

A systematic review on the effectiveness of online mindfulness-based interventions in alleviating burnout and related psychological factors among resident physicians and medical students

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Keyword : Burnout; medical students; mindfulness; online interventions; systematic review.		Abstract This systematic review investigates the effectiveness of online mindfulness-based interventions in addressing burnout and related psychological factors among resident physicians and medical students. The investigation adhered to the guidelines outlined in Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA). A comprehensive literature search was conducted across integrated databases, namely Google Scholar, PubMed, SagePub, and Springer using pertinent keywords. Nine articles met the inclusion and exclusion criteria and were included in the analysis. The results revealed that online mindfulness-based interventions show promising results in alleviating burnout among healthcare professionals and medical students. However, several factors must be considered, and a follow-up measurement is required to maintain its effectiveness.		
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INTRODUCTION

Healthcare professionals (HCPs) are individuals with one of the most physically and mentally demanding occupations among other service-based jobs. These professionals are often exposed to emotionally challenging and stressful situations in their workplace, leading to increased prevalence among physicians, nurses, and psychologists (Kriakous et al., 2021). Several studies have shown that the demanding nature of their jobs, characterized by prolonged hours, emotionally taxing tasks, and limited autonomy, places HCPs under significant stress. Furthermore, continuous exposure to these stressors can ultimately lead to the occurrence of burnout (Osman et al., 2021). The medical sector and its practitioners underwent substantial transformations due to the COVID-19 pandemic, marked by heightened demand and stress on existing healthcare resources, resulting in scarcities.

Multiple factors have been recognized as contributing to the high incidence of burnout among HCPs, such as elevated workloads in administrative roles and patient numbers, heightened job stress, time constraints, and inadequate organizational support or resources (Morgantini et al., 2020). Frontliner HCPs, particularly physicians who experienced the condition for an extended period, reported subsequent psychological distress,

anxiety, depression, and sleep difficulties. These conditions had adverse effects on their attitudes, job performance, and behaviors in professional settings (Al Ozairi et al., 2023).

Burnout is often caused by prolonged psychological distress, which impairs an individual's mental capability (Mukaromah and Wardiana, 2022). Furthermore, theoretical considerations suggest that several internal and external factors contribute to its occurrence. The internal factors include personality traits related to low self-esteem, negative affectivity, and low coping skills (Lanwehr et al., 2016), while the external factors can manifest as overwhelming job demands, an unsupportive work environment, and a lack of familial and social support systems (Lizano and Mor Barak, 2012). A previous study stated that prolonged burnout could impact the physical and psychological well-being of an individual.

Physicians burnout can be viewed as a significant gap between the perceived calling and the reality of medical practice, a phenomenon that has escalated in recent years across educational levels, from medical students to resident and fellows (Grow et al., 2019). A study reported an overall prevalence range of 45%-71% among medical students (IsHak et al., 2013). Another report found that clinical-phase medical students were two times more at risk of experiencing personal and work-related burnout due to the higher workload in their daily schedules. These individuals are required to participate in ward rounds, fulfill posting requirements, and attend night shifts along with regular classes the following day. This demanding schedule provides less time to cope with personal problems or simply enjoy 'me-time.' (Nik Ahmad et al., 2021).

The onset of burnout can be traced back to the preclinical phase of medical education. Literature suggests that factors, such as workload, insufficient support, and occasional loss of control play a role in generating feelings of emotional fatigue among students. This observation is corroborated by multiple studies reporting a high pervasiveness of stress and burnout during the preclinical phase (Fares et al., 2016; Fuad et al., 2015; Galán et al., 2011; Konjengbam et al., 2015). During this period, burnout starts to develop due to the overwhelming workload and the need to absorb a significant amount of information with limited time and memory resources. The trend of this condition tends to persist through the clinical years (Fares et al., 2016).

The period of residency is known for its high demands and challenges, representing a phase marked by heightened distress. Resident typically face a heavy workload and encounter stressful situations while balancing their dual roles. These individuals bear substantial responsibility for their patients and frequently experience a lack of control and independence. This situation can lead to burnout, especially when compounded by personality traits, such as perfectionism, self-criticism, and inadequate emotional management (Verweij et al., 2018).

Implementing strategies to improve the emotional welfare of residents and medical students is essential, comprising addressing burnout, reducing stress, and fostering resilience. These methods play a crucial role in nurturing mentally resilient healthcare providers, ensuring future physicians deliver safe and compassionate patient care (Hanson et al., 2022). Despite time constraints and the stigma surrounding mental health conditions, residents and medical students experiencing burnout can benefit from telehealth. This method has become a potential access to pursue and obtain treatment for emotional health difficulties anonymously, anywhere, and anytime. This is especially important during the pandemic, where social and

emotional consequences, such as workplace stigma and social seclusion, often occur. Telehealth helps mitigate the stigma related to psychological health conditions and reduce barriers to accessing care (Raevuori et al., 2020).

A significant gap exists between the growing trend of burnout among resident physicians and medical students, and the use of virtual mindfulness-based interventions, particularly in terms of reviewing and examining efficacy or effect size. Although the prevalence of the condition has been recognized as a pressing issue, with numerous studies reporting its prevalence and detrimental impact on HCPs, there is still a deficiency of comprehensive findings specifically reviewing the effectiveness of online interventions. Existing reports have identified several effective methods, including stress management training, communication skills, peer-group support, and breathing exercises (Kalani et al., 2018). The technological enhancements induced by the COVID-19 pandemic have underscored the importance of establishing virtual interventions and reducing access limitations in providing mental health care to the public (Raevuori et al., 2020).

