive feedback.

A major drawback of this study is that the protocol has not been tested on healthy control matched by age, sex and BMI. Moreover, I suspect that male and female participants are significantly different in Torque and Power. The authors must run a statistical analyses to verify wether the sex has significant difference in the measured variables. If male and female are significantly difference in the measured variables then the authors must consider to analysis male and female separately.
A - Thank you for this comment. Although we can understand your suggested aspects, it is important to mention that gender differences in isokinetic strength data of ACL-patients were already investigated by numerous studies (e.g. El-Ashker et al. 2017, De Ste Croix et al. 2017, Kim & Park 2015). Therefore, we decided to not consider for gender and focused in our study on the influence of leg and velocity. Our group of patients was nearly counterbalanced to gender, and therefore, the results were more generalizable. Additionally, the application of SPM will be more complex and the presentation of the results for the readers too confusing.

Specific comments

The authors must add a table on the participant demographics by including sex, age, height, weight, sports and IKDC.

A - Agreed and revised as suggested. The redundant numbers in the text were deleted.

The authors should clarify the sentence "A good to high reliability..." what was it? test -retest?

A - Now, we have clarified that the test-retest reliability was meant.

Clarify how and why the repetitions have been discarded by the two investigators. How they agree to discard a repetition?

A - As you have asked, if the ROM of single repetitions were not representative, they have to be deleted. Otherwise, the further statistical analysis will be inaccurate. Now, we have clarified this aspect as follow: “After a visual inspection and consensual decision of two investigators, single repetitions (60°/s flexion 8 rep., extension 7 rep.; 180°/s flexion 1 rep., extension 2 rep.) were removed because of non-typically shapes (e.g. due to a short ROM or discontinuous movement). “

Clarify the SPM analysis, what was the post analysis?

A - We are sorry, but we do not understand this point. As both factors (leg x velocity) of the SPM repeated measure ANOVA’s have only two levels, and thus, no post-hoc analysis were executed.

In the text, you should use operated and non-operated not injured leg (page 10 line 21)
A - We have always used “operated and non-operated” throughout the entire manuscript. However, as here ACL-deficient patients were mentioned, we used injured instead of operated leg at one point.

Reviewer 2 (Reviewer 2):

Overall impression:

This manuscript has sound design and analytical approach. Figures represent an organized and valid statistical approach. However the text in result section is not well organized. Discussion section is superficial which requires significant rewriting.

What the authors done well

* Clearly stated objectives

* Sound study design

* Detailed and sufficient description of data processing

Not meeting best practice

* SPM (Statistical parameter mapping) is not explained in layman's language so it is difficult for readers to quickly comprehend figure 2. For example: SPM(F) at y-axis, what does it mean to have higher SPM (F)?

* Result section was not presented in a logical order, making it difficult to follow. Adding number to subplots of Figure 2, and referring to the subplot number in the result section will make this section more readable.

* Discussion section has too many repetition of results.

* Discussion section does not include comparison with two studies using SPM analysis (Hiemstra et al., 2004; Hiemstra et al., 2000)

* Authors kept stating the newly gained information from SPM analysis is beneficial for clinical practice. No specific example is given.

* Need language editing. Many sentences are too long and too complex.
Thank you for the positive feedback and the specific suggestions, which we have addressed point by point below. Now, a native English speaker has proofread the entire manuscript.

REQUESTED REVISIONS:

Abstract:

* Add SPM abbreviation.

A - As the “statistical parametric mapping procedure” is only used once in the abstract, we see no reason to abbreviate SPM here.

* Add some layman's explanations about SPM.

A - Now, we have added an explanation in the method section. “At a velocity of 60 and 180°/s angle-specific torques and HQ-ratios were analyzed with conventional discrete parameters and a Statistical Parametric Mapping procedure, which evaluates continuous data.”

* Angle-specific torques and angle-specific H/Q ratio → very wordy, why not just call them torque curve, H/Q curve

A - Normally, the wording “torque curve” is used for torque-time curves. As we have investigated torque-angle curves and angle-specific H/Q ratios, we wanted to clarify this by the explicitly use of the wording “angle-specific”.

* Please present results in a logical order. Suggest focusing on main leg effect and leg*velocity interaction only. I don't think it is necessary to present main velocity, or main range effect in the abstract (p 2, line 59 to page 3, line 2)

A - Agreed. We have carefully checked the logical order concerning the presentation of the results.

