Author’s response to reviews

Title: Can meditation improve attention in older adults with a history of falls? Study protocol for a four-week proof-of-concept intervention

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Version: 2 Date: 20 Dec 2018

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Response to Reviewers

Thank you for the following suggesting and comments, which have substantially improved our current manuscript. We have provided detailed responses to each comment below.

Reviewer #1

1. Introduction: Line 46 - you need to add the abbreviation FA after "focused-attention" as you go onto to use the abbreviation in the next sentence

Response & Action: Thank you for pointing out that error, this has now been fixed.

2. I just have a couple of questions which if you can clarify will give the intervention more depth. Can you clarify if you will be randomising individuals within retirement homes or the homes themselves as if you are delivering both interventions in one retirement home there is potential for bias.

Response: Thank you for pointing out this valid concern. We will be randomizing participants on an individual basis (now clarified in the manuscript on page 7). While we recognize that this may indeed create bias because participants in the two groups may talk to one another about the intervention, there are also issues with randomizing homes themselves. Because our outcomes
are cognitive in nature, these are going to be based partially on cognitive reserve which is influenced by a host of factors, including education level, socioeconomic status, social inclusion, daily activities, etc. Because these may have such a big impact on our results, we want to control for these as much as possible which means randomizing individuals within the homes because each retirement home will attract a different demographic of older adults and will have different activities/opportunities. Although participants may talk to one another, we have created our two groups to be as similar as possible (sitting and relaxing for 20 minutes), so we are optimistic that any discussion between participants would not impact our results. However, we do acknowledge that this is a potential limitation of our study and will consider it during the interpretation of our results.

3. Can you give a little more details as to the experience of the research leader delivering the intervention - what is her experience of leading meditation?

Response: Thank you for requesting more clarification on the experience of the meditation leader. The meditation leader is the master’s graduate student leading the study. She has been consistently practising meditation on her own for three years, daily for one year. Additionally, she has been teaching weekly meditation sessions for several months. She has experience with various types of meditation, but primarily practises the focused attention meditation used in this protocol.

Action: This information has been added to the Intervention section. Page 8 now reads:

“The meditations are being led by the graduate student who is carrying out the research. She has had a consistent meditation practice on her own for three years and has practised daily for one year. Additionally, she has been teaching weekly meditation sessions for several months. She has experience with various types of meditation, but primarily practices the focused attention meditation type that is being used in this protocol.”

Reviewer #2

1. I would like some more information on the EEG component, both in the introduction and methods: The Background does not include any literature review on ERP and meditation literature, which is important to justify using EEG. In particular, what has the literature found in terms of ERPs/iAPF and meditation
Response: Thank you for pointing out this gap in our background and methodology. You are correct that adding more information as to why we are including EEG to evaluate meditation is important to our study. We have added in more information regarding the use of EEG to evaluate meditation.

Action: More information has been added to the Introduction regarding meditation and ERP/EEG. Page 4 now reads:

“There is also emerging evidence that meditation can change electrical activity in the brain, as measured using electroencephalography (EEG). In a systematic review [21], it was found that studies looking at EEG and meditation showed an increase in alpha activity during meditation, as well as increases P300 event-related potential (ERP) component amplitude during various attention tasks, including a Go/No go task similar to the SART. Both alpha activity and P300 amplitude are modulated by attention. Collectively, these findings have been interpreted as showing that meditation can effectively change the electrical activity in the brain to increase attentional resources.”

2. Please define what ERP is

Response: We have now added this into our Introduction.

Action: An ERP definition has been added. Page 5 now reads:

“More specifically, we are measuring continuous EEG during resting-state (i.e., the absence of an external task) which allows us to examine alpha activity. In addition, we are measuring ERPs during the SART. ERPs can be defined as time-locked recordings of brain activity corresponding to the presentation of stimuli. This allows us to examine changes in attention processing independent of motor responses to stimuli.”

3. The hypotheses are somewhat vague. The authors state they expect changes in ERP components (hypothesis 2) but do not state what changes (increased or decreased amplitude, shorter or longer latencies?).
Response: We apologize for not providing enough detail in our hypotheses. We expect a larger amplitude in the components of interest, indicating more attentional resources being used. This has been seen in previous studies, as discussed in the systematic review cited by Lomas, Ivtzan, and Fu in 2015. We also expect decreased latency indicating a faster processing time to the target stimuli for the meditation group.

Action: We have revised our hypotheses on page 5 to reflect this change.

4. Increases in iAPF are also hypothesised (hypothesis 3), but it is not stated whether this is within or between groups (or both).

Response: Thank you for requesting more detail in our third hypothesis.

Action: Page 5 now reads:

“...and 3) increase levels of resting state attention, as measured by an increase in individual alpha peak frequency (iAPF) during rest from pre- to post-intervention in only the meditation group.”

5. Is there a specific time period between which at-home testing and EEG will occur?

Response: Thank you for the opportunity to clarify our methods. We have added more information regarding the time-period between testing and the interventions.

Action: Pages 7-8 now read:

“Baseline testing will occur within one month before the first session of the intervention, and the end-point testing will occur within a maximum of 7 days after the last intervention session.”

6. Please include additional details about the SART in terms of number of trials, % target trials, etc. I.e. Are there enough trials to derive ERPs? Will ERPs be looked at for both target and non-target trials, or just targets?
Response: Thank you for providing us the opportunity to give more detail on the SART task. As identified in past literature, this model of the SART provides a sufficient number of trials to analyze in an older adult population. We will also be analyzing a total of 840 trials, with an estimated 84 target trials.

Action: More information regarding the SART and ERP analysis has been added to page 9.

7. There are no details about EEG/ERP processing.

Response: Thank you for the opportunity to provide more detail on the EEG/ERP processing. We have added more detail regarding both ERP processing and resting-state processing.

Action: More information has been added for ERP/EEG processing and analysis on page 10.

8. Comments regarding the intervention: Figure 1 is slightly confusing as the intervention groups are ticked at enrolment, before allocation.

Response: Thank you for the feedback regarding the order in which we allocate participants to their groups. We have moved the Allocation check from the “Baseline” timepoint to the “Enrolment” timepoint to identify that participants are randomized before the intervention begins.

Action: The checkmark for Allocation has been moved from Baseline to Enrolment in the table on page 21.

9. The authors state that an 'experienced research leader' will conduct the meditation sessions - it is unclear what kind of experience will they have?
Response: Thank you for providing us the opportunity to give more detail regarding the qualifications of the meditation leader. We have included more information.

Action: Page 8 now reads:

“The meditations are being led by the graduate student who is carrying out the research. She has had a consistent meditation practice on her own for three years and has practised daily for one year. Additionally, she has been teaching weekly meditation sessions for several months. She has experience with various types of meditation, but primarily practices the focused attention meditation type that is being used in this protocol.”

10. Could the authors provide a reference or two to justify music listening as an appropriate meditation control?

Response: Thank you for bringing up this important point regarding meditation research. There isn’t a consistently used control group for meditation research, as it is a relatively new field of research. However, we chose to use a music listening control group to try and replicate certain aspects of the meditation group that we would like to eliminate as possible confounding variables. These include socialization, taking time out of the day to relax and be still, expecting results from the relaxing component of the group, etc.

Action: More information regarding the music listening control group have been added. Page 9 now reads:

“To date there is no evidence-based or consistently used control group for meditation research [25], therefore we chose a calming music listening group to replicate the possible confounding variables such as socialization, taking the same time out of the day to relax, and others that are expected in the meditation group.”