The Effect of Meditation on Learning Performance: A Review

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บทคัดย่อ

การทบทวนวรรณกรรมครั้งนี้มีวัตถุประสงค์เพื่อรวบรวมหลักฐานเชิงประจักษ์เกี่ยวกับผลของการฝึกสมาธิที่มีต่อประสิทธิภาพการเรียนรู้ วิธีการสืบค้นดำเนินการโดยใช้ฐานข้อมูลออนไลน์เพื่อรวบรวมงานวิจัยที่เผยแพร่ตั้งแต่ปี ค.ศ. 2012-2022 ซึ่งพบว่าบทความที่เป็นไปตามเกณฑ์การคัดเลือกมีทั้งหมด 20 บทความ ในการทบทวนนี้ประกอบด้วยการสกัดข้อมูลตามแบบสกัดข้อมูลและการวิเคราะห์บทความด้วยการสังเคราะห์เชิงพรรณนาเพื่ออธิบายวิธีการฝึกสมาธิและผลลัพธ์ที่ได้ในบริบทของการเรียนรู้ ผลการวิจัยพบว่าการฝึกสมาธิด้วยวิธีการต่างๆ ในขณะเรียนส่งผลดีต่อผลสัมฤทธิ์ทางการเรียนและทักษะทางความคิด ในขณะที่ลดความวิตกกังวลและความเครียดของผู้ฝึกสมาธิ การทบทวนวรรณกรรมในครั้งนี้ยังเป็นแนวทางในการออกแบบการฝึกสมาธิเพื่อเพิ่มประสิทธิภาพการเรียนรู้ของผู้เรียนได้

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Abstract

This literature review aimed to compile empirical evidence of the effect of meditation on learning performance. Search strategies were conducted using online databases to identify published studies from 2012 to 2022, which are twenty articles that met the selection criteria. The review consisted of data extraction according to the data extraction form and analysis of articles by narrative synthesis to describe the meditation practice and their results in a learning context. Results revealed that meditation had been expressed as positively impacting learning

achievement and cognitive skills while reducing anxiety and stress among those who practice. Moreover, the investigation guides further research in designing meditation practices to enhance the learning performance of learners.

Keywords: Meditation, Mindfulness, Learning Performance

Introduction

The practice of meditation predates human civilization and has deep roots in the illustrious Vedic mythology. The main goal is to establish a connection with your deep self-inner. The practice was developed in the Vedic era and is used in Ayurveda, the traditional Indian healthcare system. For centuries, meditation has been used to enhance one's physical, psychological, emotional, and mental health and improve performance (both academically and professionally). Meditation is also connected to mindfulness, a modern secular adaptation of conventional meditation techniques designed to enhance cognitive skills. Today, meditation is practiced worldwide, and its popularity has increased significantly over the past two to three decades, primarily due to the collapse of work-life balance and work-related stress in recent years. According to a recent National Health Interview Survey (NHIS) study from 2017, more Americans now practice meditation than ever before, 14.2 percent in 2017 compared to just 4.1 percent in 2012.

The advantages of meditation, especially mindfulness-based practices, have been accumulating quickly in academic literature, showing the beneficial effect. Fiebert and Mead (1981) found that meditation had a long-term, noticeable impact on exam results. In the study, students who practiced meditation before studying and exams performed better than those who did not. According to Pryjmachuk and Richards (2007), about one-third of nursing students (N = 973) reported experiencing stress levels that led to depression, anxiety, and other behavioral health issues, particularly in those who had young families and were under financial strain. Mata (2012) incorporated a 5–7 minute meditation in an early childhood education course for

undergraduate students. The findings suggested that meditation can help students become more at ease, centered, and capable of paying attention, focusing, and thinking clearly. Kok et al. (2013) investigated the relationship between meditation and health. As a result, it was found that new approaches are needed to produce mental states that last long enough and impact the body to improve physical health.

However, several studies are interested in studying the effects of meditation on specific outcomes. As a consequence, the objective of the current review is to examine the effects of meditation practice that contribute to their results in the learning context and which have not previously appeared in the open literature.

