Author’s response to reviews

Title: Dose-Response of resistance training for neck-and shoulder pain relief: A workplace intervention study

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Author’s response to reviews:

Technical Comments:

Editor Comments:

I would like to commend the authors for their excellent article. Reviewer 2 highlighted important points to be addressed. I believe the reviewers' comments will help to increase the quality of the manuscript.

Thank you for letting us improve the paper and for all comments and suggestions.

I have some key points I would suggest the authors to consider:
(i) Please, rearrange figure 1 according to the CONSORT statement (http://www.consort-statement.org/consort-statement/flow-diagram). Additionally, participants data in the figure is not consistent with participants data in the text.

Figure 1 has been changed according to the CONSORT statement and the participants' data has been corrected in both text and the figure.

(ii) Could you describe the profession of each participant included in your study?

The professions of the participants has been added in the methods in the paragraph “subjects”.

(iii) Please, discuss the magnitude of the differences in face of the minimal clinical important difference previously reported in the literature.

We have added more to the discussion as suggested.

Reviewer reports:

José Afonso, Ph.D. (Reviewer 1): Congratulations for the work. Extremely relevant, very well justified, solid methodology, discussion perfectly in line with the results and methods. As a minor, I would highlight occasional flaws in English language that, although not serious, do somewhat stain the excellent quality of the manuscript. Therefore, I suggest there should be an additional review for language purposes.

Thank you so much and thank you for reviewing the paper. We had a native speaking Englishman to improve the language. We hope his contribution has spotted all flaws. Thank you once again.

Jessica Micheletti (Reviewer 2):

This study reports the findings of two different frequency of training per day. The aim was to examine the dose-response of these two interventions for pain relief, strength and health-related quality of life. The study is well written and of interest, but it could be improved.
Abstract

- Change: "Musculoskeletal disorder is more prevalent among office workers" for "Musculoskeletal disorders have high prevalence among office workers".

Changed, thank you

Background

The introduction is well described. However the overview of the problem should be improved. Three possibilities of training dose were cited: 1-) Different volumes and equal frequency of training per week, which results in a different total volume (reference 25); 1-) Equal volumes per session and different training frequency per week, which results in a different total volume (reference 27), and 3-) Different training frequency per day resulting in different volume per day and different total volume.

However, the author cited a study in the discussion section with different frequencies per week and different volume in each session but resulting in an equal total volume (reference 18).

We have included the study in the introduction.

The first two possibilities have already been observed in the literature, and the third is what the author the gap the authors are aiming to fulfill. I think author's rationale should be clearer to the readers, and more papers should be addressed.

Thank you for the comment, we have tried to clarify the gap in the literature.

Page 5 Line 2-3: "To the authors' knowledge, only a few studies have examined this dose-response relationship (26, 27)." This sentence should be better elaborated, once the sentence before argues for an opposite idea. I think the authors should make clear to the readers that other dose-response studies with pain vs different volume of training exist (as the studies 4, 22 and 25) as well as studies with pain vs different frequency of training per week, but studies with pain and different frequency of training do not. Please, reformulate this paragraph for better understanding.

We have tried to improve this paragraph.
The authors cited in Page 5 - Line 35-36 "it is not clear whether different training volume caused by a greater training frequency per day could relief the pain to a greater extent than lower training frequency". This is the focus of your paper and studies with this intention need to be addressed in the introduction for a better overview of the literature.

We have tried to improve this section.

Study design

The flowchart is confusing. Thirty-three participants were assessed by eligibility, however in the Subjects Section (Page 6 Line 47-48) the authors reported that an email was sent and only 30 participants responded by agreeing to participate in the study. In the pre-test 30 participants were analyzed, there was a loss of 3 (for other reasons) during the control period, but 30 were analyzed in the mid-test? This loss of 3 participant maybe should be added below the mid-test and after the randomization process. The flowchart needs to be clearer. There are recommended templates to be used. Also there is an issue in size of the font, make it consistent over the flowchart.

The flowchart and the text has been corrected. Thank you for noticing and on behalf of the authors, I apologize for the mistakes.

The final TG20 group value is lesser than the number needed to detect the desired effect size. This is a major limitation of the study.

You are absolute correct and this is the reason why we have addressed this issue specifically in the paragraph “limitations” in the discussion.

Subjects

Did the workers who answered the email agreeing to be part of the study have similar office jobs? If so, can you describe the percentage of each type of work they perform? For example, secretary, researcher, dentists, etc. Still, was the average of sitting time of these subjects obtained?? If so, this information is important to be added as well.
Thank you for addressing this. We have tried to add more information of the professions of the participants, but we only divided the professions into dentists, hairdressers and office workers with computer work as their main task. With exception of a dental care office with dentists and hygienists (n = 6), the participants were recruited form different jobs or departments (i.e. independent of each other).

