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# Enhancing Student Well-Being: A Meta-Analysis of Mindfulness Interventions

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**ABSTRACT:**
Background: Mindfulness, emotion regulation, and happiness are integral facets of psychological well-being, mutually shaping mental health and overall life satisfaction.
Objective: This meta-analysis seeks to evaluate the impact of Mindfulness-Based Interventions (MBIs) on the comprehensive well-being of students, drawing insights from randomized controlled trials.
Design: Meta-analysis of randomized controlled trials.
Methods: A comprehensive search was conducted across prominent databases, including PubMed, Google Scholar, and Web of Science, spanning data up to August 2023. The collected data was analyzed using Review Manager Software 5.3.
Results: The analysis encompassed ten randomized controlled trials involving 813 students. The findings indicated that mindfulness interventions were effective in mitigating depression, anxiety, and stress levels among students. Specific interventions, notably the Mindfulness-Based Virtual Community (MVC) program, low-dose mindfulness-based training, and Mindfulness-Based Student Programs (MBSP), demonstrated notable efficacy.
Conclusion: This meta-analysis highlights the promising role of mindfulness interventions in bolstering mental well-being, reducing stress, enhancing emotional resilience, and fostering academic persistence among university students. These results underscore the significance of integrating mindfulness interventions within educational and mental health support systems, contributing to the advancement of a healthier and more content society.

**KEYWORDS:** Mindfulness, Happiness, Emotion Regulation, Meta-analysis, Students.

## Introduction

Mindfulness, emotion regulation, and happiness are integral components of psychological well-being, intricately intertwined and profoundly impacting mental health and overall life satisfaction. Mindfulness involves non-judgmental attention to the present moment, fostering awareness of one's thoughts and emotions. Emotion regulation, crucial for mental health, influences the intensity and expression of emotions, encompassing strategies such as reappraisal and suppression. Happiness, extending beyond positive emotions, embodies a sense of purpose and contentment, influencing physical health and resilience.

Understanding the relationship between mindfulness, emotion regulation, and happiness is pivotal, contributing to holistic well-being and informing therapeutic interventions. Research suggests a positive correlation between mindfulness and happiness, yet comprehending this relationship in detail is essential. This study aims to evaluate the effect size of the relationship between mindfulness and happiness, considering emotion regulation as a mediator or moderator, furthering our understanding of enhancing psychological well-being.

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*Strength of the Relationship:*
The strength of the link between mindfulness and happiness can vary, with some studies indicating a moderately strong positive correlation. For instance, Killingsworth and Gilbert (2010) associated mindfulness meditation with reduced mind-wandering and increased happiness. Factors like the depth of mindfulness practice and individual differences influence this relationship. Notably, research has demonstrated that mindfulness practices alleviate stress and improve overall well-being. Goyal et al. (2016) found moderate evidence supporting the efficacy of mindfulness meditation in enhancing anxiety, depression, and pain.

*Direction of the Relationship:*
The relationship between mindfulness and happiness is bidirectional, wherein mindfulness promotes well-being, and heightened well-being fosters engagement in mindfulness practices. Jislin-Goldberg (2016) proposed a model highlighting this bidirectional association, suggesting that mindfulness enhances well-being, and individuals with higher well-being are more likely to practice mindfulness. Mindfulness practices facilitate stress reduction, improved emotional regulation, and increased positive emotions, contributing to greater happiness. Similarly, Keng et al. (2011) found that mindfulness meditation correlated with increased positive affect and reduced negative affect. However, individual differences and contextual factors can influence this relationship.
This nuanced understanding of the interplay between mindfulness and happiness is crucial for developing targeted interventions to promote well-being and mental health. By elucidating the dynamic relationship between these constructs, we can inform individuals, therapists, and policymakers, contributing to a healthier and happier society.

## Objective
To study the effect of Mindfulness-Based Interventions (MBIs) on the overall improvement in well-being among students, based on evidence from randomized controlled trials.

