

RESEARCH ARTICLE

The effect of mindfulness meditation on working memory: An observational study in MBBS students of RVM Institute of Medical Sciences and Research Center, Siddipet, Telangana

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ABSTRACT

Background: Meditation is a practice that has been shown to improve calmness, enhance attention, and produce a focused mind. Mindfulness is the quality of being fully engaged with whatever we are doing, being free from distraction. Students nowadays are stressed due to increasing competition relating to their academic performance and career building which, in turn, affects their performance and mental health. Most studies which show that mindfulness meditation improves focus, attention, or memory were done under supervision in serene environment away from the hustle and bustle of modern life. Our study aimed to see whether some benefit of such practice could also be attained in our everyday life settings when done for a short time and without much training or supervision. **Aims and Objectives:** The aims of this study were to investigate the effectiveness of short-term mindfulness meditation on working memory in MBBS students using visual memory test and compare with a control group. **Materials and Methods:** Total 50 students were taken and divided into two groups- test and control. A baseline measurement of their working memory by visual memory test was done. A similar test was repeated after 8 weeks of regular mindfulness meditation exercise in the test group while the control group continued with their previous routine. The results were compared with their previous performance as well as with the control group using student *t*-test. **Results:** The recorded changes were analyzed for statistical significance. The results showed statistically significant improvement in the score of test group ($P < 0.01$). **Conclusions:** Our study showed that a period of 8 weeks of mindfulness meditation was helpful in improving working memory. By practicing mindfulness meditation, we train our mind to concentrate on the present moment, leaving aside our problems, worries, and stresses. This regular practice may improve brain network training which results in improvement in working memory.


KEY WORDS: Mindfulness Meditation; Working Memory; MBBS Students

INTRODUCTION

Meditation is a practice that gives us calmness and inner peace among the stresses of everyday life. Mindfulness prevents

wandering of the mind and distraction so that we can engage ourselves fully with an assigned task. This mental mode can be developed by engaging in daily mindfulness exercises or going for an intensive course for a few weeks.^[1] Mindfulness meditation has been widely studied worldwide in different clinical or non-clinical settings.^[2] It has been shown that mindfulness is helpful for reducing stress while improving mood and generating a feeling of well-being.^[3]

Since most mindfulness meditation protocols include exercises that engage attention, studies have suggested that

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such training may improve aspects of attention.^[4] In fact, some studies have reported that mindfulness meditation does improve attention control.^[5] Since there is a well-established relation between working memory and attention, so it is not surprising that mindfulness practice will improve working memory as well. Recent studies by Chamber *et al.*, in 2008, and Semple, in 2010 have shown such findings.^[6,7] Several studies have also suggested that affective improvements, which are known to occur with mindfulness meditation, may be due to improvements of attention and working memory.^[8,9]

Working memory involves short-term memory as well as attention^[10] and varies between individuals.^[11] Having a low or high working memory may affect people in many different ways, affecting their daily life.^[12] Low working memory capacity has been thought to be due to inattention, which can increase difficulty of activities requiring sustained attention such as learning or performing mathematical tasks.^[13,14] Since the past few decades, specific courses have been designed to improve working memory using various techniques with varying levels of success. Among these, mindfulness meditation has gained popularity as a promising avenue for improvement of working memory, probably due to the affordability, ease of learning, and growing evidence of improvement of mental health and cognitive functions.

Quach *et al.*, in 2016, compared the effects of mindfulness meditation versus hatha yoga and a control group on working memory capacity in adolescents.^[15] They concluded that mindfulness meditation significantly improved working memory capacity in adolescents and suggested incorporating it in school settings. Mrazek *et al.*, in 2012, in their study observed that mindfulness reduces mind wandering and improves one's ability to attend to a task without distraction, thus enhancing performance.^[16] Youngs *et al.* showed that even a short-term mindfulness meditation practice could lead to greater increases in visual working memory as compared to controls.^[17] It has also been shown in several studies that mindfulness practices lead to changes in neural pathways. Neurologic changes may affect cognitive functions such as attention and memory. Yamaya *et al.*, in 2021, in a study concluded that focused attention meditation can activate bilateral dorsolateral prefrontal cortex and increase working memory capacity.^[18] Studies have also concluded that mindfulness training can lead to increases in hippocampal volume which may protect against proactive interference and improve working memory.^[19] Working memory requires apt attention and increased awareness. Although several studies have shown positive effects of mindfulness training on memory, most of these studies were based on long duration mindfulness exercises, done under expert supervision or in quiet, serene places. It is not possible for the common man (students inclusive) to dedicate prolonged duration to such training, avail expert guidance always or escape to quiet, and serene places for mindfulness training. Hence, our aim was to study whether similar benefits or if at all some benefit

could be gained from short duration mindfulness meditation done in normal surroundings, that is, whether short duration mindfulness training could improve working memory when done in normal settings and not requiring expert supervision. As students these days are prone to increasing stress from competition and career building and could benefit most from improved working memory, we selected them as our subjects.

Our objective was to investigate the effectiveness of short-term mindfulness meditation on working memory in MBBS students using visual memory test and compare with a control group.