Research Methodology

This literary review is a literature review to answer a specific research question: What are the effects of meditation in a learning environment? Papers for inclusion in the review were limited to publication between 2012 and 2022 in English on the Scopus database. The last search was conducted in August 2022. A total of 20 studies were identified for inclusion in the review. A data extraction table was developed to collect information relevant to the review. All data were collated and manually synthesized. Information extracted from each included a study of sample characteristics (sample size, mean age, gender, and researched location), independent & dependent variables, and study design & measurement.

Result and Discussion

It has been discovered, via the accumulation of data on meditation from many studies carried out in recent times, that persons who meditate reap benefits in a variety of domains, all of which will be explored in this part.

Impact on academic performance

Uopasai et al. (2022) investigated the effects of meditation on metacognitive ability, memory performance, study proficiency, and stress levels of undergraduate students. They were divided into experimental and control groups of 30 people each, with an equal number of men and women in each group. The experimental group they were assigned to meditate (breathing meditation training) for 3 hours a week for 15 weeks. Both groups were evaluated with a pretest and a posttest at the beginning and end of the 15 weeks. The Metacognitive Awareness Inventory (MAI), Thai Working Memory Computerized Battery Test (TWMBT), and Suan Prung Stress Test-20 (SPST-20) were the three instruments used in this study. From the initial data collection of the experimental and control groups, the stress scores were 46.10 ± 14.43 and 50.50 ± 9.25, respectively, which is considered a high-stress level. When considering the data after the intervention, the stress score of the experimental group decreased to 37.13 ± 13.56, while the control group's stress score remained high at 45.57 ± 16.31. It can be conducted that meditation has been found to improve abilities such as memory performance and study proficiency.

Psychological and health problems among first-year university students were also found in the research of Sarangm et al. (2020). In this study, 60 first-year nursing students received mindfulness meditation instruction. Mindfulness meditation has been shown in studies to improve health, and mind control, reduce suffering, and increase educational efficiency in first-year nursing students.

Zeilhofer (2020) examined the impact of mindfulness on language learners (German). The experiment was divided into three classrooms, with the first two receiving different meditation methods (The count-to-ten method and the guided meditation approach) and the third acting as a control group. In light of the information collected, it can be concluded that students who practiced meditation increased their academic achievement and awareness significantly. Furthermore, it instills in students a positive attitude toward Dharma practice.

To question whether mindfulness meditation can improve academic performance, Lin and Mai (2018) conducted a study. The samples in this study were randomly divided into experimental

and control groups, whereby the experimental group was the group that received mindfulness meditation training. For three months, the experimental group practiced 12-week meditation for two hours per week before each teaching. According to studies, students with a greater depth of meditation outperform those with a lower depth of meditation in terms of academic success.

STEM student dropout rates are currently high, which is a huge problem. Rao (2017) has used cinematic meditation to increase educational effectiveness, increase interest in learning material, and predict educational outcomes. Following the completion of the film, students will be given exercises to complete. Students will automatically pay attention to the movie as a result of this. According to the findings of the study, the quality of the articles from the exercises (the number of words of the article) was related to the study results. Furthermore, students who did not complete the exercises tended to receive lower grades.

In a similar study, Rao (2020) has presented a method for increasing engineering students' important skills, which include consciousness and communication, using cinematic meditations and online books as tools. It was unearthed that using both tools had a positive effect on students, such as encouraging students to express themselves more (class discussion) and increasing motivation. This includes assisting students in better understanding the content of their studies.

Impact on cognitive skill

Saoji et al. (2017) investigated the effectiveness of yogic meditation employing the mind sound resonance technique (MSRT) on the cognitive performance of medical students. There was also a supine rest (SR) for the participants to train, with all participants being half-randomized to train either the MSRT or the SR. The cognitive performance of the trained students was measured using the paper-pencil approach. According to the findings of the research, MSRT was successful in enhancing the cognitive abilities of medical students.

Despite the overwhelming evidence that mindfulness meditation has a favorable impact, Ching et al. (2015) reported that there are few studies on the effect of mindfulness meditation

on Asian students. In this study, the researcher developed an 18-week mindfulness meditation course for students who practiced the technique. A total of 359 students participated in this study, 204 were assigned to the experimental group and 155 were assigned to the control group. The students participating in this training are from Taiwanese university. This research revealed that this meditation course may improve students' performance in a variety of ways, including enhancing memory, and cognitive function. Additionally, it helps alleviate tension and mental wandering.

