Author's response to reviews

Title: Physical exercise at the workplace prevents deterioration of work ability among healthcare workers: Cluster randomized controlled trial

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Author's response to reviews: see over
Response to reviewers:

Reviewer #1- Oili Kettunen:

Reviewer's report:

Thank you for the opportunity to read and review your interesting article. Here are some comments to your manuscript.

1. Your study question/hypothesis is well and clearly defined and this is an interesting and original approach to the field of Work Ability/exercise studies. It is important that this kind of intervention could be used as a "good practice" in different companies not just among health care workers.
   Answer: Thank you these kind words.

2. The method used in your manuscript is well described in the method paragraph and the figure 1 is informative. In practice 10-weeks intervention is however quite short to tell improvements in WAI, especially when the baseline WAI was already “good”. It would have been interesting to see how The WAI of the study persons of the different WAI-categories at baseline: WAI poor/moderate would be after 10-weeks.
   Answer: Yes, it is a rather short period to show improvements. However, Sundstrup et al. (PMID: 24535014) have recently showed similar results on slaughterhouse workers with “good” work ability baseline scores. The baseline WAI-categories are reported in table 1 and the changes of each category is shown in table 2. Nevertheless, the total WAI score is still “good” for both groups at follow-up.

3. The amount of study persons is large and representative enough to describe female healthcare workers. The mean baseline WAI however is quite high in the sample, and it would be good/interesting to know how many of the study persons “WAI poor” and “WAI moderate” had at baseline. It is common that about 15% of the sample is in categories “poor”, does your data divided according to this? The paragraph two in discussion The WAI score can be classified in four categories; “poor” (7-27, n=X?)…you could have described the amount of persons in each category in your data.
   Answer: This is a good suggestion. We have now incorporated the following in the description of the participants: “The overall work ability score can be classified into four categories; “poor” (7-27),”moderate” (28-36), “good (37-43) and “excellent” (44-49) work ability [1]. At baseline, 1%, 9%, 39% and 51% of the entire study population (200 participants) was categorized as having a “poor”, “moderate”, “good” and “excellent” WAI score, respectively.”

4. The figures are genuine and informative.
   Answer: Thank you.

5. The manuscript adheres to the relevant standards of reporting a data.
   Answer: Thank you.

6. The discussion and conclusions are quite well balanced and supported by the data. However there are some issues I would like the author to consider: The difference between the study groups after 10-weeks was because of the decrease in WAI of “HOME”-group. There could be more discussion of the possible other reasons. The seasonal variation is one option, but there might be some more reasons? I am wondering if the “HOME-cluster” would have needed some guidance with the “training-bag”, how to use the equipment
correctly. Maybe they did not understand how to do the home-exercise in a right technique and they become some muscle pain because of the wrong technique? And this would have effect to the low motivation of the HOME-cluster (mean 1xweek exercise). It would have been interesting to have a really “follow-up” after the intervention: both clusters without any guidance or group exercise and see how stabile the results are and is there long term effect of the results? I was also wondering how many of the HOME-cluster participated to the ergonomic-counselling; I did not find it in the results or discussion.

Answer:
The average pain intensity in the neck, shoulder and low back actually decreased in HOME by 4 % but this was not significant. So this does not indicate that they increased their pain or WAI because of i.e. bad technique. Moreover, the HOME-exercises were quite simple and well explained in the posters and they did not report any difficulties with performing the HOME-exercises when we interviewed them for process evaluation.

You are right that we would probably have seen more equal results in both groups if they had performed more similar interventions. We could not test the long term follow-up effect because most of the included departments were offered training at the hospital after the intervention was finished. So the group-allocation was kind of mixed after the intervention. Nevertheless, this would definitely be interesting to study in future studies.

Unfortunately, we do not know exactly how many of the subjects participated in ergonomic courses during the intervention period. However, the courses/counseling was equally distributed over all the participating departments/units. We have now included a note on this in the discussion: “The courses were offered by the hospital’s working environment department who attempted to include all participants in the offered courses during the study period.”

7. The limitations of the study are clearly stated.
Answer: Thank you.

8. The acknowledgements according to the published and unpublished material are clearly stated in the manuscript.
Answer: Thank you.

9. Title and abstract are in line with the findings.
Answer: Thank you.

10. The manuscript is written with acceptable English language. Small grammatical notices: Discussion: page 12 at the bottom, line 282 can you rewrite the sentence, or are there a word missing: The use of dedicated instructors throughout the intervention may besides ensuring….Paragraph strengths and limitations: first sentence, read it again: is there a word missing? by outcome expectations IS a limitation….? Discretionary Revisions: The WAI-classification at baseline versus follow-up I mentioned above in the comments number 3 and 6.
Answer:
We have now changed the first sentence to: “The use of dedicated instructors throughout the intervention may not only ensure proper training intensity and safe exercise execution but also increase participant adherence, since supervised interventions is known to enhance exercise adherence [23].”
Second sentence has now been changed to: “As perceived and reported work ability may be influenced by outcome expectations a limitation of this study, and behavioral interventions in general, is that blinding of participants and those administrating the intervention was not possible.”

