

Author's response to reviews

Title:Muscle activity during hand dexterity tasks in women with arthritis

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Author's response to reviews: see over

Dear Editor and reviewer,

We thank the reviewers for time and effort to further help us improve this manuscript. Below we have tried to answer your questions and described our actions taken. We hope that this manuscript finally meets standards for publication in *BMJ Open*.

Yours sincerely

Sofia Brorsson, PhD, Corresponding author

Reviewer's report

Title: Differences in muscle activity during hand dexterity tasks between women with arthritis and a healthy reference group

Version: 2 Date: 15 October 2013

Reviewer: Hiske van Duinen

Reviewer's report:

Dear authors,

I think this manuscript contains a lot of interesting information, but I have quite a few concerns with the interpretation of the data.

-Major Compulsory Revisions

1. Most of my concerns are related to this first big concern: there is a big difference between the arthritis groups and the control group in their maximal forces. In flexion the patient groups can only produce about 30% of the maximal force of the control group, in extension 60% and 77.6%, respectively (RA and HOA). During isometric contractions under normal conditions, the surface EMG is usually more or less linearly correlated with the amount of force that is produced. This relation is not as straightforward during dynamic contractions, but it will be close to this. If we keep this in mind and we look at the amount of EMG (as a % of the EMG during the maximal contractions) that is produced in the different tasks and we try to recalculate the amount of N force that has been produced if this were closely related to the kind of tasks that had been done during the maximal contractions, we can see that the control group, even though producing much lower EMG as a % of MVC-EMG, produced higher forces. For example for the use of the pen, they produced about 30 N flexion force and about 7 N extension force, while the patient group (HOA) produced about 18 N flexion force and 8 N extension force.

We agree with the reviewer. This big difference in force between healthy and people and people with arthritis is in line with our hypothesis. The healthy population who used a greater force in writing with a pen probably did so because it was possible (but not necessary) while people with arthritis only use the necessary force required by the task. Healthy people use in general greater forces during these tasks but relative to their maximum force they use a considerable less percentage than patients with arthritis do.

2. In the discussion, the authors mention that the balance between flexion and

extension might be very important, which might be improved by training. I agree that this balance might be important, but probably it is more important relative to the absolute forces than to the relative muscle activity. As the flexor force is much more deteriorated than the extensor force, the 'muscle imbalance' in between flexion and extension EMG might actually be beneficial for the balance in forces. And the training of especially flexor force might be necessary to balance out this difference in deterioration.

Thank you for adding this new way of analyzing the problem. On a group level this is correct and of course if there is a large deterioration in the flexion force this should be included in exercises but also if there are deteriorated extension forces this should not be neglected.

3. In the methods part of the abstract, the authors describe that there are 2 arthritis groups. In the results part of the abstract, the authors write 'the arthritis group'. Later on in the manuscript, it turns out that the authors sometimes pool the two arthritis groups. Whenever they look at the data of the pooled groups, they should use plural for 'arthritis groups'.

Thank you we have corrected this throughout the manuscript and also had the manuscript language checked.

4. The second sentence in the abstract suggests that that authors are looking at the 'recruitment of muscle fibers'. To me this suggests that the authors are looking at motor unit recruitment, which is not the case. The authors are looking at the activity of the extensor vs. flexor muscles.

Thank you for noticing this, we have adjusted the abstract according to your suggestions.

5. In Table 2 hand exercise 4, the values for the middle (b) and little (d) fingers are strikingly similar. Please make sure these values are correct.

We have rechecked the figures and made sure that data are correct.

6. Figure 2 shows the muscle activity in FCR and EDC when performing daily tasks and hand exercises. The y-axes in panels A & B have the label % MVIC. This suggests that we are looking at a percentage of force, instead of at the percentage of EMG during the MVIC. I assume that the y-axes in panel C & D should have the same labels, which are missing. The values in these figures indicate that the tasks used to record the maximal force (and the accompanying EMG) were not optimal for these muscles.

Thank you for noticing this we have added missing labels in the figures C & D.

We have used validated devices to measure maximal extension and flexion forces throughout the study, and there might be learning effects even though a value over 100% MVIC should not be possible. This is more common in people with arthritis and pain might be one reason for when testing maximal forces. We have added a short paragraph concerning this issue in the discussion section, PPL...

7. Table 3 should be implemented in Tables 1 and 2 as stars or other symbols,

so that you can read those tables and see which differences are significant, without having to look at table 3.

We have tried to make it easy for the reader and could not find a pedagogic way to include table 3 into table 1 and 2. We think it is important to show the actual p-values and prefer to use not only stars for significant cases.

8. As the authors show a large range in the DA SH scores, it would be interesting to see whether these scores correlate with some of the EM G measures, for example that higher DA SH scores are related to lower MVCs and subsequently higher % MVC EM G activity.