MATERIALS AND METHODS

This observational study was conducted in the Department of Physiology of RVM Institute of Medical Sciences and Research Center, Telangana, from August 2022 to November 2022. The study subjects were 50 students of MBBS (1st year). Students who were not willing to participate in the study were excluded from the study. The Institution Ethical Committee approval was taken for the study. Informed consent was taken from each student before participation. The students were asked to do a series of visual memory tests which included a word recall test, picture recall test, and picture identification test. In word recall, they were shown 15 words of different categories for 3 min and then asked to recollect and write them down in next 2 min. In picture recall, they were shown 20 objects of different categories for 3 min and then recollect and write them down in the next 2 min. In the picture identification, they were shown a video of 13 pictures in 10 s and then asked to choose the correct one from two similar ones. Their baseline scores were checked.

They were then grouped into two groups-each comprising 25 students. The test group students were shown a video clip of 10 min of mindfulness meditation using breath awareness technique. They were asked to do the mindfulness meditation once in presence of an instructor. They were then asked to practice the same every morning without fail before they started their routine work for a period of 8 weeks. The control group was asked to continue with their previous routine. The test group was followed up regularly.

After 8 weeks, a similar series of tests were repeated in both the groups. The mean total memory test score (TMTS) at baseline and after 8 weeks in both the groups were calculated and compared statistically using "student *t*-test."

RESULTS

Mean TMTS at baseline in test group was 32.96 and in control group was 32.76. Mean TMTS after 8 weeks in test group was 35.24 and in control group was 32.96. The difference in TMTS between the test and control groups after 8 weeks

was calculated using unpaired *t*-test. $P < 0.001$ was obtained which was highly significant. The difference between TMTS at baseline and after 8 weeks was also calculated in the meditation group. $P < 0.003$ was highly significant Tables 1 and 2, Figure 1.

DISCUSSION

The study showed after a period of 8 weeks of mindfulness meditation, memory test scores improved significantly in the test group as compared to those who did not practice mindfulness. When compared to their baseline values, also the test group showed significant improvement after only 8 weeks of meditation.

Several studies have shown findings similar and comparable to ours. Youngs *et al.* showed in their study that a single and brief mindfulness meditation intervention can lead to improvements in visual short-term memory capacity.^[17] Similarly, Azunny *et al.*, in a study on athletes, concluded that 4 weeks of daily mindfulness meditation is beneficial for the athletes and improves their attention and working memory.^[20] Mrazek *et al.* also showed that a 2 week mindfulness training exercise is an effective and efficient technique for improving cognitive function as shown by improved working memory and GRE performance.^[16]

However, a few studies differ in their opinion. A study by Quek *et al.*^[21] did not find any evidence that participants in

the mindfulness condition outperform the control condition on working memory tasks. Their results suggest that a single session of mind full practice may not be sufficient to enhance working memory capacity. It may be opined therefore, while a single session of mindfulness training may not be very effective, a short-term course may be very helpful.

A notable positive aspect of our study was that the test group decided to continue with the practice as they felt this gave them a feeling of mental peace and well-being that helped them to face their day-to-day challenges. While these findings can be attributed to a calmer state of mind improving focus, it could partly also be due to the fact that while the test group was motivated to do well, the control group was not as they were doing nothing new. This was one limitation of the study. The second was that the study was on a small group. Further studies in larger population and with some other activity such as reading, engaging in a hobby in the control group to pinpoint to the benefit of mindfulness exercise are needed.

CONCLUSION

Mindfulness is a state of mind characterized by full attention to the present state without reacting to external stimuli.^[1] By practicing mindfulness, we train our minds to concentrate on the present moment, leaving aside our problems, worries, and stresses. This regular practice may improve brain network training which, in turn, results in improvement in working memory. As mindfulness meditation helps us to focus more on a task, we have fewer lapses of attention. The underlying precise physiological mechanisms await discovery though increase in hippocampal volume and activation of dorsolateral prefrontal cortex have been shown to play a role.^[8,9] Our study also showed that by practicing mindfulness meditation, we train our mind to concentrate on the present moment and thus improve our focus and attention. This regular practice may improve brain network training which results in improvement in working memory.

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Table 1: Memory scores after 8 weeks

Group	Memory score after 8 weeks (mean±SD)	P-value
Meditation group	35.24±3.94	<0.001
Control	32.96±9.79	

Table 2: Comparison of memory scores

Group	Memory score AT baseline (mean±SD)	Memory score after 8 weeks (mean±SD)	P-value
Meditation group	32.96±7.54	35.24±3.94	<0.003

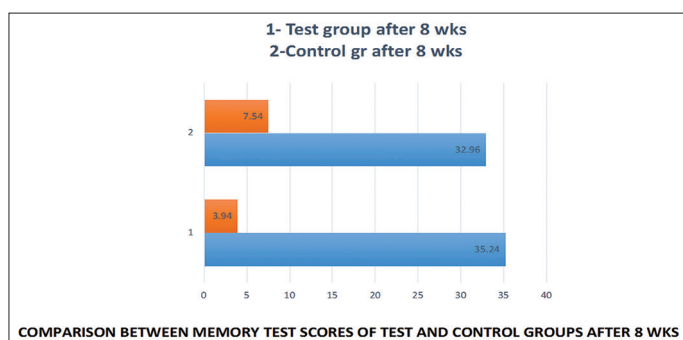


Figure 1: Comparison of memory scores

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