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# Intervention and Evaluation of Mindfulness Mobile Application on Mental Health: A Scoping Review

**Lia Novianty¹\*, Faridah Binti Moh. Said², Nisha Nambiar²**

*¹Department of Nursing, Sekolah Tinggi Ilmu Kesehatan Sukabumi, Jawa Barat 43122, Indonesia*

*²Faculty of Nursing, Lincoln University College, Wisma Lincoln, 12-18, Jalan SS 6/12, 47301 Petaling Jaya, Selangor, Malaysia*

*\*Corresponding Author's Email: lianovianty@dosen.stikesmi.ac.id*

## ABSTRACT

**Background:** Mobile health (mHealth) technologies, especially mindfulness-based applications, have emerged as promising interventions to address barriers to traditional therapy such as accessibility, cost, and stigma. **Objective:** To systematically map and evaluate existing mindfulness-based mobile applications and their impact on mental health outcomes. **Methods:** A systematic search of PubMed, Scopus, and CINAHL was conducted for studies published between 2008 and 2024. Inclusion criteria included studies evaluating Mindfulness Mobile Apps targeting mental health, published in English, and employing various methodologies. Data extraction encompassed app features, intervention outcomes, and methodological quality, appraised using the Joanna Briggs Institute tools. **Results:** In this study 10 out of 215 records met the inclusion criteria. Interventions ranged from mindfulness meditation apps like Headspace and Calm to cognitive-behavioural therapy-integrated tools. Outcomes assessed included stress reduction, enhanced mindfulness, improved well-being, and reduced depressive symptoms. Randomised Controlled Trials (RCTs) consistently reported significant improvements in stress and mindfulness, while quasi-experimental studies showed variability in effect sizes due to methodological limitations. Most apps demonstrated strong usability and efficacy in reducing psychological distress, with intervention durations ranging from one week to three months. **Conclusion:** Mindfulness-based mobile applications offer scalable, accessible solutions to improve mental health. Future research should focus on long-term outcomes and diverse populations to maximise the impact of these digital interventions.

***Keywords: Digital Interventions; Mental Health; mHealth; Mindfulness; Mobile Applications;***

## INTRODUCTION

Mental health disorders, including anxiety and depression, are widespread global health issues that profoundly affect individuals' quality of life and productivity (WHO, 2022). While traditional therapeutic approaches such as Cognitive-Behavioural Therapy (CBT) have proven effective in treating these conditions (Cuijpers *et al.*, 2022). Several barriers—such as limited accessibility, high costs, and societal stigma often prevent individuals from seeking or receiving adequate mental health care (Kazandjian, 2025). In response, there is increasing interest in utilising mobile health (mHealth) technologies to deliver mental health interventions, particularly mindfulness-based applications. These apps have demonstrated efficacy in alleviating symptoms of anxiety and depression while enhancing overall mental well-being (Flett *et al.*, 2020; Ru *et al.*, 2025).

Mindfulness, defined as the practice of maintaining nonjudgmental awareness of thoughts, emotions, and present-moment experiences, has been incorporated into various therapeutic models to address mental health challenges (Kabat-Zinn, 2012). Interventions such as Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) have shown significant success in reducing symptoms

of anxiety and depression (Maddock & Blair, 2023). The proliferation of smartphone technology has enabled the development of mobile applications that deliver mindfulness training, offering scalable and accessible mental health support (Torous *et al*., 2020).

New studies show that smartphone apps that promote mindfulness can have a positive impact on people's mental health. For example, Huberty *et al*. (2019) showed that compared to a control group, employees who used a mindfulness mobile app for consumers had far less stress and more well-being. Similarly, Fish and Saul (2019) discovered that college students' depressed symptoms were significantly reduced when they used gamified mobile mindfulness meditation software. Bostock *et al*., (2019) found that mindfulness meditation software reduced stress and improved mental health when used in the workplace. The ability of mindfulness apps to reduce anxiety, sadness, and stress across varied demographics was further supported by a comprehensive study by Ford *et al*. (2020). It was found by Economides *et al*., (2018) that mindfulness therapies delivered through mobile devices improved participants' ability to control their emotions and overall mental health. The COVID-19 pandemic was a time when mindfulness applications were very useful, as pointed out by Diana and Noviekayati (2021), who also noted the apps' scalability and accessibility as means of dealing with mental health issues. A recent synthesis by Pan and Rafi (2025) also supports these findings, highlighting that culturally adapted mindfulness applications show promise in low- and middle-income countries, including Indonesia.

Although some studies have shown encouraging results, few have provided a thorough evaluation of the current state of mindfulness-based mobile therapies and how well they work in different settings and demographics. A scoping review is necessary to investigate the current state of mindfulness mobile apps, including their features, intervention, intended users, and results. A more effective intervention may be developed with the help of this review, which would also help to fill up research gaps and direct future studies. Consequently, the purpose of this research is to offer a synopsis of mindfulness-based mobile apps and assessments of their efficacy in fostering psychological well-being.