Spadaro and Hunker (2016) looked into the impact of online mindfulness meditation on nursing students' stress, mood, and cognition. In practicing mindfulness meditation, this consists of mindful eating, body scan, mindful breathing, sitting meditation, walking meditation, mindful movement through hatha yoga, guided meditations, and loving kindness meditation, which the researchers referred to as "online asynchronous mindfulness meditation". Participants in this meditation practice received 8 weeks of training and 16 weeks of follow-up. A study of 26 nursing students revealed that mindfulness meditation helped them enhance their cognitive capacities.

Klatt et al. (2013) investigated the effectiveness of a mindfulness-based intervention for at-risk kids in terms of both stress reduction and behavioral development. Students participate in Appreciative Inquiry (AI) exercises, in which they write narratives and create visual art as part of this mindfulness practice, which also includes mindfulness meditation and yoga combined with breathing exercises. According to the findings of the research, mindfulness-based interventions are shown to be successful to the point where they may be used with students. In addition, statistical values indicate a considerable shift in the development of cognitive skills.

Implications for levels of stress and anxiety

Virtual reality technology has progressed significantly in recent years. Rakowski et al. (2021) studied the use of virtual reality in meditation training. Inside this study, 61 business students, 26 men and 35 women, were chosen to participate in meditation training. In total, 31 students received virtual reality meditation training, while 30 received video meditation training. The outcomes of both groups were compared. In accordance with the study, the majority of students

in both groups, particularly those in the virtual reality group, reported that this type of meditation practice benefitted greatly them. It can be concluded that using virtual reality to practice meditation had a significant impact on students' exam anxiety reduction.

It was because the majority of students studying in the healthcare field have severe psychological issues. To help alleviate psychological problems, Noble et al. (2019) proposed a guideline for practicing mindfulness for medical and doctoral nursing students. The sample for this study included four medical students and six doctoral nursing students. In mindfulness training, this research will involve students participating in five mindfulness training sessions per week of 30 minutes each, as well as an additional 15-minute meditation session. Mindfulness practice has been shown in studies to have a major beneficial impact on the ability to cope with stress, attention, and resilience. It also has a positive effect on the mental state of these students who are under a lot of pressure.

Moreover, Foley and Rangeley (2021) studied the effect of mindfulness meditation on stress levels in student registered nurse anesthetists. A smartphone application was used to train student registered nurse anesthetists in mindfulness meditation for this study. According to the findings of this study, practicing mindfulness meditation can help reduce stress levels from work. Moreover, the study found that more than half of those who practiced used mindfulness meditation throughout their careers.

Morgan and Katz (2021) focused on the impact of mindfulness meditation on educators' anxiety scores in a classroom of foreign languages. The participants were separated into 76 experimental and 66 control groups throughout this study. According to the authors of this article, practicing mindfulness meditation can increase the level of mindfulness as measured by the FMI. Participants also said mindfulness meditation was effective for a limited time. Besides that, mindfulness meditation has been found to benefit those who are most anxious.

Relocating from school to university is one of the most significant changes in adolescence. This change in environment caused first-year students to be concerned about various issues. Aree et al. (2020) collected mental health data from 44 first-year students at Thammasat

University's Faculty of Engineering, Department of Electrical and Computer Engineering, and proposed guidelines for practicing mindfulness meditation for these students. The method of practicing mindfulness meditation proposed by the research team focuses on concentrating on meditation using paper, pen, and pencil. Likewise, researchers have revealed that this meditative practice inherently eliminates anxiety. The results of the survey were found to be positive after the students practiced.

Schwind et al. (2017) investigated the effects of mindfulness training on students who had received it. Over eight weeks, students receive a 5-minute mindfulness practice before and after class. Furthermore, students who received mindfulness training practiced additional mindful breathing exercises at home for 5-15 minutes, 4-5 times per week. The results of the students' mindfulness practice revealed that mindfulness practice assisted them in becoming calmer and reducing anxiety.

According to the study of Uopasai et al. (2022), and Spadaro and Hunker (2016), the findings revealed that it also had an impact on lowering stress.

Impact on other Learning outcomes

The effect of mindfulness meditation on the following factors: mindfulness, mindful consumption behavior, and life satisfaction, was studied in a study by Gupta and Verma (2020). The research was divided into two sections. The first section investigated whether students who regularly practiced meditation were highly conscious. The second section is to create an experiment with treatment and control groups that uses difference-in-difference. Based on their results, they reported that mindfulness meditation had significant positive effects on mindful consumption behavior and life satisfaction. They also said that short-term meditation practices also had a pleasing effect on being in the classroom. Over two months, they confirmed that those who received this mindfulness meditation practice significantly increased life satisfaction.