## Methods
### Eligibility Criteria
Inclusion Criteria:
The articles considered in this meta-analysis are exclusively published research papers, thereby not involving any ethical concerns. The inclusion criteria encompassed the following parameters: (1) Population (P): Students from both school and college settings; (2) Intervention (I): Studies focusing on mindfulness-based interventions, such as mindfulness meditation, mindfulness cognitive training, MBSR, MBCT, among others; (3) Outcome (O): Well-being, depression, anxiety, stress, or mindfulness levels of the students served as outcome measures, without necessitating the specification of a particular measurement tool for these identified outcomes; (4) Study Design: Only randomized controlled trials were considered; (5) Language: Only studies published in the English language were included.

*Exclusion Criteria:*
Studies were excluded if they met any of the following criteria: (1) Participants belonged to non-student populations; (2) Studies were duplicates; (3) Full-text versions were unavailable; (4) Study data was incomplete or deemed unsuitable for the purpose of meta-analysis; (5) Studies involved interventions other than mindfulness-based interventions.

### Information Sources
We searched the following databases:
Google Scholar
PubMed
Scopus

### Search Strategy

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The current meta-analysis adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, following the framework established by the University of Guelph-Humber (2021). To ensure a comprehensive approach, the research team conducted a thorough search across various databases, including PubMed, Google Scholar, and Web of Science. The search terms used were as follows: ("Mindfulness" or "Meditation" or "mindfulness" or "meditation" or "mindfulness-based intervention" or "MBSR" or "mindfulness-based stress reduction" or "mindfulness-based cognitive therapy") and ("students" or "college students" or "school students") and ("randomized controlled trial" or "randomized" or "randomly" or "trial" or "groups").
Following the comprehensive literature retrieval, the research team meticulously reviewed and analyzed the titles and abstracts of identified articles, excluding those that were not relevant to the scope of this meta-analysis. Subsequently, full texts of the remaining articles were meticulously examined to ensure their alignment with the inclusion criteria. Furthermore, to enhance the comprehensiveness of the search, the research team thoroughly scrutinized the reference lists of pertinent reviews, meta-analyses, and systematic reviews. Articles that met the predefined inclusion criteria were selected for further examination and analysis in this meta-analysis.

### Selection Process

The primary author conducted data extraction independently, following a predetermined Excel table format. The extracted information encompassed details such as author name, publication year, country of origin, research design, sample size for both the experimental and control groups, participant characteristics, intervention type, duration in weeks, and outcome measures using specific scales. Any discrepancies were resolved through consultation with a third researcher, ensuring accuracy and consistency.

Data were entered into the RevMan 5.3 software for systematic management and analysis. To assess the statistical heterogeneity within the included literature, the I2 statistics and chi-square test, as outlined by Higgins et al. (2003), were computed before integrating the results. When I2 was found to be less than 50% and P value greater than 0.10, indicating low heterogeneity among the selected studies, the fixed-effect model was employed. Conversely, when I2 exceeded 50% and P value was less than 0.10, signifying high heterogeneity, the random-effects model was utilized to consolidate the findings.

In the application of the fixed-effect models, it was assumed that the effect sizes across the population were uniform for all studies (Cheung et al., 2012). In contrast, the adoption of the random-effects model aimed to generalize the outcomes beyond the selected studies by considering them as random samples from a larger population (Lim et al., 2018). Continuous data were analyzed using the standardized mean difference (SMD) accompanied by 95% confidence intervals (CI). Significance in the overall effect was determined by a bilateral P value of less than 0.05.

### Risk of Bias Assessment

The primary researcher independently conducted the quality assessment of the included literature, employing the quality assessment criteria outlined in the Cochrane Handbook (5.1.0). The assessment categorized the risk of bias as 'Low-risk', 'Unclear', or 'High-risk'. In instances where uncertainty arose, leading to ambiguity in the classification, the second researcher was consulted to ensure accurate and consistent evaluation.

## Results

### Study Selection

Initially, a total of 743 English studies were identified, out of which 42 were found to be duplicates. Subsequently, based on the analysis of their titles, 541 studies were excluded due to various reasons, including cases being analyzed (3), studies being meta-analyses (12), and themes being deemed irrelevant (541). Following an evaluation of the abstracts, 119 more studies were excluded as they were non-randomized controlled trials (15), not actual trials (43), or reviews (62). Upon a comprehensive review of the complete texts, an additional 16 studies were excluded due to

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incomplete data (9) or the full text being unavailable (7). Consequently, 10 randomized controlled trials (RCTs) were included for the purpose of this meta-analysis.