## METHODOLOGY

### Study Design

This study employed a scoping review methodology based on the framework proposed by Arksey & O'malley, 2007) and further refined by Levac, Colquhoun and O'Brien (2010) and the Joanna Briggs Institute (Peters *et al*., 2020). The scoping review aimed to systematically map the available literature on mobile mindfulness applications for enhancing mental health among students, identify research gaps, and provide an overview of intervention effectiveness: (1) identifying the research topic, (2) searching for relevant studies, (3) selecting appropriate studies, (4) extracting data, and (5) summarising and presenting findings. The review was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist (Tricco *et al*., 2018).

### The review was guided by the following questions:

1. What mobile-based mindfulness applications have been developed to improve mental health among students?

2. How has the effectiveness of these applications been evaluated in the literature?

### Search Strategies

The study adopted a systematic search approach to achieve its objectives, using keywords such as "mobile app", "mindfulness", "mental health", "stress", "psychological well-being", and "student" to target three primary areas of interest. Relevant articles were retrieved from PubMed (MEDLINE), Scopus, and CINAHL databases, focusing on publications from January 2008 to January 28, 2024. The selected studies were organised using the RefWorks citation management tool, with duplicate entries removed during a detailed review of titles and abstracts by two independent researchers. In cases of disagreement or

uncertainty about a study's eligibility, the full text was carefully reviewed to facilitate a final decision. The researchers compared their evaluations and resolved discrepancies through discussion to ensure agreement. Only studies that passed the initial title and abstract screening proceeded to a comprehensive review for inclusion.

### Inclusion and Exclusion Criteria

The following were the study's inclusion criteria: 1) research on college, health, and medical students' mental health through mobile app interventions; 2) articles published in English between 2008 and 2024; and 3) publications with a focus on the English language. Research concentrating on methodology, publications in languages other than English, review articles, and studies employing mobile applications that use e-consultation or video conferencing as an intervention were all deemed ineligible.

### Data Extraction

Collaboratively, the study team determined which variables needed to be retrieved and created a data graphing form. The article provides an overview that covers the following: initial author, publication year, study design, study location, and patient population characteristics. It goes on to describe the intervention in depth, including its goals, the main functions of the mobile app, the method of delivery, the data collected, the outcomes that were analysed, and the study's conclusions.

### Quality Appraisal

The quality and reliability of the evidence were ensured by critically evaluating studies using the critical appraisal techniques of the Joanna Briggs Institute (JBI) (Aromataris *et al*., 2022). These studies utilised randomised controlled trials (RCTs), quasi-experimental designs, and other assessment methodologies. A thorough review of the evidence was ensured by evaluating the included studies for reliability and quality using the critical appraisal techniques of the Joanna Briggs Institute (JBI) (Aromataris *et al.*, 2022). Study design, sample size, intervention details, outcome metrics, and possible biases were all part of the methodological considerations used in this evaluation. Resolving evaluation disparities among team members through organised consensus discussions improved reliability. Using Cohen's kappa coefficient to evaluate the agreement amongst reviewers, an inter-rater reliability analysis was done to further confirm the evaluation method (McHugh, 2013). In order to reach a consensus, studies that had scores that were inconsistent were re-evaluated.

### Data Analysis

An approach known as thematic synthesis was utilised in the data analysis process in order to classify and explain the findings that were associated with mindfulness mobile applications and the impact that they have on mental health. According to Thomas and Harden (2008), the extracted data were subjected to a comprehensive assessment in order to uncover recurrent patterns, themes, and gaps Channel gaps in the existing literature. For the purpose of providing insights on the effectiveness of mindfulness applications, descriptive statistics were used to summarise quantitative data sources, where those sources were available.