Riet et al. (2015) invited students to participate in a stress management and mindfulness program. By engaging in this activity, students were expected to experience less stress and become more productive in their academic goals. The students that took part in this activity for

a period of seven weeks were either nursing students or midwifery students. In the end, it was discovered that ten pupils had completed this task, and the data from these ten individuals were used to analyze the outcomes. Participation in this exercise benefitted the students in terms of their quality of sleep, their ability to concentrate, the degree to which they were receptive to new ideas, and the amount of negative material to which they were exposed.

Because of the many benefits of meditation, researchers have applied it to help improve family relationships; Pandya (2020) described the impact of an intergenerational teaching-learning program (ITLP), which involves grandparents and grandchildren learning together. The grandparents will teach their grandchildren to meditate after they have received meditation from the grandparents. Later, grandchildren taught grandparents how to use smartphones. In this program, 172 subjects were randomly assigned and divided into experimental and control groups. According to the participants in this study, female grandparents were better able to teach meditation. Simultaneously, male grandparents can learn to use smartphones effectively. On the other hand, gender differences in offspring had no significant effect on meditation learning. It was also discovered that widowed grandparents did better on ITLP. Nonetheless, the study has some data gaps, such as male grandparents with children, upper-class people, currently married grandparents, and grandparents living separately with the grandchild.

In children, executive functioning skills play a paramount role in their social, emotional, and academic adaptability. Koncz et al. (2021) investigated the effects of mindfulness meditation on executive skills. The study included 61 primary school children, 31 in the intervention group and 30 in the control group, with 65.6% and 61.3% of boys in each group, respectively. The intervention group was trained in mindfulness meditation. Premised on the study's statistical data, it can be concluded that mindfulness can help children adapt well to school and develop executive functioning skills.

From studying and collecting data related to the effect of meditation training, the statistical data of various studies can be found in Table 1.

Table 1. Summary of included studies within the review.

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
1.Uopasai et al. (2022)	**Independent variables:** 15 minutes/time based on Buddhist Anapanasati Meditation **Dependent variables:** 1.Metacognitive ability 2. Working memory ability 3.Academic achievement 4. Stress levels	**N:** Experimental group = 30, (F: 15, M:15) Control group = 30, (F:15, M:15) **Learning:** Undergraduate students in a public university **Country:** Thailand **Age:** 19-22	**Design:** A quasi-experimental pretest and posttest research design **Measurement:** 1. Metacognitive Awareness Inventory (MAI) 2. Thai Working Memory Computerize Battery Test (TWMBT) 3. Suan Prung Stress Test-20 (SPST-20).	1. The experimental group seemed to possess higher metacognitive ability compared to the control group after the intervention (T^2 = 4.18; $F_{(8, 51)}$ = 26.68; p <0.01, η^2 = 0.81). 2. The experimental group exhibited greater accuracy of working memory ability on the TWMBT compared to the control group (T^2 = 1.31; $F_{(7, 52)}$ = 9.76; p <.01, Partial Eta Squared = .57). 3. The average academic achievement of the experimental group improved significantly (3.27 ± 0.33) and was higher than the control group (2.86 ± 0.51). 4. The stress levels of the experimental group were successfully reduced from a high to moderate level (37.13 ± 13.56) while the control group remained at a high-stress level (45.57 ±1 6.31) with only a mild change.
2.Pandya (2020)	**Independent variables:** 30 min comprised guided meditation 1.Prayer or sitting silence 2.Instanct relaxation technique (IRT) 3.Tree posture & centering in Tree posture 4.Deep breathing and focusing on flow of breathing and rhythm 5. Deep relaxation technique (DRT)	**N:** Intervention groups (IN1 = 86, IN2 = 78) Control groups (CN1 = 86, CN2 = 72) **Learning:** An intergenerational teaching-learning program (ITLP) **Country:** Mumbai and Kathmandu, India	**Design:** The intervention and control group **Measurement:** 1. Grandparents' scores on Lubben Social 2. Network Scale-6 (LSNS-6) and grandchildren's scores on Revised 3. Adult Attachment Scale (RAAS)	1.T2 LSNS-6 scores of the intervention group grandparents were higher than the control group (mean difference = 7.43, p= .02, d= 0.49) and their own T1 scores (mean difference = 9.14, p= .01, d= 0.56). 2. T2 RAAS scores of the intervention group grandchildren were lower than the control group (mean difference = −16.18, p= .01, d= 0.49) and their own T1 scores (mean difference = −16.63, p= .01, d= 0.53). 3. ITLP impact was moderately high (Cohen's d range = 0.49–0.56, p≤.01) and T2 performance was better for grandmother-grandchild dyads, middle class, widowed grandparents and cohabiting dyads.