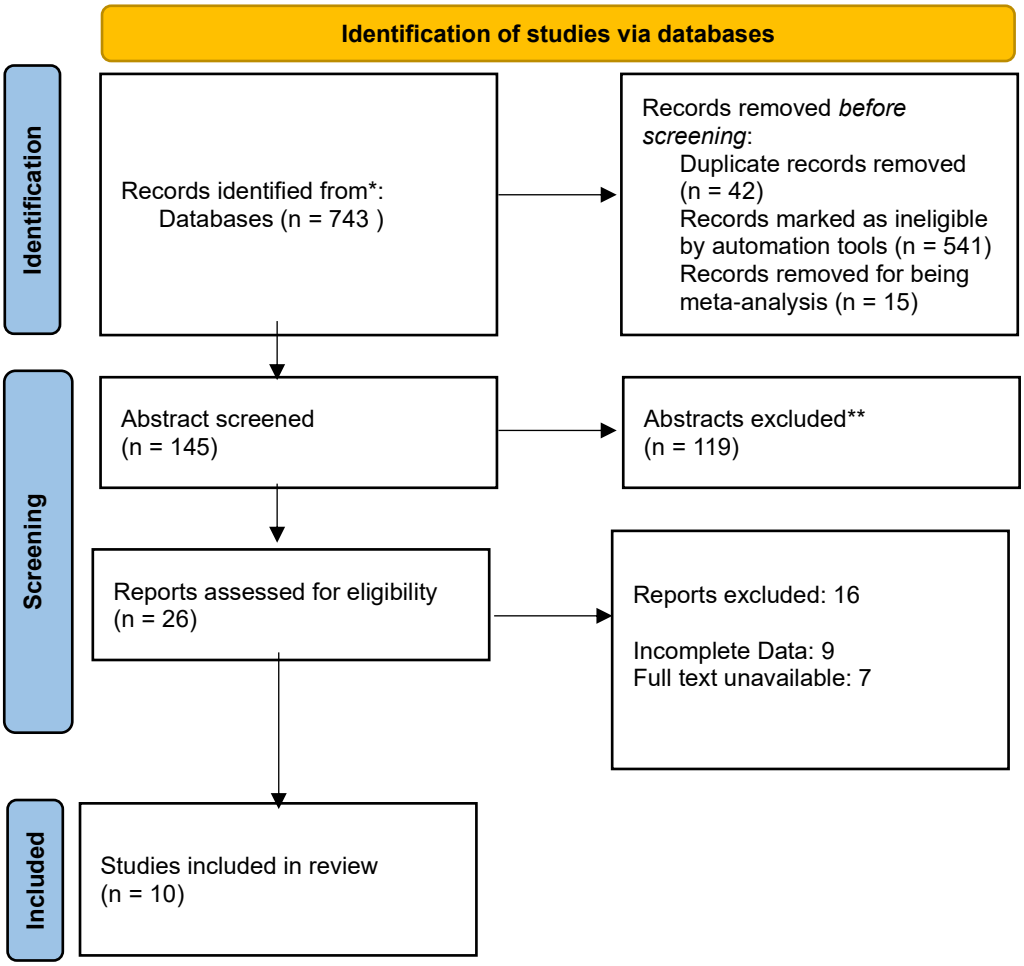


**Figure 1: Flow diagram of study selection**

**Study Characteristics**

Ten randomized controlled trials (RCTs) conducted and published between 2019 and 2023 were incorporated into the analysis. Geographically, one study originated from Canada, two from China, two from the United States, one from Spain, two from Brazil, one from Pakistan, and one from Kenya. Notably, all the studies were published in the English language. The sample sizes across the selected studies varied from 10 to 154 participants, totaling 813 students who were recruited for the research. Of these, 420 students were involved in the experimental groups, while 413 were part of the control groups. The research participants comprised students across different educational levels, including school, undergraduate, and master's students. The interventions implemented were all mindfulness-based, lasting from 16 days to 9 weeks, with each session spanning 1 to 3 hours per week. Various outcome measures were examined, encompassing depression, anxiety, stress, emotion regulation, resilience, self-efficacy, well-being, and levels of mindfulness. Refer to Table 1 for a comprehensive overview of the distinctive attributes characterizing the included studies.

