**As Predicted: "Highway to the mindful zone: Meditation and the attentional blink"** (#12472)

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**1) Have any data been collected for this study already?**

No, no data have been collected for this study yet.

**2) What's the main question being asked or hypothesis being tested in this study?**

The primary task used in this study will be the rapid serial visual presentation (RSVP) task. A mindfulness meditation intervention will result in fewer attention blinks (AB) (i.e., a reduction in T2 errors following T1 stimuli) and a smaller T1-ellicited P3b EEG component compared to participants who simply completed a somatic relaxation session. T2 accuracy improvements will likely be largely accounted for by improved accuracy on the long inter-stimulus-interval condition, as it would show a shrinking of the attention blink duration. These changes will be judged by comparing post-intervention with pre-intervention measures.

Resting state EEG will also be recorded while participants complete their respective interventions (mindfulness meditation or somatic relaxation). We will use a Fast Fourier Transformation to transform the recorded resting state EEG time series into spectral power bands. Because alpha and theta spectral powers have been associated with proficiency in Mindfulness Meditation, we believe it will be a good way to relate the intensity of mindfulness experienced during the intervention to any improvements/changes in their performance. We predict that attentional blink performance changes (i.e., T2 error rate and T1-elicited P3b amplitudes) will be negatively correlated with both alpha and theta powers in the mindfulness meditation condition. These correlations are expected to be weaker or absent in the somatic relaxation condition. Additionally, alpha and theta powers during rest are expected to increase following mindfulness meditation, but not somatic relaxation.

Participants will also be asked to perform a finger-tapping task. Like the RSVP task, they will perform it twice, with the two runs separated by either a mindfulness meditation or somatic relaxation intervention. They will be asked to tap their fingers once every 600 ms for 4 minutes (they'll be given a metronome for the first 10 s to help them get the rhythm). We predict that response time standard deviations (RTSDs) will be more reduced at time 2 in participants assigned to the mindfulness condition than participants assigned to the somatic relaxation condition. In addition to RTSDs, we will also use the strength of the spectral power at 1.67 Hz (corresponding to the frequency they will be asked to keep). This reduction suggests an increased reliance on a more diffuse form of attention that appears to be mediated by the default mode network.

We will also have participants complete the Toronto Mindfulness Inventory (TMI) and the Philadelphia Mindfulness Scale (PMS) both before and after completing these tasks. We predict that the mindfulness group will show more improvements in self-reported mindfulness on the TMI, as it measures state mindfulness, and that these improvements will be correlated with AB improvements. PMS scores are not predicted to meaningfully change following the intervention, as PMS is designed to assess trait mindfulness and is unlikely to change following such a short intervention.

**3) Describe the key dependent variable(s) specifying how they will be measured.**

The dependent variables are T2 accuracy, T1-elicited P3b amplitude, resting state alpha and theta EEG spectral power, response time standard deviations (RTSDs) and finger-tapping frequency power during a finger tapping task, scores on the Toronto Mindfulness Inventory, and scores in the Philadelphia Mindfulness Scale.

**4) How many and which conditions will participants be assigned to?**

Between-groups conditions (2): Mindfulness Meditation and Somatic Relaxation

Within-groups conditions (4):

– short and long inter-stimulus-intervals (this condition is only relevant to the RSVP task).

– pre- and post-intervention

**5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.**

The analyses will be carried out as specified in the Hypotheses section. However, it should be noted that this study will attempt to use as many non-parametric analyses as possible. Therefore, all between-groups and between-condition comparisons will be conducted with permuted differences tests. Similarly, the significance of correlations will also be conducted using permutation tests. Finally, bootstrapped confidence intervals using resampling with replacement will be used to compute 95% confidence intervals for all summary statistics and comparisons.

**6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.**

Participants who make either no T2 errors or no T2 errors on the pre-intervention RSVP will be excluded from the analysis.

Participants whose error-rates, finger-tapping rhythm, or pre-intervention mindfulness scores significantly deviated from the group. Outliers who deviate more than three median absolute deviations (MAD) from the median will be removed prior to analysis.

**7) How many observations will be collected or what will determine sample size?**

No need to justify decision, but be precise about exactly how the number will be determined.

N = 80 (40 participants per condition). This was determined using the PANGEA webapp:

<https://jakewestfall.shinyapps.io/pangea/>

Participants must have no history of mental or neurological illness, with no prior meditation experience (<10 hours in the past year, with no regular frequency). Participants will also be excluded from the analysis if their EEG data contains too many artifacts to be considered useful.

**8) Anything else you would like to pre-register?**

(e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)