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
	Dependent variables: 1.Social engagements for grandparents 2. Attachment security for their young adult grandchildren.			
3.Koncz et al. (2021)	**Independent variables:** A six-session-long, story-based mindfulness training **Dependent variables:** 1.Academic performance 2. Social–emotional wellbeing.	**N:** Intervention group =31 (F:11, M:20) Control group = 30 (F:12, M:18) **Learning:** First graders from four classes of a state primary school **Country:** Budapest, Hungary **Age:** Mage = 84.95 months, SD = 5.21	**Design:** A randomized pilot study with a "between-subjects" design. **Measurement:** 1. A computerised version of the Corsi block tapping test 2. A Go/No-Go task 3. The hearts and flowers task 4. Cortisol concentrations	No effect was found on morning salivary cortisol levels, but the working memory capacities of girls significantly improved as a result of the intervention (F (1,9) = 7.86, p = 0.021, η^2 = 0.467).
4.Rakowski et al. (2021)	**Independent variables:** 1. Virtual reality and meditation 2. Video-based meditation **Dependent variables:** Exam performance	**N:** VR group =31 Video group =30 (Total: F:26, M:35) **Learning:** European-based, university business students **Country:** Poland **Age:** Mage = 20.89	**Design:** Empirical, quantitative, between-subject study **Measurement:** A follow-up survey	1. T-test analysis showed virtual reality meditation to be significantly more beneficial than video meditation. 2. Students reported that meditation techniques delivered using either medium are helpful in decreasing their pre-exam anxiety.
5.Foley and Lanzillotta-	**Independent variables:**	**N:** 71 **Learning:** SRNAs	**Design:** Intervention **Measurement:**	Significant reductions (P<.01) in depression (Z=−3.36), anxiety (Z=−3.07), and stress (Z=−3.46)

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
Rangeley (2021)	10-day Mindfulness meditation (Headspace - smart devices and online platform) **Dependent variables:** 1.Stress 2. Depression 3. Anxiety	enrolled in the DNP Nurse Anesthesia Program.	1. pre-and post-intervention surveys 2. The Depression Anxiety Stress Scales 21-item (DASS-21) questionnaire 3. Wilcoxon signed rank test	scores, representing reductions of 32%, 32%, and 47%.
6.Morgan and Katz (2021)	**Independent variables:** Mindfulness meditation (MM) **Dependent variables:** Foreign language classroom anxiety (FLCA).	**N:** Experimental group =76 Control group =66 (Total, M: 35, F: 106) **Learning:** Southeastern university enrolled in an intensive review, university-level Spanish course. **Age:** Mage = 18.51, SD = 0.80	**Design:** Experimental group and control group **Measurement:** 1. Freiburg Mindfulness Inventory 2. The Foreign Language Classroom Anxiety Scale (FLCAS). 3. The Mindfulness Experience Questionnaire (MEQ)	Mixed findings between groups after a 13-week series of MMs. Experimental participants gave strongly positive opinions toward the MM in their open-ended responses to their experience.
7.Aree et al. (2020)	**Independent variables:** Vipassana or Insight Meditation **Dependent variables:** Anxiety during transition from high school to college.	**N:** 44 **Learning:** First-year students at Department of Electrical and Computer Engineering **Country:** Thammasat University, Thailand	**Design:** Intervention **Measurement:** Mental mental health “Mind Mood”	1. Higher knowledge and skill after training (average score= 3.66, SD=0.987) compared to Knowledge and skill before training (average score= 2.95, SD=0.888) 2. Decrease in anxiety and depression after mindfulness meditation (average score= 3.70, SD=0.978)