**Table 1 Characteristics of studies included in the meta-analysis.**

| Author (year) | Country | Design | Sample Size | Participants | Intervention | Intervention period | Scales |
|---|---|---|---|---|---|---|---|
| **Ritvo, P (2021)** | Canada | RCT | 154 | Undergraduate students in university | Mindfulness Virtual Community (MVC) | 8 weeks | PHQ-9, BAI, PSS, FFMQ-SF |

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|---|---|---|---|---|---|---|---|
| | | | | | program | | |
| **Karing, C (2021)** | Germany | RCT | 71 | University students | Mindfulness Training | 6 weeks | FFMQ, PHQ-4, |
| **Sousa, G. M. D (2021)** | Brazil | RCT | 40 | Students aged 18-30 years | Mindfulness Training | 4 weeks | SMS, FFMQ |
| **Winger t (2022)** | US | RCT | 52 | Undergraduates | Mindfulness-based strengths practice | 8 weeks | PERMA-Profiler |
| **González-García (2021)** | Spain | RCT | 66 | First year psychology students | Mindfulness and Compassion-based Intervention | 16 days | BAI, PSS, FFMQ |
| **Sarfraz (2023)** | Pakistan | RCT | 156 | University students | Mindfulness Training Course | 8 weeks | PWB-S, CORE-OM, FFMQ |
| **Alemu (2023)** | Kenya | RCT | 10 | Kenyan Secondary School students | Mindfulness-based interventions | 1 hour session weekly | BAI, PSS |
| **Li, J., & Qin, X. (2021)** | China | RCT | 106 | College students | Mindfulness-based stress reduction | 8 weeks | ACS-anger, depression, anxiety, positive emotion |
| **Loucks (2021)** | US | RCT | 96 | College students | Mindfulness-based program | 9 weeks | PSQI, PSS-10, R-UCLA |
| **Jia-Yuan (2022)** | China | RCT | 72 | College students | Mindfulness-Based Emotion Management Intervention | 4 weeks | FFMQ, Emotion Q, Resilience Q |

E: RCT= Randomized Control Trial, PHQ-9= Patient Health Questionnaire-9, BAI= Beck Anxiety Inventory, PSS= Perceived Stress Scale, FFMQ= Five Facets Mindfulness Questionnaire Short Form (FFMQ-SF), SMS= State Mindfulness Scale (SMS), PHQ-4= Patient Health Questionnaire, ACS= Affective Control Scale, PSQI = Pittsburgh Sleep Quality Index, PSS-10 = 10-item Perceived Stress Scale, R-UCLA = Revised University of California, Los Angeles scale.

## Discussion

### Summary of major findings

In this meta-analysis, a comprehensive search for relevant English studies was undertaken, employing both MESH and free terms. A total of ten meticulously selected randomized controlled trials were assembled and incorporated into the analysis. These trials encompassed a collective sample of 813 students from various regions, spanning multiple countries across Asia, the Americas, and Europe, thereby bolstering the generalizability of the conclusions. The research revealed that mindfulness interventions were effective in significantly diminishing levels of depression, anxiety, and stress among students, while concurrently elevating their mindfulness levels.

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The Mindfulness-Based Virtual Community (MVC) program displayed noteworthy efficacy, inducing statistically significant reductions in the Perceived Stress Scale (PSS) compared to the Wait-List Control (WLC) group, while other between-group differences were not significant (Ritvo, P, 2021). This effectiveness highlights its potential as a viable intervention during challenging circumstances.
Furthermore, research supports the potential of a low-dose mindfulness-based intervention in promoting various positive outcomes among students, including heightened mindfulness, self-efficacy, body awareness, and reappraisal. The quality of implementation emerges as a critical factor influencing the effectiveness of such interventions (Karing, C, 2021). Emphasizing the importance of implementation quality underscores the need for well-designed and executed mindfulness programs.
Additionally, the findings underscore the correlation between higher trait mindfulness and lower levels of psychological distress, advocating for the utility of brief mindfulness-based interventions in alleviating distress among university students (Sousa, 2021).

