**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 7N extension force, while the patient group (HOA) produced about 18 N flexion force and 8N extension force.

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 'misbalance' in between flexion and extension EMG might actually be beneficial for the balance in forces. And the training of especially flexion force might be necessary to balance out this difference in deterioration.

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 group'.

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.

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.

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.

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.

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

- Minor Essential Revisions

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

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.

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

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'.

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

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

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'.

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.

- Discretionary Revisions

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

2. Figure 2 should be larger.

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.

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

**Declaration of competing interests:**

I declare that I have no competing interests.