### RESULTS

### Searching Results

This PRISMA flowchart illustrates the process of identifying, screening, and including studies for review (Figure 1). The initial search identified 215 records from databases, with no records retrieved from other registers. Following this, 190 records underwent screening, resulting in the exclusion of 75 records that did not meet the inclusion criteria. During eligibility evaluation, 40 reports were excluded due to various reasons: 17 did not use mobile apps, 5 were pilot studies, 3 were qualitative studies, and 5 were protocol interventions. Ultimately, 10 studies met the criteria and were included in the final review, with no additional reports identified.
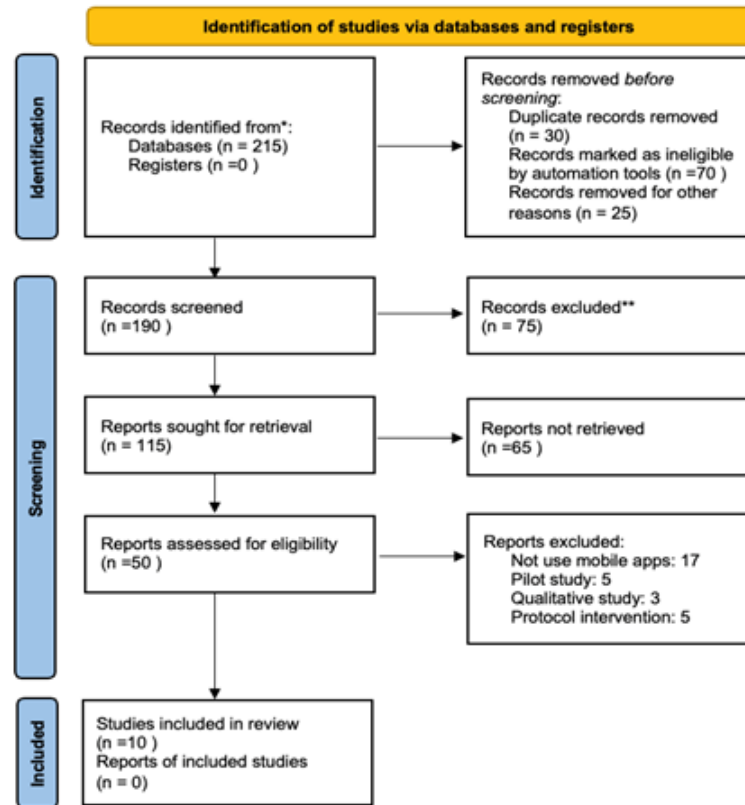
**Figure 1: PRISMA 2020 Flow Diagram Depicting the Selection Process for a New Systematic Review Based Solely on Database and Registry Searches**

### Quality of Study

Several studies, such as those conducted by Bruhns *et al*. (2021); Chu *et al*. (2022); Orosa-Duarte *et al*. (2021); and Plotkina, Valentini and Casteran (2025), demonstrated high methodological rigour. These studies incorporated robust randomisation procedures, well-defined control groups, and clearly articulated outcome measures. While sample sizes varied, most were sufficiently powered to detect meaningful differences, thereby enhancing the reliability and validity of their findings.

In contrast, studies by Zawadzki *et al*. (2025) employed experimental designs without full randomisation. Although these designs offered valuable insights, they were subject to potential biases related to group allocation and participant variability. The interventions examined across the studies were diverse, ranging from mindfulness-based techniques (e.g., Headspace, Calm) to structured mindfulness and cognitive-behavioural therapy (CBT) approaches (e.g., MCT and More, My Student Mindfulness App). Intervention durations spanned from one week to three months, with longer durations generally associated with more robust outcomes.

Most studies utilised validated assessment tools to evaluate stress, mindfulness, and related mental health outcomes. For instance, Huberty *et al*. (2019) and Simpson (2024) focused on stress reduction and improvements in mindfulness, while others, such as Flett *et al*. (2020), incorporated additional metrics like resilience and college adjustment. Across the studies, mobile applications consistently demonstrated positive effects on mental health, including reductions in stress, improved mindfulness, and enhanced coping abilities. However, the magnitude of these effects often varied depending on app features, user engagement, and intervention duration. While most randomised controlled trials (RCTs) exhibited strong methodological quality, some quasi-experimental studies had limitations, including small sample sizes and shorter intervention periods, which may limit the generalisability of their findings.

To further ensure reliability, Cohen's kappa coefficient was calculated to measure inter-rater agreement during the appraisal process. The results indicated substantial agreement, with kappa values ranging from 0.75 to 0.90, affirming the consistency and rigor of the evaluation.

**Main Finding**

Table 1 provides an overview of the included studies, summarising study design, sample characteristics, intervention outcomes, and durations. Most studies employed randomised controlled trial designs, ensuring robust methodological rigour. Samples ranged from 45 to 400 participants, primarily comprising university students, healthcare students, and student pharmacists. Outcomes measured included stress, mental well-being, burnout, self-compassion, mindfulness, and other psychological parameters. Intervention durations varied, with periods ranging from one week to three months. For instance, Chu *et al.*, (2022) investigated a mindfulness mobile application for six weeks, while Flett *et al.*, (2020) extended their intervention to three months.