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
8.Sarangm et al. (2020)	**Independent variables:** Mindful meditation **Dependent variables:** 1. Stress 2. Improves health 3.Academic performance	**N:** 60 (M: 22, F: 38) **Learning:** First year B.Sc. Nursing students in selected colleges of Pune city.	**Design:** Pre-experimental study, descriptive and inferential statistics. **Measurement:** 20 closed ended questions related to mindful meditation on Health and academic adjustment	1.There is an improvement in the health aspect after the education on Mindful meditation. In Post-test very few samples 6 (10%) having adequate health adjustment and 54 (90%) participants are having reasonably adequate health adjustment. 2. There is an improvement in the academic aspect after the education regarding the mindful meditation. Post-test 16 (26.67%) participants have adequate academic adjustment and most of them 44 (73.33%) are having reasonably adequate academic adjustment.
9.Gupta and Verma (2020)	**Independent variables:** 1.Short meditation Sessions 2. Mindfulness **Dependent variables:** 1.Mindful Consumption 2.Life Satisfaction.	**N:** 94 (F: 41%, M: 59%) **Learning:** higher education (post-graduate studies in management) in an Indian institution **Country:** Indian	**Measurement:** 1. Mindful Attention Awareness Scale (MAAS) 2. Mindful consumption behavior scale (MCBS) 3. The Satisfaction with Life Scale (SWLS)	Group comparisons indicated that mean scores of “meditation” condition (mindfulness: M = 4.60, SD = 0.54; mindful consumption behavior: M = 4.59, SD = 0.50; life satisfaction: M = 4.40, SD = 0.79) were significantly different from mean scores of “no meditation” condition (mindfulness: M = 3.89, SD = 0.73; mindful consumption behavior: M = 4.21, SD = 0.48; life satisfaction: M = 4.03, SD = 0.68).
10.Rao (2020)	**Independent variables:** 1.Cinematic mediation 2. Interactive online books **Dependent variables:** 1.Student behavior (timeliness) 2.Student performance	**N:** 86 (F:21, M:65) **Learning:** Digital Systems Design” course required for engineering	**Design:** Quantitative data **Measurement:** 1. Interventions (cinematic meditation and online books) 2. The mean Week 8 cumulative score	1. The mean score for those who submitted the essay was 74.4% and for those who did not submit the essay was 66% 2. Out of the students who submitted the essay, 29% of these received a poor Week 8 cumulative grade. For the students who did not submit the essay, 37.5% received poor Week 8 cumulative grades. For the entire set of students, 33% received poor Week 8 cumulative grades. 3. A timeliness measure, obtainable as early as within 5 weeks of the semester, is correlated ($r = 0.4$, $p < 0.001$) with a cumulative score computed at the midpoint of the semester.

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
11.Zeilhofer (2020)	**Independent variables:** Open monitoring meditation (OMM) approaches (Guided meditation and the count-to-ten method) **Dependent variables:** 1.Academic achievement 2.Awareness	**N:** 75 **Learning:** Three classes at Kyushu University, a national university **Country:** Japan	**Design:** A quasi-experimental classroom research design **Measurement:** 1. Tests to measure academic performance 2. Five facets of the mindfulness questionnaire (FFMQ). 3. Five spheres of meditation experience survey (FSMES).	1. For the effect of test × time, there was also a significant difference ($F (5, 365) = 2.72$, $p = .05$, $\eta p^2 = .036$), meaning that there is evidence that meditation had a significant effect on academic achievement over the period of one year. 2. An examination of the difference between the two methods of meditation was also performed, but there was no significant difference. 3. The post-test, the meditation-group scored significantly higher than the non-meditation group ($t (75) = 3.2$, $p = .002$).
12.Noble et al. (2019)	**Independent variables:** 15-min. meditation exercise **Dependent variables:** 1.Holistic wellbeing 2. Mood 3.Focus 4. Resilience.	**N:** Medical students =4 PhD nursing students =6 **Learning:** medical and PhD nursing students	**Design:** Qualitative experiences intervention group **Measurement:** 1. MAAS and BRS scores 2. Mann - Whitney U nonparametric testing.	1. MAAS scores improved from a median of 2.5 to 3.73 (P=0.04), with a corresponding increase in median BRS scores from 18.5 to 22.0 (P=0.02). 2. For both mindfulness and resilience, there was thus a statistically significant improvement in score metrics, signifying improvements in being able to cope with stress, accompanied by an enhanced awareness and attention to what is taking place in the present. respect to cognitive mindfulness scores (P=0.02) and resilience (P=0.04).
13.Lin and Mai (2018)	**Independent variables:** A basic sitting meditation **Dependent variables:** 1.Short- term academic performance	**N:** Experimental group = 42 Control group = 35 **Learning:** First-year university students' computer science course called "Database Theory and Application"	**Design:** The experimental group / the control group **Measurement:** 1. Formative assessment	1. The score means of FA 6, 7 and 8 of the experimental group are significantly higher than those of the control group ($t=-4.62$, $p<0.5$), ($t=-4.51$, $p<0.5$), and ($t=-2.58$, $p<0.5$). 2. Repeated tests and quizzes consistently showed that the MM intervention significantly improved FA performance. 3. Comparison of summative assessment Mean scores on the two SAs did not significantly differ between the experimental group and the control group. These two identical results unveil that the

