Author's response to reviews

Title: The effects of multi-domain versus single-domain cognitive training in non-demented older people: a randomized controlled trial

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Author's response to reviews: see over
Dear Dr. Tree-Booker,

We would like to express our gratitude for the comments made by you and reviewers, which greatly improved our manuscript (MS: 5651524986181287). We have modified the manuscript according to the reviews’ recommendations. All the changes we have made are typed in red. We respond to the comments from the reviewers as follows.

Sincerely yours,

Wenyuan Wu

**Reviewers' comments:**

**Reviewer 1:**

*Question 1:*

Please explain the inconsistent results. For instance why single domain training outperformed multi-domain training on more that half of the 24 (3 time points × 8 cognitive domains) post-training assessments. Moreover explain why single domain training, which focused on reasoning, outperformed multidomain in several cognitive domains but not in the reasoning domain. The abstract leads one to believe that the multicomponent training did better than single domain but the data does not support this.

*Reply:* We really appreciated your review and constructive comments. In this study, we presented the different effects of multi-domain and single domain training, thus, we deleted the misleading sentence that leads one to believe that the multicomponent training did better than single domain in Abstract as suggested.

Figure 3 showed 24 post-training assessments (3 time-point × 8 cognitive
domains) while Table 4 showed the NES of two intervention groups. We also noticed that 13 of 24 posttest assessment of single-domain may showed a little improvement as indicated in Figure 3, but actually only 4 of them were significant different (Table 4) which reflect the visuospatial/constructional and attention ability. Based on these data, we concluded that multi-domain cognitive training (CogTr) enhanced memory proficiency, while single-domain CogTr augmented visuospatial/constructional and attention abilities. These data showed the advantages of each intervention.

It is interesting that the single domain training, which focused on reasoning, outperformed multi-domain in other cognitive domains but not in the reasoning domain. Why single-domain training outperformed multi-domain in other cognitive domains? The reason might be the generalization of training effect. Several studies have proved that non-trained cognitive domains could also be improved after single-domain training [1, 2]. The reason why multi-domain training outperformed single domain training in the reasoning domain may be that reasoning, as an important mental process, needs to collaborate with other brain process. Single-domain usually without regard for the elaborate collaboration with other mental processes required to create and maintain a viable healthy mind capable of flexibility in thinking, recalling, linking, and reacting to one’s world [3]. Thus, multi-domain training may have more advantage than single-domain training considering the collaboration. We added this in the Discussion. Thank you very much.

Reference:


**Question 2:**

Very few of the subjects completed all training sessions. There should be a post-hoc analysis of the impact on cognitive outcomes of number of training sessions completed.

**Reply:** Thank you for this constructive suggestion. We added the post-hoc analysis of the impact on cognitive outcomes of number of training sessions completed as suggested (Table 5). Thank you very much.

**Reviewer 2:**

**Question 1:**

The title is too long and is somewhat misleading. It implies that the outcome was independent living skills when, in fact, it was cognitive tests that have been associated
with independent living abilities in other studies. I suggest, “The effects of multi-domain versus single domain cognitive training in non-demented older people: A randomized controlled trial.”

Reply: We are very grateful for your constructive comments. We have changed the title as suggested. Thank you very much.

Question 2:

On page 6, 7 lines from the bottom, the usual cutoff for normal on the MMSE in the U.S. is 24 (some use 26). Is the normal cut-off point lower in China? If so, please state that in the paper.

Reply: Thank you very much for this suggestion. The normal cut-off point of the MMSE is lower in China due to the low education level. We have stated that in the paper as suggested (Page 7, Line 4).

Question 3:

On page 8, second full paragraph, I couldn’t get a good enough handle on exactly what happened during the middle 30 minutes of the training sessions. Since this is so important, I think it deserves a great deal more explanation.

Reply: Thank you for your suggestions. The middle 30 minutes focused on a certain cognitive technique, such as different memory strategy training, reasoning ability training, etc. The trainer taught the participants about a certain strategy or technique. All participants received instructions about the rule, including its methods and
function and how to use it in daily life, such as Loci memory training, face/name memory training, et al. Sometimes, the participants need to be tested about the content to assess their learning success. We also added the detailed explanation in the manuscript as suggested (Page 8, Line 4 from the bottom). Thank you very much.