*Table 1: Characteristics of Included Studies*

| Authors, Year | Study Design | Sample | Outcome Measures | Intervention Duration |
|---|---|---|---|---|
| Chu *et al.*, (2022) | Randomized, longitudinal, controlled | 56 student pharmacists | Stress, burnout, and mindfulness | 6 weeks |
| Plotkina, Valentini & Casteran, (2025) | Randomized Controlled Trial | 64 university students | Mental well-being and coping abilities | 8 weeks |
| Bruhns *et al.*, (2021) | Randomized Controlled Trial | 400 students | Depressive symptoms, self-esteem | 4 weeks |
| Orosa-Duarte *et al.*, (2021) | Single-blind, Randomized Controlled | 168 healthcare students | Anxiety, empathy, self-compassion, mindfulness | 8 weeks |
| Flett *et al.*, 2020) | Pragmatic, randomized controlled | 250 first-year university students | Distress, college adjustment, resilience | 3 months |
| O'Daffer *et al.*, (2022) | Experimental Study | 208 undergraduate students | Stress | 40 days |
| Gonzales (2022) | Experimental Study | 88 medical students | Stress | 30 days |
| Huberty *et al.*, (2019) | Randomized, waitlist-controlled trial | 88 undergraduate students | Stress | 8 weeks |
| Lyzwinski *et al.*, (2019) | Randomized Controlled Trial | 90 undergraduate students (n=45 per group) | Weight behaviours, weight, and stress | 1 week |
| Simpson, (2024) | Randomized Controlled Trial | 88 medical students | Perceived stress, mindfulness, well-being | 30 days |

Table 2 illustrates the content and outcomes of the mindfulness-based mobile applications assessed. Commonly used apps included Headspace, Calm, and other mindfulness tools. These applications generally incorporated mindfulness meditation practices, cognitive behavioural therapy (CBT), and stress management techniques.

**Stress Reduction**

Multiple studies demonstrated significant reductions in stress levels among participants. For instance, O'Daffer *et al.* (2022) observed notable stress decreases among students using the Headspace app. Similarly, Simpson (2024) reported significant interactions between time and treatment group for perceived stress and well-being.

**Enhanced Coping and Well-being**

Over the course of eight weeks, Plotkina, Valentini and Casteran (2025) showed that the Balloon app dramatically enhanced both the mental well-being and the ability to cope with stressful situations. The results of this study are consistent with those obtained by Orosa-Duarte *et al.* (2021), who discovered that a mindfulness app efficiently reduced anxiety and promoted self-compassion.

**Improved Mindfulness and Self-Compassion**

Huberty *et al.*, (2019) highlighted the effectiveness of the Calm app in enhancing mindfulness and self-

compassion among stressed college students. Additionally, Lyzwinski *et al*. (2019) demonstrated that the My Student Mindfulness App significantly improved mindfulness and emotional regulation.

### Reduction in Depressive Symptoms

Bruhns *et al*., 92021) found that a self-help smartphone app integrating CBT and mindfulness reduced depressive symptoms among students compared to a waitlist control group.

### Impact on College Adjustment and Resilience

Flett *et al*., (2020) emphasised the positive impact of mindfulness meditation apps, particularly Headspace, in improving college adjustment and resilience.

*Table 2: Mobile Application Content and its Effectiveness*

| Authors, Year | Application Name | Content | Findings |
|---|---|---|---|
| Chu *et al*., (2022) | Headspace (Mindfulness App) | Mindfulness-based techniques | Daily use of the mindfulness app significantly enhanced student pharmacists' mindfulness, reduced stress, and alleviated burnout. |
| Plotkina, Valentini & Casteran, (2025) | Balloon (G+J Innovation GmbH) | Custom mindfulness training covering stress management, meta-cognition, self-care, and compassion | The app effectively enhanced users' mental well-being and coping strategies. |
| Bruhns *et al*., (2021) | MCT&More | Cognitive behavioral therapy, mindfulness, acceptance commitment therapy, and metacognitive training | The app showed efficacy in reducing depressive symptoms in students compared to a waitlist control group. |
| Orosa-Duarte (*et al*., 2021) | Mindfulness-Based App | - | Comparable effectiveness to IMBP in reducing anxiety while fostering self-compassion and mindfulness among healthcare students. |
| Flett *et al*., (2020) | Headspace | Audio-guided mindfulness meditation | Frequent app users reported reduced psychological distress (-5 points) and improved college adjustment scores (+10 points) compared to non-users. |
| O'Daffer *et al*., (2022) | Headspace, Smiling Mind | Mandatory 10-day meditation, optional 30-day continuation | Participants using Headspace experienced greater stress reduction than those using Smiling Mind. |
| Gonzales (2022) | Headspace | Audio-guided mindfulness meditation | Stress reduction levels were similar between the intervention group and the waitlist control group after 30 days and at a 60-day follow-up. |
| Huberty *et al*., (2019) | Calm | Stress, mindfulness, and self-compassion training | The Calm app effectively reduced stress and improved mindfulness and self-compassion in stressed college students. |
| (Lyzwinski *et al*., 2019) | My Student Mindfulness App | MBSR techniques, including body scan, breathing exercises, and loving-kindness meditation | The app group showed significantly reduced stress, emotional eating, and improved mindfulness compared to a behavioral self-monitoring electronic diary. |
| Simpson (2024) | Headspace | Audio-guided mindfulness meditation | Significant improvements were noted in perceived stress and well-being due to interactions between intervention time and treatment group. |

