Reviewer’s report

Title: Are there two forms of isometric muscle action? Results of the experimental study support a distinction between a holding and a pushing isometric muscle function

Version: 0 Date: 28 Feb 2017

Reviewer: FJ Goodwin

Reviewer’s report:

The authors have undertaken an interesting aspect analyzing the different types of isometric contractions. However, I have concerns regarding the methods, the apparatus used to assess the different types of muscle action, the statistical analysis and conclusions drawn from the analysis.

Line 31-34: How is concentric muscle action like a motor? Also the use of "no motion" to describe isometric action is not appropriate given there is muscle shortening and tendon deformation with no overall gross joint motion noticed.

Line 39: The authors in study [4] found "The present findings provide evidence that isometric muscle contractions loaded in either concentric or eccentric manners elicit similar EMG amplitudes" whereas this current study reports different EMG activity was found.

Line 53-58: Defining PIMA and HIMA after already using them previously in Line 41-42

Line 136: Description of PIMA and HIMA could be moved up

Line 179-189: Is this describing HIMA?

Line 191-200: Improved description of testing procedures needed. Total number of contractions? Were the order of HIMA and PIMA completely random or block order?

Line 195-200: 2 different rest times listed (60s vs 120s)

Line 208-211: List a 3 cm failure criteria then states any movement during HIMA would be a failure, what is the failure criteria?

Line 228-233: Why only the longest single isometric used vs total isometric since you are interested in time to failure?

Line 233: How is the relevant to this paper?

Line 249-252: 2 subjects stopped prior to exhaustion since they completed PIMA longer than HIMA, how is this seen as a successful trial and how did you determine they stopped not due to exhaustion?
Line 328-332: The authors discuss differences between longest isometric hold differences between HIMA and PIMA however clear issue with methodology regarding "slippage" of piston

Line 353-371: Clear design flaw regarding HIMA measurement given it induces movement unintentionally.

Line 410: "HIMA is closer to the eccentric muscle action" The authors make the argument that HIMA and PIMA are isometric muscle actions, what does "close" to eccentric mean?

Line 425-431: Appropriate information regarding increased EMG activation for concentric and concentric activity pre-activation.

Line 440-459: The authors discuss potential metabolic indications for fatigue, however did not measure lactate or any other metabolic measurements.

Line 448: The authors make the argument that 80% MVC likely resulted in ischemia for HIMA only, however subjects completed 80% MVC for PIMA as well. Wouldn't this result in near similar fatigue effects?

Line 474-484: The authors make several generalizations about what is happening on a lactate/substrate/blood flow level without any support.

Line 505-509: The authors openly claim their MTG measurement has never been utilized before yet are using it to make statements regarding differences between HIMA and PIMA.

Line 520: EMG defined for the first time despite been used previously. (Line 49, 68, 103, etc)

Line 552-555: Interesting however not relevant to this paper independently

Line 581: Is the musculoskeletal system more vulnerable during eccentric muscle action or is more vulnerable during the loading forces that coincides with eccentric muscle eccentric (first 50% of stance, etc)

Methods:

Additional information is needed to describe the testing procedures and application of HIMA and PIMA contractions. (Testing order, rest periods, etc)

Conclusions:

The authors take a broad approach to discuss why their results occur including lactate and muscle/tendon oscillations however not fully supported. The overall spectrum of MMG/MTG did not differ, only the last 10% of trials. However there was a significant difference between PIMA and HIMA and trial length so this is comparison may not be appropriate.
The authors found a significant difference of single isometric phase length however state a significant design flaw during the HIMA which would result in shorter isometric phases compared to PIMA.

Statistics:

The authors state they will use paired t-tests if normally distributed or Wilcoxon-test for if not normally distributed. However the normality of the data and the type of tests are never further explained anywhere else in the results.

Written English:

Improvements needed utilizing English syntax. "It is common sense (Line 33)….. We basically support and agree (Line 265)…..",

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

No

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

Unable to assess

Are the conclusions drawn adequately supported by the data shown? If not, please explain in your comments to the authors.

No

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

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