**Question 4:**

On page 12 and Figure 1, the first sentence says that 270 of the 320 were eligible implying that 50 were not eligible, but the next sentence says that those 50 refused to participate. That is confusing.

**Reply:** Sorry for the confusing expression. In fact, 320 individuals were eligible and 270 individuals agreed to attend our study. The other 50 individuals refused to participate. We have clarified this in the manuscript. Thank you very much.

**Question 5:**

Why did 53 subjects drop out of the study before even completing the baseline cognitive testing? Didn’t they understand what they were signing up to do? Was there a long time lag?

**Reply:** Thank you for your comments. We think the reasons why 53 subjects drop out of the study before even completing the baseline cognitive testing are as follows. First, there was a long time lag between randomization and baseline assessment, therefore, some older adults had totally forgotten our study or changed their contact information. Second, the baseline assessment was conducted in the summer. Some old
adults refused to attend the assessment due to the hot weather. We added this into our limitation part. Thanks again.

**Question 6:**

Discussion: It is not at all surprising to me that single domain cognitive training resulted in greater improvements in reasoning. Those assigned to that group received considerably more training in reasoning skills than the multi-domain group. That needs to be made much clearer. (Or am I confused?)

**Reply:** We really appreciated your review and your constructive suggestions and comments. The results showed both training groups presented great improvements in reasoning, and had no significant group differences at immediate and 6-month follow-up. Meanwhile, the multi-domain group showed better performance at 12-month follow-up, which was consistent with the training effect maintenance on other cognitive test. Thus, although single-domain group received considerably more training in reasoning skills, it didn’t showed significant predominance in reasoning test. We have tried our best to replace all the un-appropriate expression in discussion. Thank you very much.

**Question 7:**

Discussion: In this section I wouldn’t use statistical expressions like “Time*Group interaction effect.” Just summarize in one paragraph the key findings, then discuss the implications, then discuss the limitations and strengths of the study in ordinary
language.

Reply: Thank you very much. We have revised it as suggested.

Question 8:
Discussion: Try again to convince the readers that the changes seen in cognitive test scores will probably translate to better daily functioning and that the training performed in the study could be widely implemented at a reasonable cost. Otherwise why should we care?

Reply: Thanks for this sincere advice. We have specified that as suggested in the last paragraph of discussion.

Question 9:
Conclusions: This section seemed redundant and too long. Try to reduce the whole section to no more than 3 sentences.

Reply: We have revised the “conclusion” session as suggested. Thank you very much.

Question 10:
Abstract: Under Background and throughout, the abbreviation, “CT,” for cognitive training is problematic since it usually refers to computed tomography. I suggest using CogTr or just not abbreviating it.

Reply: We have defined acronyms as suggested (Cognitive Training, CogTr). Thank you very much.
**Question 11:**

Results: On page 14 - 17, much of the data included in the text is also included in the tables and figure where it much easier to follow. I would reduce the amount of data included in the text to the minimum amount needed to understand the key findings and refer the reader to the tables and figure.

**Reply:** Thank you for your constructive suggestions and comments. We have reduced the amount of data included in the text to the minimum amount as suggested. Thank you very much.

**Question 12:**

Abstract: Under Results, there seem to be some words missing from the first sentence after the second “CT.” The second sentence is also confusing and should be rewritten.

**Reply:** We have modified the related content as reviewed. Thank you very much.

**Question 13:**

On page 4, 4 lines from the bottom, I suggest that you begin that sentence with “They concluded that [cognitive exercise training in healthy older adults…”]

**Reply:** Thanks for your advice. We revised it as suggested.

**Question 14:**

On page 5, middle of the page, I suggest moving “Previously, few studies …. Positive
effects.” To a new paragraph just before the paragraph that begins, “The first aim of the present study…”

**Reply:** Thank you very much. We have changed it as suggested.

**Question 15:**

On page 5, 5 lines from the bottom, I would delete “of the present study” and replace it with “was.”

**Reply:** We have modified it as suggested. Thank you very much.