

Effects of a Single Meditation on Working Memory

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Introduction

- **Mindfulness meditation** involves focusing attention completely on a single stimulus, like one's in- and out- breaths, in order to remain anchored in the present moment, without evaluating the moment as good or bad.
- A growing body of research supports its beneficial role in improving attention and **working memory** after meditation interventions, especially of lengths ranging from 8-weeks to 3-months (Tang, Hölzel & Posner, 2015).
- Some studies suggest immediate effects of the practice. Tang et al. (2007) found improvements in attentional conflict monitoring after just 5 days of 20-min practices per day. Similarly, Zeidan et al. (2010) demonstrated improvements of working memory, as measured by an *n*-back task, after 4 days of 20-min meditative sessions.
- **The present study seeks to extend this literature by testing the hypothesis that working memory improvements can be detected, using a modified version of a working memory Stroop task (Kiyonaga & Egner, 2014), after just a single 20-min session of mindfulness meditation.**

Participants

- 33 undergraduates, no prior meditation experience
- One confederate accompanied participants in both conditions to bolster meditation group size

Materials

- **State Mindfulness Scale (SMS;** Tanay & Bernstein, 2013), a self-report questionnaire that queries Ps on how well statements about mindfulness described their experience in the past 15 minutes (e.g., , *I noticed many small details of my experience*) with a rating from 1 (*Not at all*) to 5 (*Very well*).
- Ps were randomly assigned to 1 of 2 conditions:
 - **20-min audio-guided meditation** (UC Health – UC San Diego) , $n = 17$
 - **20-min audio-book – *The Natural History of Selborne*** (White, 1908/2011), $n = 16$
- **Adapted Working Memory Stroop Task** (modified Kiyonaga & Egner, 2014) - Participants first hold a color word in mind, then press a key corresponding to three color frames presented sequentially (either green, blue or red). Finally, they indicate whether another color word matched the initial word.

Green →  →  →  → Red
Yes? No?

- **Interest in pursuing further mindfulness training –** rated from 1 (*disinterest*) to 5 (*strong interest*).

References

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Procedure

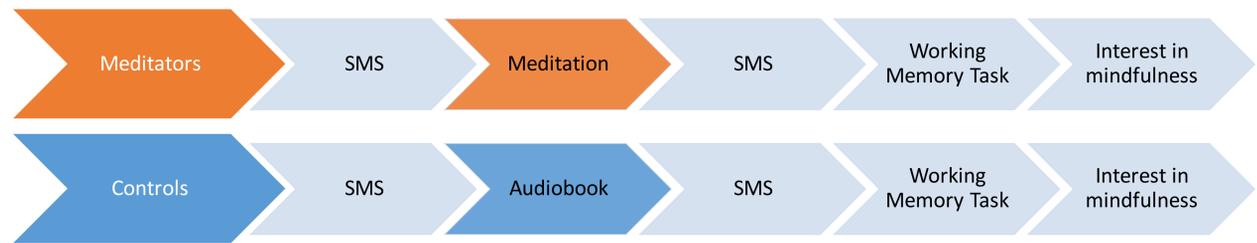


Figure 1. State Mindfulness Scale

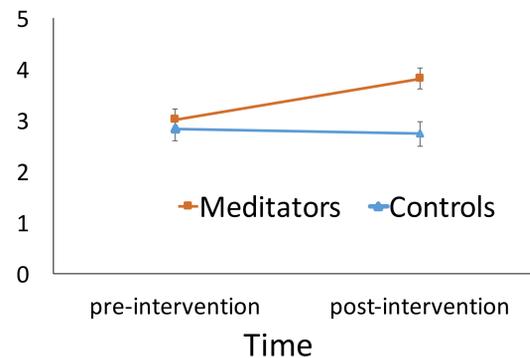
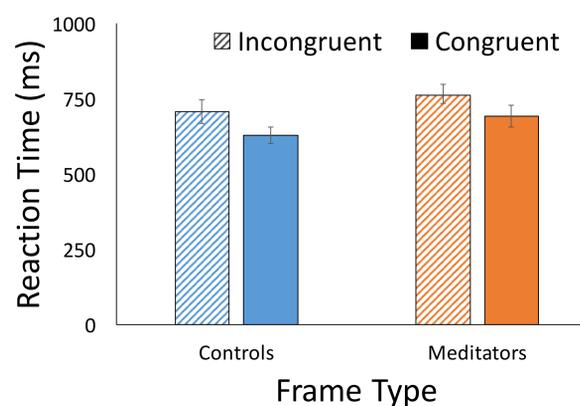


Figure 2. Stroop Interference: Slower RT for incongruent than for congruent trials



Interest in Future Practice: There was no significant difference between the meditation group ($M = 2.88, SD = 1.16$) and the control group ($M = 2.75, SD = 1.12$) for interest in pursuing future mindfulness training.

Discussion

- Meditators did not perform significantly better for Stroop performance, suggesting that more than one meditation session is necessary for detection of the working memory improvements seen in other studies (e.g., Zeidan et al., 2010).
- Though executive function may not increase after just 20 minutes, results for the State Mindfulness Scale may indicate increased present-moment engagement following just one meditation. It is possible, however, that participant expectancy effects may have influenced results. Future work should include objective as well as subjective measures of mindfulness.
- Future studies should investigate other potential short-term outcomes of meditation, such as stress reduction and reduced emotional reactivity. This line of research is important in informing an understanding of the relatively unknown causal mechanisms of meditation.

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Results

Intervention had an effect on SMS scores.

- Figure 1 shows a group by time interaction, $F(1,31) = 5.81, p = .02, \eta_p^2 = .07$, which reflects meditators scoring significantly higher from pre- to post-intervention, $t(32) = 2.87, p = .007, d = .97$, while controls' scores did not significantly increase, $t(30) = -0.32, p = .751, d = .11$.

Did the meditation group's perceived increase in state mindfulness affect their Stroop scores compared with controls?

- **Working memory recognition** (# correct on yes/no question, out of 93): no significant difference between meditators ($M = 90.88, SD = 2.87$) and controls ($M = 91.31, SD = 2.80$)
- **Stroop Interference** (difference in reaction time between congruent and incongruent trials for first frame): Figure 2 shows there was no group by frame type interaction, $F(1,31) = 0.23, p = .638, \eta_p^2 = .007$, indicating that Stroop interference (difference between striped and solid bar) was not measurably reduced for the meditation group when compared to the control group.