

Exploring the Effect of Mindfulness Meditation on Recall

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## **Abstract**

Mindfulness is a particular way of paying attention to the present moment characterized by a receptive and non-judgmental attitude (Kabat & Zinn (994). One benefit researchers have examined is the effect of mindfulness on memory. Calma-Birling and Gurung (2017) and Ramsburg and Youman (2014) examined the effect of brief mindfulness training on student's academic performance. They examined the short and long terms effects of mindfulness meditation on memory in an academic setting and found that short term benefits did exist. However, they only examined the immediate short-term impact, by testing the students on the material in the same class. The current study examines the possible benefits that occur when the mindfulness not only occurs before the lecture, as it did in Ramsburg and Youman's study (2014), but also before a test separated from the lecture by 24-48 hours. In the end, there was no significant effect of the second administration of mindfulness training before the quiz. Explanations of possible reasons are discussed below.

## **Exploring the Effect of Mindfulness Meditation on Recall**

The term mindfulness has become a buzz word in society as of late. The word refers to, as Kabat and Zinn (1994) said, "...a particular way of paying attention to the present moment characterized by a receptive and non-judgmental attitude". Originating from Eastern Religions like Buddhism, this trend has made its way into many corners of society through mediums such as applications on various technological platforms. While this concept is proliferated throughout popular culture, it also finds applications in the clinical realm. Chiesa, Calati, and Serretti (2011) state that mindfulness meditation practices, MMPs, actually improve cognitive functioning.

Chisea et al. (2011) defined mindfulness as having two parts. The first component is being in a mental state characterized by openness to whatever is happening in the current moment both internally and externally. The second is the ability to be non-judgmental about what is occurring. It's important to note that they only included studies which used patients who had no prior exposure to mindfulness meditation practices or those who started being involved on their own. Their hypothesis was that performing focused attention meditations would involve development of at least four different faculties: 1) being able to have sustained attention about a target object, 2) the monitoring faculty which detects mind wandering, 3) the ability to disengage from a distracting object (attention switching), and 4) the ability to redirect focus to the chosen object (selective attention). Chisea et al. (2011) suggest that a relationship may exist between mindfulness meditation practices and development of working memory, increases in meta-awareness, and executive functions such as problem solving.

After their meta analysis of 23 articles, they found that mindfulness meditation practices did have cognitive benefits for processes such as selective and executive attention, enhanced

working memory capacity, and increased memory specificity (which is a psychological marker of mental well being). Because of the way mindfulness involves the different faculties mentioned above, it has shown benefits to various areas of cognition as described in the studies used in their meta-analysis.

Norris et al. (2018) claim that these benefits are seen in the early stages after someone becomes involved in mindfulness meditation practices. They say that the development of executive attention occurs early during mindfulness training. Another study conducted by Zeidan, Johnson, Diamond, David, and Goolkasian (2010) found that four days of mindfulness training for 20 min/day was effective in increasing mindfulness scores compared to a control group. All this evidence indicates that mindfulness meditation practices through the use of the four faculties mentioned earlier, namely sustained attention, monitoring faculty, attention switching, and selective attention do lead to cognitive benefits. One such cognitive benefit was examined by Ramsburg and Youman (2014) in their attempt to address the potential benefits of meditation in a higher education classroom setting.

They conducted three experiments each aiming to examine a different element of the possible effect that meditation could have on academic performance. Their first experiment's goal was to test the hypothesis that a brief meditation before a lecture about health and psychology would improve students' performance on a short quiz which followed the lecture. Their second experiment was to test whether the improvements in quiz performance could be attributed to increased interest in different lectures as opposed to another cognitive mechanism. Finally, their third experiment was to test whether the improvements in learning resulting from the meditation would replicate for a topic completely unrelated to the meditation training, they

assumed the topic of health and psychology was related to mediation. They also presented the material in video form, a different format from the prior two experiments where the information was presented in lecture form.

Their results showed significant differences in academic performance between students who were randomly assigned to a meditation group and the control group. The students who had the meditation training had better results on the post-lecture exam. In their discussion however, Ramsburg and Youman (2014) confess that while their study demonstrated cognitive benefits from mindfulness training in the realm of academic performance, it didn't examine the cognitive mechanisms behind the performance increase. That question was examined by Calma-Birling and Gurung (2017) and they offer an explanation.

Calma-Birling and Gurung (2017) investigated the effect of brief mindfulness training on student's academic performance. Building upon the study of Ramsburg and Youman, they conducted a long term study to examine if brief mindfulness training on a bi-weekly basis would improve long term knowledge retention. Their results showed that while their brief mindfulness training sessions affected significant improvement, the sessions had no significant impact on the long term academic performance of the students in their experiment.

The authors suggested that an explanation for the lack of long term benefit was due to the dosage of mindfulness not being strong enough to affect long term memory retention. They also suggested that the reason they found short term memory improvement was because, as researchers such as Creswell (2016) say, mindfulness practices help train attention. Meaning, in order to be mindful successfully, it requires several steps. For example, an individual must notice their mind wandering, shift it back to the mindfulness meditation practice, and sustain that

attention. They posit that taking part in a mindfulness meditation practice before a lecture helps limit mind wandering that takes place during the lecture.