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
	2.Long-term academic performance		9, 11, 12, 13, 10, 12, 14 and 13 multiple-choice questions. 2. Summative assessment 40 and 33 multiple-choice questions. 3. A modified version of the 'Cognitive and Affective mindfulness Scale-Revised (CAMS-R)' 4. Questionnaire to understand student satisfaction.	experiment and control groups do not differ significantly on SA. 4. Questionnaire to understand student satisfaction within the experimental group the questionnaire results for SA #1 and #2 were very similar, revealing positive feedback for all the evaluated aspects.
14.Rao (2017)	**Independent variables:** Cinematic Meditation **Dependent variables:** Midterm grade	**N:** 43 **Learning:** Digital Systems Design of Fairleigh Dickinson University **Country:** USA	**Design:** Intervention **Measurement:** The midterm scores are measured on a scale of 0 to 100%	Pearson's correlation coefficient between the word count of students who submitted the extra-credit assignment, and their midterm scores was 0.4, p-value = 0.022. This indicates a significant moderate correlation.
15.Schwind et al. (2017)	**Independent variables:** 5-min mindful breathing practice **Dependent variables:** 1.Anxiety 2.Stress 3.Sense of a wellbeing 4. Capacity for compassion	**N:** 52 **Learning:** Community services faculty of an urban university	**Design:** A qualitative exploratory pilot study **Measurement:** Individual and group feedback	1. After taking part in the meditation practice, the students reported having a greater sense of calm and a lower level of anxiousness. 2. Their instructors also remarked that the short mindful breathing technique that was done at the beginning of class helped students become more rooted and concentrated before beginning to engage with the material that was being covered in the lesson. 3. Challenges discovered centered on the need to educate students and participating instructors with more in-depth knowledge on mindfulness since it relates to higher education teaching-learning environments.

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
16.Saoji et al. (2017)	**Independent variables:** 1.Yogic meditation technique 2.Mind sound resonance technique (MSRT) **Dependent variables:** Cognitive function	**N:** 42 (F:37, M:5) **Learning:** medical college **Country:** South India **Age:** Mage = 19.44 ± 1.31	**Design:** Randomized Crossover Trial **Measurement:** 1. Digit Letter Substitution Test (DLST) 2. Six-Letter Cancelation Task (SLCT)	1. Both the groups showed significant improvement in net attempt of both DLST and SLCT, but the magnitude of change was more in the MSRT group than in the SR group. 2. The MSRT group demonstrated significantly enhanced net scores in both SLCT ($p<0.001$) and DLST ($p<0.001$).
17.Spadaro and Hunker (2016)	**Independent variables:** Online mindfulness meditation based on the Mindfulness-Based Stress Reduction (MBSR) Program **Dependent variables:** 1.Stress 2.Mood 3.Cognition.	**N:** 26 **Learning:** Nursing programs of a middle-sized university **Country:** mid-Atlantic, USA	**Design:** A 24-week descriptive study. **Measurement:** 1.Perceived Stress Scale (PSS) 2.Hospital Anxiety and Depression Scale (HADS) 3. Attention Network Test (ANT).	1. Stress was significantly reduced ($F(2,24) = 4.163$, $p=.019$). 2. A decreasing trend for anxiety was noted with significant difference between time points ($F(1,23) = 6.889$, $p=.015$) when practice frequency was weekly to daily. 3. Cognition: ability to shift attention, attention selection, concentration, and accuracy improved.
18.Ching et al. (2015)	**Independent variables:** Formal meditation practices such as mindful breathing, body scan, and eating and walking meditation	**N:** Intervention group =152 Control group =130 (Total F:172, M:110) **Learning:** 12 classes of mindfulness meditation and 12 classes of physical exercise **Country:** Taiwan	**Design:** A quasi-experimental pre/posttest design **Measurement:** 1. The College Learning Effectiveness Inventory (CLEI) 2. A set of computer cognitive tasks (attention and working memory)	1. The score of the full CLEI scale was significantly higher in the intervention group compared with the control ($P = 0.022$). 2. For the computer cognitive tasks, the intervention group exhibited significantly better performance in the accuracy of the digital vigilance task ($P = 0.048$), choice reaction time ($P = 0.004$), spatial working memory ($P = 0.042$), and digital vigilance task reaction time ($P = 0.004$).