The Mindfulness-Based Student Programs (MBSP) intervention resulted in marked improvements in student well-being, engagement, meaning, and health, as well as increased retention rates, suggesting the potential of MBSP in enhancing college student well-being and academic persistence (Wingert, 2022).

Notably, the study findings suggest that brief online mindfulness and compassion interventions represent a feasible approach to bolstering mental health during the COVID-19 lockdown among university students, highlighting the potential of online interventions in alleviating the mental health challenges arising from the pandemic (González-García, 2021).

Moreover, evidence from studies indicates the effectiveness of mindfulness interventions, such as Mindfulness Training for College Students (MTC) and Mindfulness-Based Stress Reduction (MBSR), in enhancing psychological well-being and reducing the fear of emotions among college students, thereby emphasizing the potential applicability of these interventions in diverse educational settings (Sarfraz, 2023; Li, J., & Qin, X., 2021).

Furthermore, early-stage trials suggest that MB-College interventions may foster well-being in young adults, while modified 4-week mindfulness-based emotion management interventions emerge as a viable strategy for improving mindfulness levels and resilience among college students (Loucks, 2021; Jia-Yuan, 2022).

In summary, the data collectively highlights the promising role of mindfulness interventions in promoting mental well-being, stress reduction, emotional resilience, and academic persistence among students, emphasizing the importance of integrating such interventions within educational and mental health support systems.

## Limitations of the present study

In the course of this meta-analysis, it was found that studies did not provide a detailed account of their randomization procedures, thereby limiting the depth of this analysis. Moreover, the absence of a standardized measurement tool for similar outcomes contributed to an increase in heterogeneity, as did the inclusion of diverse mindfulness intervention protocols across the studies. Subsequent findings emphasized the need for further exploration into the sustainability and duration of the positive impacts of mindfulness interventions on students. Additionally, certain studies lacked comprehensive data on the long-term effects of these interventions, further limiting the understanding of their lasting effects. It is important to consider the potential influence of external factors, such as socio-cultural backgrounds and educational settings, on the effectiveness of the interventions, as these could contribute to variations in the outcomes. Lastly, the exclusion of research published in languages other than English might have introduced a language bias, which is a point of consideration for future analyses.

## Future Research

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Longitudinal studies are needed to assess the sustained effects of mindfulness interventions on student well-being and academic performance. Tailored intervention strategies that consider the diverse needs and cultural backgrounds of students can enhance the relevance and effectiveness of mindfulness programs. Comparative studies evaluating the relative effectiveness of various mindfulness intervention approaches, along with investigations into the efficacy and accessibility of virtual and online mindfulness programs, are essential. Integrating mindfulness practices into academic curricula and conducting comparative analyses of implementation quality can further enhance the impact of mindfulness interventions. Additionally, incorporating diverse outcome measures beyond psychological well-being can provide a comprehensive assessment of the multidimensional impacts of mindfulness interventions on students.

## Conclusion

In conclusion, this meta-analysis underscores the pivotal role of mindfulness interventions in promoting mental well-being and reducing stress among students, thereby emphasizing the importance of integrating such interventions within educational and mental health support systems. The findings from ten carefully selected randomized controlled trials demonstrate the effectiveness of diverse mindfulness-based programs, including the Mindfulness-Based Virtual Community (MVC) program, low-dose mindfulness-based training, and Mindfulness-Based Student Programs (MBSP), in fostering emotional resilience and academic persistence. Notably, the findings highlight the need for a standardized measurement tool and a detailed account of the randomization process in future studies. Longitudinal investigations, comparative analyses of intervention approaches, and the incorporation of diverse outcome measures beyond psychological well-being are essential to further enhance our understanding of the multifaceted impacts of mindfulness interventions on students. This comprehensive analysis provides valuable insights into the potential of mindfulness interventions to contribute to a healthier and more content society.

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