We agree that the average sitting time would be important information to add to the paper, but unfortunately, we did not measure it. However, to be included in the study, their main occupation had to be computer work or perform low-intensity isometric contraction during a working day (typically 8 hours). We have added this as a limitation of the study (see the discussion).

Why people with pain above 60mm in the VAS were not included? The reasons for that must be reported.

The reason has been reported, as suggested.

None of the participants voluntary had above 60 mm in pain.

Table 1 is confusing. I did not understand what the asterisk symbol represents.

These symbols are very often used (at least in Europe). We have therefore not replaced them. Furthermore, we have added explanations of the symbols below the table.

Procedures

Page 6 Line 1-2: "The TG10 and TG20 groups reported to perform 89% and 87% of the training sessions respectively." Performing 89% of the training means the participant may have missed 5 sessions. If you consider these consecutive absences, the participant did not perform a week of training, which is bad within a training program, once it can affect their adaptation and even possible improvements. Did you have any control over those missed days? Were these missed days consecutive? Was there any kind of exclusion for X consecutive missing days?

Thank you for address this. Every week, the training instructor visited the workplaces to monitor one training session and collect the VAS scores, health-related quality of life and training attendance. The maximal absences of training days consecutively were two and we did not have a number of consecutive missing days. The reasons for absences were not related to the study, but typically illness, traveling or other reasons. We did not perform a systematic analysis of the absences as 36 out of 40 possible sessions (TG 10) and 70 out of 80 possible session (TG 20) are very high adherence rate.
Training

Perhaps the term elastic band should be replaced by elastic tube. To review! (see this article: Test-retest reliability of knee extensors endurance test with elastic resistance from Lopes et al.)

Elastic band has been replaced by elastic tube, as suggested.

The authors cite that the band progression was implemented by utilizing thicker bands, two bands, or shortening the band in the starting position of the exercise. However the order of this progression was not made explicit. Which option was initially made? swap the band for a thicker one? put two bands? The reader who will perform this training needs to know these details.

We have tried to clarify the order of the progression. However, we had to add the words “in general” because there were some variation between the participants, between the exercises and also the fact that an elastic tube can be stretched to curtain point. The closer a person gets to the maximal stretching point, the force will not be linear, but increase rapidly. Similar, if the tension of the tubes are very low, they will not provide a resistance until the end of the ROM. However, this is very easy to detect and quite often the participants adjusted the lengths of the tubes after the first repetitions in a set. Therefore, the range of motion of each exercise (but also the length of the arms of each participants), decided which method was best. This was something the participants learned very fast after the first ”introduction” week and the reason why a very experience instructor was present in the first five training sessions (see methods).

Participants previously performed a 12-15RM test to find the ideal starting elastic tube ???

How was exercise speed controlled? Metronome? how much beats per minute?

The exercise speed was not controlled, but all participants were instructed to perform the repetitions in and controlled tempo. To find the “optimal” length of the tubes to perform 12-15RM the first four weeks, the participants used the first “introduction” week to find the length. Furthermore, each exercise was performed twice which often led to increased or even decreased resistance in the second set. We have tried to add some more information in the methods to clarify this.

Isometric strength

Photos can help the reader to better understand the test.
Figure 3a (shrugs) and 3b (seated row) has been added.

## Results

p-value should be added in Table 2.

Added, as suggested.

In my opinion figures 3, 4 and 5 could be merged into one table only. This makes the correct values of general pain, worst pain and health-related quality of life more visible, as well as reducing the number of figures in the text.

No problem. Figures 3, 4 and 5 have been replaced with a table.

## Discussion

The discussion is well written. However, like in the introduction I believe that there is a need to focus more deeply on the gap presented: The lack of studies that observe different training's frequency per day. Even if there are few, this should be cited.

We have added some paper to the discussion to focus more deeply on the presented gap.

Specifically, paragraphs 2 and 3 aim to show that approximately 60-minute of training (volume) is sufficient for pain improvements. However, the authors cite Andersen et al 27 as an example to support this thought (Page 14 - Line 43). However, the authors of the above article reported that 1-2 sessions of 20 minutes produce similar effects to 2-3 sessions of 20 minutes, that should be discussed.

We have discussed the findings of this study, as suggested.

Finally, the discussion presents important points, however, attention needs to be paid on the population that included men and women. Hormonal differences, gains in training and even pain may be influenced by gender. This is a point that can be discussed and even entered as a limitation.
We have added your point as a limitation as the men were “equally distributed” (3 vs 4) in the two training groups and represented “only” 26% of the participants.

Thank you so much and thank you for reviewing the paper. We hope you find our amendments satisfactory.