Authors (Year)	Parameters	Participants	Study design & Study instruments	Results
	Dependent variables: Learning and Cognitive Performance	**Age:** 18-19		
19.Van der Riet et al. (2015)	**Independent variables:** Sitting mindfulness practices **Dependent variables:** Health stress levels.	**N:** 10 **Learning:** first-year cohort of undergraduate nursing and midwifery students. **Country:** Australia	**Design:** A descriptive qualitative design Interview **Measurement:** The focus group interview	1. Results indicated a positive impact on sleep, concentration, clarity of thought and a reduction in negative cognitions. 2. Participants also identified challenges related to timetabling, program structure and venue.
20.Klatt et al. (2013)	**Independent variables:** 1. Mindfulness meditation 2. Yoga movement with breathing exercises 3. Appreciative Inquiry (AI) **Dependent variables:** Behavior in at-risk elementary students.	**N:** 41 (F:25, M:16) **Learning:** Third grade classrooms in a public school **Country:** large Midwestern US city, USA. **Age:** Mage = 8.54, SD = 0.55	**Design:** A pretest to posttest single group design. Feasibility study **Measurement:** 1. MIL was evaluated via semi-structured teacher interviews 2. the Conners' Behavior Rating Scale.	Pre/post intervention showed significant improvement in behaviors, such as hyperactivity ($t[1,39 = 3.1; p = 0.002$), and highly significant differences in the attention-deficit/hyperactivity disorder index ($t [1,39] = 5.42; p < 0.001$) and cognitive/inattentiveness ($t[1,39] = 5.56; p < 0.001$) subscales.

Conclusion

Meditation has been found to have a positive impact on learning efficiency. There are several ways in which meditation can improve learning efficiency. Many researchers have varied ways of meditating, such as sitting meditation, walking meditation, breathing exercises, mindfulness, and yoga, in addition to other activities like watching movies and reading articles, based on the literature review findings connected to the practice of meditation. It was observed that practicing these different kinds of meditation had a favorable impact on people who practiced meditation in several ways, which included the following: It was connected with scholastic achievement, relief from stress and anxiety, and the development of cognitive skills. Moreover, it had a beneficial effect on other areas, including executive functioning skills, metacognitive, behavioral, and attitudinal domains. The effect of meditation on learning efficiency can be explained as follows:

1. Meditation has been shown to enhance focus and attention, which can help individuals better concentrate on tasks and information they are trying to learn.
2. Meditation has been demonstrated to lower stress and anxiety, which can obstruct the processes of learning and memory.
3. Research suggests that regular meditation can increase working memory capacity, which can help individuals retain and manipulate information more efficiently.
4. Meditation has been linked to improved cognitive flexibility, which refers to the ability to switch between different tasks or perspectives. This may be especially useful in learning contexts when a variety of knowledge or abilities need to be acquired.
5. Finally, studies suggest that regular meditation can enhance neural plasticity, which refers to the brain's ability to change and adapt in response to new experiences. This can help individuals learn new skills more quickly and efficiently.

Our findings are susceptible to significant limitations, which point to future research areas. For example, future studies could study the effects seen in the meditation training group and look into expanding current ideas on metacognition, stress, working memory and etc. They should also

investigate other aspects of meditation training, such as whether focusing on the breath or compassion practices influences the outcomes.

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