Thank you for your suggestion but this is not in accordance with our aim but we will keep this in mind for future manuscripts.

-Minor Essential Revisions

1. Surface EM G can be abbreviated as sEM G (without hyphen). Maximal voluntary contractions are usually abbreviated as MVC, even if it is an isometric contraction.

We have changed this according to suggestions throughout the paper.

2. In the last sentence of the first paragraph of the Background, the authors refer to hand deformity, which can occur in 'late cases'; to me 'late stages' sounds more appropriate.

Thank you, we have changed "late cases" to "late stages".

3. The first sentence of the abstract needs to be fully rewritten to make clear what it means.

The paper has been language checked and this sentence has been rewritten.

4. The first sentence of the section 'Statistical analysis' needs to be rewritten. As this section describes both how the data were treated and the statistical analyses, I would change the heading in 'Data and Statistical Analyses'.

The heading has been changed according to suggestions.

5. On page 3, in the third paragraph of the background, the second sentence, there is a typo: it reads quantity instead of quantify.

Thank you, this has been corrected.

6. I suggest using muscle activity instead of muscle activation throughout the manuscript.

Thank you this has been corrected according to your suggestion.

7. In the discussion on page, in the sentence after the referral to reference 24, the authors use 'where'. This should be replaced by 'in which'.

Thank you, this has been corrected.

8. Further down this page in the first sentence of the next paragraph, I suggest

breaking the first sentence into two sentences, putting a full stop after 'disease' and using 'Therefore,' instead of 'why'. In its current form this sentence seems grammatically unsound.

Thank you, this has been corrected.

-Discretionary Revisions

1. I suggest using the term 'control group' instead of 'reference group'.

The healthy group is not matched with we prefer to use the word reference group.

2. Figure 2 should be larger.

Thank you, this has been corrected.

3. Table 2 would be clearer if the items that were used (pen, key, scissors, zipper) were mentioned in the Table itself, as well as in the description underneath.

Thank you, this has been corrected.

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 **DONE**

Statistical review: Yes, but I do not feel adequately qualified to assess the statistics. **DONE**

Declaration of competing interests:

I declare that I have no competing interests.

Reviewer's report

Title Differences in muscle activity during hand dexterity tasks between women with arthritis and a healthy reference group

Version 2 Date 4 November 2013

Reviewer Cheryl M et al

Reviewer's report:

Minor essential reviews

Figures - 1 - these figures are quite difficult to ascertain the grip given the extent of background objects in the scene. Please simplify them and concentrate only on the grip postures you are trying to illustrate as described in the section on 'Hand Exercises and Daily Tasks'.

Thank you this has been corrected

2 - this is extremely small and it's difficult to view anything with certainty. Please provide a larger version for inclusion in the paper.

Thank you this has been corrected

Background

Page 3, 3rd paragraph - 'strength measures will quantify...'

Thank you this has been corrected

Methods

Page 4, 3rd paragraph - If your intention was to include the friends of the RA / HOA patients, then this should be clarified. At the moment, the structure of this sentence remains unclear. Were these healthy people informed that by accompanying their RA / HOA friends, they would be asked to be included in the study? Please clarify.

Thank you this has been rewritten

Muscle Activation

Page 5, 1st paragraph - please clarify what the 'standardised procedure' was?

Thank you this has been clarified

Results

Page 7, Paragraph 1 - 'it was possible' is too informal. Simply state that 'Data was analysed from 20 RA subjects.. '.

Thank you for your suggestion, this has been rewritten

Page 8, paragraph 1 - there is no purpose to presenting the statistical difference between ages. Simple descriptive statistics would suffice.

Thank you for your suggestion this has been rewritten

Discussion

General point - there is little critical appraisal in the discussion and this could be improved.

We have further emphasized the limitations of our study in the discussion section to make this section clear to the reader.

Page 9, Paragraph 3 – please define what you mean by muscle balance? Do you mean the relationship between agonist/antagonist, or something different?

Thank you for your suggestion, this has been rewritten

Page 10, Paragraph 1 – ‘use another word than ‘degree of muscle activity’ that is more accurate than descriptive.

Thank you for your suggestion, this has been rewritten

Page 11, paragraph 3 – I don’t think it can be argued that you did not include in paired hand function. You should revise or clarify this statement.

Thank you this has been clarified

Conclusion

The Authors have made a generalisation in the recommendations for treatment that do not take into account the joint mobility issues and other symptoms of these pathologies. While this is a useful recommendation, it should be treated with caution and the present study cannot claim to recommend treatment plans on its findings. Perhaps a more tempered statement would be better that suggests it may be beneficial if possible given other aspects of the pathology.

Thank you this has been clarified.

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being Published **D O N E**

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I have no competing interests.