However, a study conducted by Lueke and Lueke (2019) offers a different explanation to that of Calma-Birling and Gurung. That is, Lueke and Lueke (2019) proposed that mindfulness helps academic performance by encoding information into long-term memory. They show through their experiment that because of this encoding benefit, brief mindfulness training is beneficial when it comes to learning information for future recall.

#### Current Study:

In the experiment by Calma-Birling and Gurung (2017) the mindfulness meditation was administered before the lecture content was taught and the quiz was given right after the lecture was finished. On top of this, students were told that they were going to be given an exam on the topic after the lecture. While Calma-Birling and Gurung (2014) tested both the long term and short term effect of mindfulness meditation on academic performance their measures to gauge this, the tests and quizzes, were separated by a wide gap. Their long term results also seem to stand as a challenge to the conclusion of Lueke and Lueke (2019) that mindfulness helps with memory encoding. If mindfulness helped with memory encoding, why didn't the experiment of Calma-Birling and Gurung (2014) demonstrate any long terms benefits.

The goal of this study is to examine the short term recall benefits of mindfulness on a longer scale than measured previously. Mindfulness has been shown to increase recall when it comes to self threatening memory (Saunders, Barawi, McHugh, 2013), however it is unclear how mindfulness meditation practices affect recall when they are done immediately prior to a test.

While the experiment of Calma-Birling and Gurung (2014) did not show long term benefit of

mindfulness, there are a few aspects of that experiment which the current study seeks to examine. In their experiment they didn't conduct mindfulness meditations before the actual exam, just the quizzes which were administered right after the lecture content was delivered. The authors didn't examine how performance would be influenced if there was a delay between the lecture content and the quiz. Another variable that the current study seeks to examine, as mentioned before, is the effect on test performance if there is mindfulness meditation immediately before the quiz? However mindfulness works on a theoretical level, there should be benefits to undergoing a mindfulness meditation immediately prior to the test, the study seeks to examine this effect.

There will be two conditions in this study. Both groups, control and experimental, will undergo mindfulness meditation and then listen to a lecture. Then, within 48 hours the groups will take a quiz about the lecture they viewed, however solely the experimental group will be administered a second mindfulness meditation. This additional mindfulness meditation will measure the effect of mindfulness on test performance, separately from the lecture unlike Calma-Birling and Gurung (2014). My hypothesis is that this second mindfulness meditation will have a positive impact on academic performance, resulting in higher test scores.

Another aspect of this experiment which makes it relevant is that due to the safety measures governments have implemented in response to COVID-19 this study will have to be administered through an online platform. As of July 2020, 98.6% of learners worldwide were affected by the pandemic, representing 1.725 billion children and youth, from pre-primary to higher education, in 200 countries according to a 2020 study done by the United Nations. As Shivangi Dhawan, a researcher at the University of Delhi, says "Time and location flexibility,

though it is the strength of online learning these aspects are fragile and create problems. Student's non-serious behavior in terms of time and flexibility can cause a lot of problems.” (2020). One concern this study will have to take into account is the impact having to administer the study remotely without proper supervision. However, a benefit of this study is that it can give clarity on the impact of mindfulness meditation in an online classroom environment.

## **Methods and Materials**

### Participants:

There were in total 48<sup>1</sup> participants with ages ranging from 19 to 28 years old who participated in this study either for no benefit or to receive research credit for psychology classes. Twenty-three of the participants were assigned into the control condition, hereafter called one meditation group, and twenty-five into the experimental condition, hereafter called the two meditation group.

### Materials:

We used a TED talk titled *What you can do to prevent Alzheimer's* given by Lisa Genova.<sup>2</sup> It is 13 minutes and 41 seconds long and involved enough technical terminology and complex subject matter to mimic a college lecture. The quiz administered during the second session consisted of 15 questions. The mindfulness meditation was taken from a YouTube video clip called “5-Minute Meditation You Can Do Anywhere”.

The experiment used the State Mindfulness Scale to gauge the impact of the mindfulness meditation on the subjects (See Appendix). The SMS, created by Ruimi, Hadash, Tanay, & Bernstein (2019), is a self-report measure of mindfulness. The SMS measures participants'

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<sup>1</sup> Due to technical complications and some participants not following the procedure of the experiment 161 responses had to be discarded.

<sup>2</sup> [https://www.ted.com/talks/lisa\\_genova\\_what\\_you\\_can\\_do\\_to\\_prevent\\_alzheimer\\_s?language=en](https://www.ted.com/talks/lisa_genova_what_you_can_do_to_prevent_alzheimer_s?language=en)



perceived level of attention to and awareness of their present experience. The scale measures two domains of experiential events or objects of which one may be mindful; bodily sensations, mental events, or it can present a combined total score. According to Ruimi, Hadash, Tanay, & Bernstein (2019), higher scores reflect higher levels of state mindfulness. This experiment looks at the total score of participants. The data were collected using the survey medium *Qualtrics* and the links were emailed out to the email addresses provided by the subjects.

*Procedure:*

The experiment was conducted across two separate sessions separated by 24 to 48 hours.