* Main leg effect for flexor torque curve is not presented in the abstract.
As we have stated: “Angle-specific torques and HQ-ratios were different between the operated and non-operated leg and between velocities.” Therein, main effects of the flexion torque are included.

* The velocity influenced the location of the maximum torques during flexion and the amount of the maximum torques during extension → Suggested rewrite: Flexion torque reaches its maximal value at different angle when tested at different speed. Extension torque maximum differs mainly by testing speed but occurs at similar joint angle.

A - We have clarified this as follows: “At the higher testing velocity, the maximum flexion torque occurred at greater knee flexion, whereas the maximum extension torque occurred at a similar joint angle.”

* The relationships between conventional and angle-specific HQ-ratios → do you mean correlation coefficient, if so, just use the term correlation coefficient

Key words

Team sport, speed are not necessary

A - We have deleted the key word “speed” and leave “team sport”, because we have tested only team sport athletes.

Introduction

After you review that SPM has been applied in post-ACL analysis, the reviewer immediately asked "so what is new about your study?" You did not mention this knowledge gap after several sentences. Suggest moving this paragraph (from page 5, line 6 to end of paragraph) at the end of 2nd paragraph of introduction.

A - As we have stated in the second paragraph of the introduction: “Both methods (FDA and SPM) have been applied in ACL-research to analyze movement strategies during cutting [11], stair descent [12], and unilateral and bilateral jumps [13, 14].” But not in isokinetic analyses. We have added a further sentence to clarify this: “Therefore, the application of such methods may be also promising in isokinetic data analysis.”
State explicitly why including acceleration and deceleration range may be a problem (e.g., at 180 deg/sec, the participant won't be able to reach that speed at early and late range).

A - Now, we have added a further sentence to clarify this point. “This may had an impact on the results, because local extremes in torque at the start and end of each repetition were frequently discernible, which originate from inertial forces [23].”

Method

Page 6, last line → after stating that data is extract for speed between 50 to 150 deg/sec, state that ROM for available data may differ for each trial → therefore you also need to specify ROM range to extract data (i.e., 19 to 81 degrees, page 7, line 54).

A - Now, clarified via an additional sentence. “Therefore, the available ROM may differ for each repetition.”

Results

* Add number to subplot, and refer to subplot number in the result section.

A - Thank you for this helpful suggestion. We have now numbered the subplots and use the numbers in the result section.

* Move page 9, line 25 to 39 to page 8, right after ###### Figure 1 near here #######

A - We disagree with this advice. As in this paragraph the relationships between the conventional and angle-specific HQ-ratios were presented, we decided to present the angle-specific HQ-ratios before.

* The following statement is out of place → The mean angle-specific HQ-ratios ranged over the entire ROM from 0.43 to 1.89 (see Figure 2 - top right). Better placed at page 8, line 53.
A - We also disagree here. This paragraph is structured as follows: results of the angle-specific extension and flexion torques and then the angle-specific HQ-ratios. Therefore, we have decided to leave the statement at this place.

Discussion

* Avoid repeating results extensively (page 11, last paragraph).

A - We have carefully revised the discussion section to avoid the extensively repetition of some results. As we have discussed some methodologically aspects regarding SPM in the last paragraph, minor repetitions are unavoidable.

* Please compare your results with two studies using SPM analysis (Hiemstra et al., 2004; Hiemstra et al., 2000)

A - To clarify, Hiemstra et al. have not used SPM analysis in their studies. They have used strength and HQ-ratio maps and have applied independent T-test to evaluate potential differences between the operated leg of patients and control legs. Therefore, it is difficult to compare our study results directly to these of Hiemstra et al.. Nevertheless, we have extensive discussed their results in paragraph 3 and 4 of the discussion section.

* Give concrete suggestions for clinical application

A - As we have stated in the discussion, the angle-specific analysis of isokinetic torque values could be used to localize specific strength deficits in patients after an ACL-reconstruction. Thereafter, the resistance training could be more individualized with respect to knee angle and velocity.

I don't understand why correlation between H/Q curve and traditional H/Q varies by range. Traditional H/Q is a fixed number and does not vary by range.

A - In the entire manuscript, we have not stated that the correlation between H/Q curve and traditional H/Q varies by range. In Figure 1 (bottom) we present the correlations coefficients between the traditional HQ-ratio and the (angle-specific) HQ-ratios that were calculated for each knee flexion angle. These coefficients differ according to velocity, leg, and knee flexion angle, but not by range. Therefore, the angle-specific HQ-ratios over the entire ROM were not represented by conventional calculated HQ-ratio values.