## DISCUSSION

The findings of this study highlight the growing utilisation of mindfulness-based mobile applications in mental health interventions, notably for the purpose of stress management and the enhancement of psychological well-being. Recent studies have provided valuable insights into the effectiveness of digital mental health interventions among university students, healthcare trainees, and pharmacy students, reinforcing evidence across various contexts. For instance, a systematic review by D'Adamo *et al*. (2023) examined the reach and uptake of digital mental health interventions based on cognitive-behavioural therapy for college students, highlighting their potential benefits. Additionally, a study by Lattie *et al*. (2021) evaluated the effectiveness of a self-guided mobile app platform for college student mental health, demonstrating positive outcomes. Spijkerman, Pots and Bohlmeijer (2016) confirmed through meta-analysis that online mindfulness interventions effectively reduced stress and enhanced mindfulness and self-compassion. For example, Linardon *et al*. (2019) discovered that smartphone-based mindfulness interventions significantly improved

psychological well-being. Spijkerman, Pots and Bohlmeijer (2016) also identified that online mindfulness interventions were effective in reducing stress. This study, in contrast to the reviews that came before it, incorporates research that was published up until the year 2023, with a particular emphasis on mobile applications rather than more general digital interventions. There is a rising dependence on commercially available platforms for mental health support, which is shown in the increased use of apps such as Headspace and Calm. Furthermore, this analysis illustrates the variety in intervention durations and outcomes, highlighting the significance of adapting interventions to the specific needs and settings of individual users.

The majority of the included studies employed randomised controlled trial (RCT) designs, which are widely regarded as the gold standard for evaluating intervention efficacy (Juszczak *et al*., 2019). Sample sizes ranged from 45 to 400 participants, providing sufficient statistical power in most cases. However, differences in intervention durations—spanning from one week to three months—present challenges in assessing long-term versus short-term effects. For example, Chu *et al*. (2022) observed significant reductions in stress and improvements in mindfulness over a six-week intervention using a mindfulness app, while Flett *et al*. (2020) reported comparable outcomes over a three-month period. These findings highlight the need for more consistent intervention durations to enable stronger comparative analyses.

Mobile applications such as Headspace and Calm demonstrated effectiveness in reducing stress, fostering self-compassion, and enhancing overall mental well-being (Borg, 2023; O'Daffer *et al*., 2022). These apps often integrate mindfulness meditation, cognitive behavioural therapy (CBT) techniques, and stress management strategies, which align with existing evidence supporting the efficacy of these approaches in mitigating psychological distress (Hofmann *et al*., 2010). Nonetheless, differences in content delivery and user engagement levels may influence the observed outcomes. Positive results, including decreased burnout and improved mindfulness, emphasise the relevance of these interventions in high-stress settings, such as among healthcare students. For instance, Flett *et al*. (2020) highlighted the importance of sustained app engagement in enhancing self-compassion and reducing psychological distress. These findings align with the broader literature supporting digital mental health interventions, particularly for individuals with limited access to traditional therapy (Harrer *et al*., 2019).

The widespread adoption of mindfulness-based mobile apps presents a scalable and accessible solution for mental health challenges, particularly for underserved populations. This is particularly pertinent in academic and healthcare environments, where stress and burnout are widespread (Dyrbye, Thomas & Shanafelt, 2006). The findings of this study underscore the clinical value of these applications in improving psychological well-being (Strauss *et al*., 2023). For healthcare providers, mindfulness apps represent a cost-effective and scalable method to manage stress and prevent burnout in high-pressure environments. Incorporating tools like Headspace or Calm into workplace wellness initiatives could help alleviate stress and enhance productivity (Borg, 2023; Chipps, 2024). Furthermore, these apps provide an alternative for individuals facing barriers to traditional mental health services, such as stigma, cost, or geographic limitations. Future clinical guidelines should consider integrating mobile mindfulness applications as complementary tools for mental health promotion and stress management.

Mindfulness-based mobile applications hold significant potential for enhancing mental well-being and stress management among diverse populations, making them a valuable resource in nursing practice. Nurses can integrate these tools into patient care plans to promote mindfulness, reduce stress, and support mental health in both clinical and community settings. Additionally, these applications can serve as accessible, cost-effective adjuncts to traditional nursing interventions, particularly for patients with limited access to mental health services. To maximise their impact, nurses can advocate for and participate in the development of culturally adapted versions of these applications for non-English-speaking populations. Training programmes for nurses on how to effectively recommend and support the use of mindfulness-based applications can further enhance their integration into care. By embracing technology-driven interventions, nursing professionals can contribute to a more holistic, patient-centred approach to mental health care.

