

Abstract

The purpose of practicing mindfulness is to bring deliberate and non-judgmental attention to the present moment. Over the past two decades, mindfulness has become widespread in the Western world and is primarily marketed as a stress reducer and a means to increase well-being. Recently, several studies also indicated that mindfulness can improve cognitive functions including working memory. Working memory is crucial for preserving and manipulating small amounts of information before responding or long-term retention, and it is a strong predictor of academic success in school. In the present study, we examined the effect of mindfulness practice on working memory functions using the n-Back task and oscillatory activity using EEG. This novel approach allowed us better to understand the relationship between mindfulness and cognitive functions. Additionally, we examined the relationship between a mindfulness state measured by the MAAS questionnaire, working memory functions, and oscillatory activity. Fifty participants (16 men and 34 women) were recruited for this research: 25 mindfulness practitioners (at least once a week for at least a year) and 25 non-practitioners. The participant performed a computerized n-back task where they identified whether a stimulus presented was the same as the one presented two steps earlier while their brain waves were recorded at various frequencies and time windows (rest, encoding, retention, pre-retrieval, and retrieval). Our findings revealed that mindfulness practitioners had significantly higher accuracy in the n-Back task, though no differences were found in reaction time between the groups. There was no significant relationship between mindfulness state (MAAS) and n-Back task performance. However, EEG measures showed a significant decrease in gamma wave intensity during encoding and retrieval at the F4 electrode in mindfulness practitioners compared to non-practitioners. Furthermore, a higher state of mindfulness was associated with a decrease in average gamma wave activity in the pre-retrieval time window at the AF4 electrode; the higher the state of mindfulness, the lower the gamma wave activity in the subjects. We interpret the decrease in gamma wave activity through the Neural Efficient Hypothesis, which suggests that individuals with higher intelligence or expertise exhibit lower oscillatory activity, inducing higher efficiency. These findings suggest that mindfulness practice can positively impact working memory, providing a basis for its implementation in education settings. Mindfulness interventions are relatively easy and inexpensive, with no side effects or risk, and they support the brain's flexibility and adaptability, an important message for the education system.