Reviewer #2 - Eleonor Fransson:
Reviewer's report:

Regarding manuscript entitled “Physical exercise at the workplace prevents deterioration of work ability among healthcare workers: Cluster randomized controlled trial” This is an important study evaluating the effect of two exercise interventions on work ability using a cluster randomized controlled trial design. The study is well designed and well performed and the manuscript is clear in writing and style. I have only some minor comments on the manuscript that the authors may consider:

- Minor Essential Revisions

1. Methods: Please clarify both in study design and recruitment and randomization sections that only female health care workers were included in the study. This is briefly mentioned in the abstract (method), first paragraph in the discussion and in the conclusion, but not at all in the method section in the main text. Also consider to add this information in the manuscript title and study aim as well.

   Answer: Thank you for this comment. We have now included this in the methods section: “We conducted a two-armed parallel-group, single-blind, cluster randomized controlled trial with allocation concealment among female healthcare workers recruited from three hospitals (18 departments) situated in Copenhagen, Denmark, from August 2013 to January 2014”.

2. Methods, recruitment and randomization, line 116-117. Please clarify further what were the eligibility and exclusion criteria. Do the exclusion criteria described in text equal the exclusions due to contradictions in figure 1, after the baseline examination?

   Answer: We have now included the specific exclusion criteria: “Exclusion criteria were (1) pregnancy, (2) hypertension (Systolic BP > 160, diastolic BP > 100), (3) a medical history of cardiovascular diseases (e.g. chest pain during physical exercise, heart failure, myocardial infarction and stroke), (4) traumatic or severe injury to the neck, shoulder, arm or hand regions or (5) a medical history of life threatening disease and cardiovascular- and life threatening disease”.

3. Results, work ability, line 199: Please clarify (if true) that the sickness absence item was reversed, i.e. that sickness absence actually decreased, not increased, in the WORK group compared with the HOME group. If the item was reversed, please also add a note on this in table 1 and 2 (and also for other items, if relevant).

   Answer: The total number of days in sick leave during the past year was categorized into 0 days (5 point), 0<days<10 (4 point), 11≤days<25 (3 point), 26≤days<100 (2 point), and ≥100 days (1 point). This is now incorporated in the methods section.

4. The WAI estimates for the WORK and HOME groups in figure 2 do not match the baseline values and changes in WAI reported in table 1 and table 2, respectively. This might be due to adjustments in analysis. Please add footnotes to table 2 and/or figure 2 if it is crude or adjusted values.

   Answer: Yes this is because the values are adjusted for baseline values. I have now added this to the legends: “Figure 2. Change in work ability index (WAI) from baseline (0-wks) to follow-up (10-wks) with workplace exercise (WORK; full lines) and home-based exercise (HOME; dashed lines). Values are means (SE) adjusted for baseline values. ** Denotes greater reductions in WAI with workplace exercise compared to home-based exercise (Post hoc test: P < 0.01)”.

5. The discussion is in general very good and raises several important issues and puts the results into context. However, I miss a discussion about the exercise intervention itself consisting of exercises 5x10 minutes a week during 10 weeks. Would another approach including for example longer intervention time and longer bouts of exercise at each session have yielded different results? Why was this approach chosen?

   Answer:
We have now included the following in the discussion at line 297 ff: “Implementing longer training sessions may potentially have yielded more positive results. However, the reason for choosing only ten minutes was to offer a low duration, yet effective and realistic training program that could be implemented during the busy working day of a healthcare worker. We were informed by the hospitals health and safety board, prior to the study, that in order to increase training adherence the training sessions should be as short as possible. Thus, although shorter training sessions may compromise the physiological training effect the shorter duration may, however, increase training adherence in this specific hospital setting. Nonetheless, Andersen et al. have previously shown that brief daily sessions of 2 minutes of shoulder resistance training was equally effective as 12 minute sessions in reducing neck and shoulder pain among office workers [43]. However, in order to implement exercises targeting both the neck, shoulder and lower back region we chose to implement 10 minute sessions which, when performed twice a week at the workplace, proved not only to be effective in relieving pain intensity but also preventing deterioration of workability”.

6. Even if a statistically significant group*time interaction was found, the difference between the groups was small. Please discuss the clinical relevance of the findings, given the effect size, a little bit further.
Answer: We have included the following in line 317 ff: “Accordingly, performing physical exercise at least twice a week may prevent the age-related deterioration of work ability, health and physical capacity among workers with physically demanding work. However, the small-to-moderate between-group effect size shown in this study indicates that the clinical implications of workplace-based exercise on work ability should be handled with caution”.

- Discretionary Revisions
7. Introduction, lines 84-87: The sentence starting with Thus, a need… does not seem to relate to the previous sentences in the paragraph, please consider to rephrase.
Answer: The “thus” refers the two previous sentences. We have therefore changed it to the following: “Altogether, a need exists to examine if increasing the healthcare workers individual capacity by means of physical exercise can increase work ability”.

8. Methods, study design, line 96: Please clarify that allocation concealment relates to the examiners at post-intervention evaluation.
Answer: Allocation concealment is used before group allocation to prevent selection bias by concealing the allocation sequence from those assigning participants to intervention groups, until the moment of assignment. Nevertheless, the examiners were blinded at follow-up as stated in line 127.

9. Table 2. The footnote describes that the p-value denotes difference between groups at baseline, but should be group*time interaction?
Answer:
Thank you. This has now been corrected: “* denotes difference between groups at follow-up, P < 0.05”.