### Limitation

Despite these promising outcomes, this review has notable limitations. The heterogeneity of study

designs, populations, and intervention durations complicates direct comparisons and limits generalisability. For instance, while some studies focused on university students, others targeted healthcare professionals, resulting in differences in baseline stress levels and mental health needs. Additionally, the reliance on self-reported outcomes, such as stress and mindfulness, may introduce response bias. The short duration of certain interventions, such as one-week programmes, also raises questions about their long-term effectiveness. Lastly, excluding non-English studies may have omitted valuable research from non-English-speaking regions.

## CONCLUSION

Mindfulness-based mobile applications provide a promising avenue for improving mental well-being, stress management, and mindfulness across diverse populations. The reviewed studies demonstrate their effectiveness, scalability, and accessibility. Future research on mindfulness-based mobile applications should delve into their potential for integration with emerging technologies, such as artificial intelligence and virtual reality, to create more personalised and immersive user experiences. Additionally, examining their effectiveness across various demographic groups, including underserved and high-risk populations, will provide insights into reducing health disparities. Investigating the role of cultural adaptations and language localisation in enhancing engagement and outcomes will be crucial in extending their global applicability. Longitudinal studies focusing on sustained behavioural changes and their impact on mental health metrics will further validate their long-term benefits. Collaboration between technology developers, mental health professionals, and policymakers can facilitate the inclusion of these applications in routine healthcare systems, promoting a holistic approach to mental well-being.

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## Conflict of Interest

The authors have no conflicts of interest to declare.

## REFERENCES

Arksey, H., & O'malley, L. (2007). Scoping studies: towards a methodological framework. International Journal of Social Research Methodology, 8(1), 19–32. https://doi.org/10.1080/1364557032000119616

Aromataris, E., Stern, C., Lockwood, C., Barker, T. H., Klugar, M., Jadotte, Y., Evans, C., Ross-White, A., Lizarondo, L., & Stephenson, M. (2022). JBI series paper 2: tailored evidence synthesis approaches are required to answer diverse questions: A pragmatic evidence synthesis toolkit from JBI. *Journal of Clinical Epidemiology, 150*, 196–202. https://doi.org/10.1016/j.jclinepi.2022.04.006

Borg, A. (2023). *Achieving a sense of calm: soma design for better Sleep through seamless technologies*. Received from: https://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Akth%3Adiva-333667. Accessed on, August 21, 2025.

Bostock, S., Crosswell, A. D., Prather, A. A.,&Steptoe, A. (2019). Mindfulness on-the-go: Effects of a mindfulness meditation app on work stress and well-being. *Journal of Occupational Health Psychology, 24*(1), 127–138. https://doi.org/10.1037/ocp0000118

Bruhns, A., Lüdtke, T., Moritz, S., & Bücker, L. (2021). A Mobile-Based Intervention to Increase Self-esteem in Students with Depressive Symptoms: Randomized Controlled Trial. *JMIR mHealth and uHealth, 9*(7). https://doi.org/10.2196/26498

Chipps, W. (2024). South African university students' user experience of mobile applications for anxiety and depression. Retrieved from: http://hdl.handle.net/11427/40830. Accessed on 12th July, 2024.

Chu, A., Rose, T. M., Gundrum, D. A., McMorris, T. E., Klausner, E. A., Lang, L. A.,&Shan, G. (2022). Evaluating

the effects of a mindfulness mobile application on student pharmacists' stress, burnout, and mindfulness. *American Journal of Health-System Pharmacy, 79*(8), 656-664. https://doi.org/10.1093/ajhp/zxab467

Cuijpers, P., Noma, H., Karyotaki, E., Cipriani, A., & Furukawa, T. A. (2022). Effectiveness and Acceptability of Cognitive Behavior Therapy Delivery Formats in Adults with Depression: A Network Meta-analysis (vol 76, pg 700, 2019). *Jama Psychiatry, 79*(2), 180-180. https://doi.org/10.1001/jamapsychiatry.2019.0268

D'Adamo, L., Paraboschi, L., Grammer, A. C., Fennig, M., Graham, A. K., Yaeger, L. H., Newman, M. G., Wilfley, D. E., Taylor, C. B., Eisenberg, D.,&Fitzsimmons-Craft, E. E. (2023). Reach and uptake of digital mental health interventions based on cognitive-behavioral therapy for college students: A systematic review. *Journal of Behavioral and Cognitive Therapy, 33*(2), 97–117. https://doi.org/10.1016/j.jbct.2023.05.002

Diana, Z.,&Noviekayati, I. G. A. A. (2021). Hubungan antara persepsi risiko Covid-19 dan self-efficacy menghadapi Covid-19 dengan kepatuhan terhadap protokol kesehatan pada masyarakat Surabaya. (The relationship between Covid-19 risk perception and self-efficacy in dealing with Covid-19 with compliance with health protocols in the Surabaya community). *Jurnal Ilmiah Psikologi MIND SET, 1*(01), 105-116. https://doi.org/10.35814/mindset.v1i01.2601