**Day 1.** A link was sent to a potential participant who, once they click on it, was sent to a Qualtrics survey. Initially, both groups had the same survey format wherein the participants engaged in a mindfulness meditation, answered questions from the State Mindfulness Scale about their experience while meditating, and lastly watched a TED talk video played for them. After the completion the first survey, an email with instructions regarding the second survey was sent to the participant. In this email was a link to the second survey.

**Day 2.** The second survey was taken the following day.. Once the participant accessed the survey, the software randomly assigned the participants into one of two groups. The experimental change that was applied was only present the second day of the experiment:

1. The one meditation condition was solely administered a quiz on the subject matter presented in the video only.

2. The two meditation condition, participated in the same mindfulness meditation session as they had the day before, completed the question from the State Mindfulness Scale once more, then finally completed the quiz.

## Results

Analyses used an alpha level of .05. We conducted an independent samples t-test. Participants in the two-meditation condition had numerically higher test scores ( $M = 11.44$ ,  $SD = 2.31$ ) compared to the participants in the one-meditation condition ( $M = 10.87$ ,  $SD = 2.36$ ),  $p = .40$ . However, these means did not differ significantly,  $t(46) = .85$ . The means of the SMS also differed between the two groups with the one-meditation group scoring lower on average ( $M = 2.88$ ) compared to the two-meditation group ( $M = 3.1$ ), however the difference was not significant,  $t(24) = -.342$ ,  $p = .749$ .

**Table 1:**

Condition	Quiz Scores	Mean	Standard Deviation
One-Meditation	23	10.869	2.36
Two-Meditation	25	11.44	2.31

## Discussion

Analyses showed that there was no significant differences between the test performance in the one-meditation and two meditation conditions. This result was contrary to the hypothesis the cognitive benefits described by Chiesa, Calati, and Serretti (2011) whose study yielded a significant difference in academic performance beyond the time frame demonstrated by Ramsburg and Youman (2014).

One possible explanation for our lack of significant results is that the gap between the quiz and the Ted talk was not ideal for this experiment. The experiments mentioned above showed that in the long term mindfulness wasn't helpful, while another showed that it was helpful immediately following the lecture material. The goal of this experiment was to try and

find a middle ground to examine in terms of how far that short term memory benefit could be stretched. These results may show that the meditation's benefits, as shown in Ramsburg and Youman (2014), don't extend to 48 hours passed the time the information was encoded. Future research may be interested in focusing on this one question and examining the rate at which the benefits of the meditation deteriorate.

Another explanation could be that both groups had a mindfulness meditation before the Ted talk material was shown to them. This was done to try and build off of the experimental design as conducted by Ramsburg and Youman (2014). However, it could be that conducting an experiment where even the first survey didn't have a mindfulness meditation intervention would show more the benefits of mediation in the short term.

Another reason for why this experiment didn't achieve a significant result could be due to the nature of the time period within which it was conducted. During the Covid-19 pandemic, one recent study showed how students in West Point who were randomly assigned to online or in person learning displayed a difference in grades (Kofoed, Gebhart, Gilmore, & Moschitto, 2021). Online learners suffered lower grades by a measure of .2 standard deviations compared to their in person counterparts. Another study conducted by Cacault et al. (2021), showed that when streaming lectures substitute for in person attendance, students were negatively impacted. Another study by Almendingen et al. (2021) showed that two weeks into the lockdown, 75% of students reported that their life had become more difficult and 50% felt that learning outcomes would be harder to achieve due to the sudden shift to online education. Twelve weeks into the lockdown, the corresponding numbers were 57% and 71%, respectively.

It could be that this study may have achieved significant results in a context where the researcher was there to ensure focus and proper participation. While participants were instructed to find a quiet place where they could focus, there was no guarantee that they complied sufficiently. In fact, much of the data collected had to be discarded because participants did not comply with the instructions. Either the participants had skipped through most of the video, as was reflected in the time, or they failed to complete the second part of the survey within the required time limit. It can't be assumed that this would have been completely avoided if the experiment had been done in person, however a follow up experiment may be worthwhile to verify whether presenting the experiment online was a factor.

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Appendix:

Figure 1: SMS Scale Questionare

We are interested in what you just experienced during this meditation. Please indicate how much you experienced each of the following by clicking on one number per question.

	Not at all	A little	Moderately	Quite a bit	Very much
I was aware of different emotions that arose in me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tried to pay attention to pleasant and unpleasant sensations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found some of my experiences interesting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed many small details of my experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt aware of what was happening inside of me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed pleasant and unpleasant emotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I actively explored my experience in the moment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I clearly physically felt what was going on in my body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I changed my body posture and paid attention to the physical process of moving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that I was experiencing the present moment fully	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed pleasant and unpleasant thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed emotions come and go	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed various sensations caused by my surroundings (e.g., heat, coolness, the wind on my face)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed physical sensations come and go	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had moments when I felt alert and aware	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt closely connected to the present moment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed thoughts come and go	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt in contact with my body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware of what was going on in my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was interesting to see the patterns of my thinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I noticed some pleasant and unpleasant physical sensations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>