Dyrbye, L. N., Thomas, M. R.,&Shanafelt, T. D. (2006). Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. Academic Medicine: *Journal of The Association of American Medical Colleges, 81*(4), 354–373. https://doi.org/10.1097/00001888-200604000-00009

Economides, M., Martman, J., Bell, M. J.,&Sanderson, B. (2018). Improvements in Stress, Affect, and Irritability Following Brief Use of a Mindfulness-based Smartphone App: A Randomized Controlled Trial. Mindfulness, 9(5), 1584–1593. https://doi.org/10.1007/s12671-018-0905-4

Fish, M. T.,&Saul, A. D. (2019). The gamification of meditation: a randomized-controlled study of a prescribed mobile mindfulness meditation application in reducing college students' depression. *Simulation&Gaming, 50*(4), 419-435. https://doi.org/10.1177/1046878119851821

Flett, J. A. M., Conner, T. S., Riordan, B. C., Patterson, T.,&Hayne, H. (2020). App-based mindfulness meditation for psychological distress and adjustment to college in incoming university students: a pragmatic, randomised, waitlist-controlled trial. *Psychology & Health, 35*(9), 1049–1074. https://doi.org/10.1080/08870446.2019.1711089

Gonzales, C. H. (2022). The impact of peer supportive accountability on use of a mindfulness app in depressed college students: A mixed methods study. Loyola University Chicago. Retrieved from: https://www.proquest.com/openview/a2cdcab3372a29637935f2b3f0e98f53/1?pq-origsite=gscholar&cbl=18750&diss=y . Accessed on 28th July, 2024.

Harrer, M., Adam, S. H., Baumeister, H., Cuijpers, P., Karyotaki, E., Auerbach, R. P., Kessler, R. C., Bruffaerts, R., Berking, M.,&Ebert, D. D. (2019). Internet interventions for mental health in university students: A systematic review and meta-analysis. *International Journal of Methods in Psychiatric Research, 28*(2). https://doi.org/10.1002/mpr.1759

Hofmann, S. G., Sawyer, A. T., Witt, A. A.,&Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. Journal of Consulting and Clinical Psychology, 78(2), 169–183. https://doi.org/10.1037/a0018555

Huberty, J., Green, J., Glissmann, C., Larkey, L., Puzia, M.,&Lee, C. (2019). Efficacy of the Mindfulness Meditation Mobile App "Calm" to Reduce Stress Among College Students: Randomized Controlled Trial. JMIR mHealth and uHealth, 7(6). https://doi.org/10.2196/14273

Juszczak, E., Altman, D. G., Hopewell, S.,&Schulz, K. (2019). Reporting of multi-arm parallel-group randomized trials: Extension of the CONSORT 2010 Statement. *JAMA, 321*(16), 1610–1620. https://doi.org/10.1001/jama.2019.3087

Kabat-Zinn, J. (2012). Mindfulness for beginners: Reclaiming the present moment-and your life. Retrieved from: https://efaidnbmnnnibpcajpcglclefindmkaj/https://thekeep.eiu.edu/cgi/viewcontent.cgi?article=1544&context=jcba . Accessed on 29th July, 2024.

Kazandjian, C. (2025). Utilizing Artificial Intelligence to Improve Access to Mental Health Services for Depression and Anxiety in Underserved Communities (Doctoral dissertation, Northeastern University). Retrieved from: https://archive.org/details/mindfulnessforbe0000kaba. 18750 &diss=y . Accessed on 16th August, 2024.

Ford, C. G., Vowles, K. E., Smith, B. W., & Kinney, A. Y. (2020). Mindfulness and meditative movement interventions for men living with cancer: A meta-analysis. Annals of Behavioral Medicine, 54(5), 360-373.

Lattie, E. G., Cohen, K. A., Hersch, E., Williams, K. D. A., Kruzan, K. P., MacIver, C., Hermes, J., Maddi, K., Kwasny, M.,&Mohr, D. C. (2021). Uptake and effectiveness of a self-guided mobile app platform for college student mental health. Internet Interventions, 27. https://doi.org/10.1016/j.invent.2021.100493

Levac, D., Colquhoun, H.,&O'brien, K. K. (2010). Scoping studies: advancing the methodology. Implementation Science, 5, 1-9. https://doi.org/10.1186/1748-5908-5-69

Linardon, J., Cuijpers, P., Carlbring, P., Messer, M.,&Fuller-Tyszkiewicz, M. (2019). The efficacy of app-supported smartphone interventions for mental health problems: A meta-analysis of randomized controlled trials. *World Psychiatry: Official Journal of The World Psychiatric Association (WPA), 18*(3), 325–336. https://doi.org/10.1002/wps.20673

Lyzwinski, L. N., Caffery, L., Bambling, M., & Edirippulige, S. (2019). The mindfulness app trial for weight, weight-related behaviors, and stress in University Students: Randomized controlled trial. JMIR mHealth and uHealth, 7(4), e12210. https://doi.org/10.2196/12210

Maddock, A.,&Blair, C. (2023). How do mindfulness-based programmes improve anxiety, depression and psychological distress? A systematic review. *Current Psychology, 42*(12), 10200-10222. https://doi.org/10.1007/s12144-021-02082-y

McHugh, M. L. (2013). The chi-square test of independence. *Biochemia Medica, 23*(2), 143-149. https://doi.org/10.11613/BM.2013.018

O'Daffer, A., Colt, S. F., Wasil, A. R.,&Lau, N. (2022). Efficacy and conflicts of interest in randomized controlled trials evaluating headspace and calm apps: Systematic review. *JMIR Mental Health, 9*(9). https://doi.org/10.2196/40924

World Health Organization. (2022). WHO guidelines on mental health at work. World Health Organization. Retrieved from: https://www.who.int/publications/i/item/9789240053052 . Accessed on 12th September, 2024.

Orosa-Duarte, Á., Mediavilla, R., Muñoz-Sanjose, A., Palao, Á., Garde, J., López-Herrero, V., Bravo-Ortiz, M. F., Bayón, C.,&Rodríguez-Vega, B. (2021). Mindfulness-based mobile app reduces anxiety and increases self-compassion in healthcare students: A randomised controlled trial. *Medical Teacher, 43*(6), 686–693. https://doi.org/10.1080/0142159X.2021.1887835

Pan, J. Y.,&Rafi, J. (2025). Culturally adapted guided internet-based cognitive behavioral therapy for Hong Kong people with depressive symptoms: Randomized controlled trial. *Journal of Medical Internet Research, 27*. https://doi.org/10.2196/64303

Peters, M. D. J., Marnie, C., Tricco, A. C., Pollock, D., Munn, Z., Alexander, L., McInerney, P., Godfrey, C. M.,&Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBI Evidence Synthesis, 18(1*0), 2119–2126. https://doi.org/10.11124/JBIES-20-00167

Plotkina, D., Valentini, T., & Castéran, H. (2025). App yourself: A meta-analysis of the effectiveness of well-being mobile apps on employee well-being and mental health. *International Journal of Stress Management, 32*(1),

31–46. https://doi.org/10.1037/str0000345

Ru, Y., Norlizah, H. C., Nasuha Burhanuddin, N. A., Liu, H.,&Dong, J. (2025). The correlation between mindfulness and problematic smartphone use: A meta-analysis. *Addictive Behaviors, 164*, 108272. https://doi.org/10.1016/j.addbeh.2025.108272

Simpson, A. (2024). Headspace: Encouraging stress reduction and mindfulness in first responders through using a mobile application. Retrieved from: https://scholarworks.calstate.edu/concern/projects/c247f197f . Accessed on, 5th August, 2024.

Spijkerman, M. P., Pots, W. T.,&Bohlmeijer, E. T. (2016). Effectiveness of online mindfulness-based interventions in improving mental health: A review and meta-analysis of randomised controlled trials. *Clinical Psychology Review, 45*, 102–114. https://doi.org/10.1016/j.cpr.2016.03.009

Strauss, C., Bibby-Jones, A. M., Jones, F., Byford, S., Heslin, M., Parry, G., ...&Cavanagh, K. (2023). Clinical effectiveness and cost-effectiveness of supported mindfulness-based cognitive therapy self-help compared with supported cognitive behavioral therapy self-help for adults experiencing depression: The Low-Intensity Guided Help Through Mindfulness (LIGHTMind) randomized clinical trial. *JAMA Psychiatry, 80*(5), 415-424. https://doi.org/10.1001/jamapsychiatry.2023.0222

Thomas, J.,&Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Medical Research Methodology, 8, 1-10. https://doi.org/10.1186/1471-2288-8-45

Torous, J., Myrick, K. J., Rauseo-Ricupero, N.,&Firth, J. (2020). Digital mental health and COVID-19: using technology today to accelerate the curve on access and quality tomorrow. *JMIR Mental Health, 7*(3). https://doi.org/10.2196/18848

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., Lewin, S., … Straus, S. E. (2018). PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Annals of Internal Medicine, 169*(7), 467–473. https://doi.org/10.7326/M18-0850

Zawadzki, M. J., Torok, Z. A., Peña, M., &Gavrilova, L. (2025). App-based mindfulness meditation reduces stress in novice meditators: A randomized controlled trial of headspace using ecological momentary assessment. *Annals of Behavioral Medicine: A Publication of The Society of Behavioral Medicine, 59*(1). https://doi.org/10. 1093/abm/kaaf025