As online interventions gain prominence in various domains, such as accessibility in health and well-being, it becomes crucial to bridge this study gap by conducting systematic reviews and meta-analyses that evaluate their efficacy in reducing burnout among resident physicians and medical students. Mindfulness means being aware by giving full attention to the current involvement non-judgmentally, and this model of awareness has been proposed to be effective in confronting difficult psychological content, as well as overcoming barriers to pursuing a valued life (Kinnunen et al., 2019). As a person-centered method, mindfulness-based methods have proven to help individuals regulate emotions better, achieve well-being, and improve inter- and intrapersonal relationships (Salvado et al., 2021; Wang et al., 2023). These study endeavors contribute to the existing literature and provide valuable insights into the potential benefits and limitations of the methods, thereby enabling healthcare providers and policymakers to make informed decisions regarding their implementation and integration. Therefore, this literature review aims to review the efficacy of online Mindfulness-Based Interventions (MBIs) delivered through digital platforms, such as video conferences, mobile applications, and online consultations (both individual and group-focused modules), in mitigating burnout among resident physicians, clerkship, and medical students in the preclinical phase.

METHOD

This study was carried out using a Systematic Literature Review (SLR) method, which gathered all relevant empirical evidence based on pre-defined eligibility criteria to specifically address the study question. Furthermore, the literature review process was based on the guidelines provided by the Preferred Reporting Items for a Systematic Review and Meta-Analysis (PRISMA) (Page et al., 2021). Data were acquired from numerous journal databases spanning the years 2016-2023, including Google Scholar, Springer, PubMed, and SagePub. The keywords used for searching were "Online mindfulness-based interventions," "burnout," AND "resident physicians" OR "medical students" OR "preclinical students".

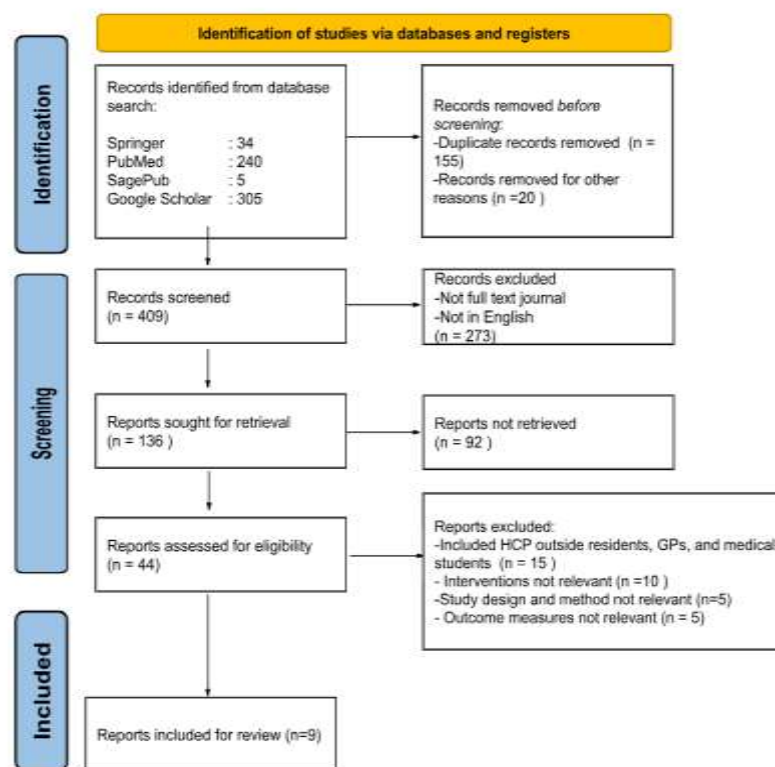


Figure 1. PRISMA flow diagram

The journals selected in this study must meet the subsequent inclusion criteria: (1) an experimental study, (2) comprised the use of online mindfulness-based interventions, (3) included a comparison group, (4) written in English, and (5) published in peer-reviewed, full-text journals. The exclusion criteria were studies using qualitative methods, non-randomized controlled trials (non-RCT), and articles in the form of literature reviews or meta-analyses.

Based on Figure 1, the search results using the aforementioned keywords yielded a total of 584 studies from the 4 selected sources. After screening, a total of 409 articles were obtained and were further selected based on the inclusion and exclusion criteria. This led to the selection of 9 studies for a systematic review, comprising 430 participants. The respondents included comprised medical students, interns, trainees, and resident physicians across various departments. Furthermore, the selected journals used online mindfulness-based interventions by adapting them to the study objectives and participant profiles. The primary focus of these journals was the usage of virtual mindfulness-based interventions to alleviate burnout while aiming to enhance positive psychological qualities (such as resilience, mindfulness, empathy, self-compassion, and well-being) or reduce destructive emotional qualities (such as stress, fear, and depression).

RESULTS AND DISCUSSION

A total of 9 articles were involved in this analysis based on the inclusion and exclusion conditions, and their summaries are provided in Table 1.

Table 1. Articles included in this study

Author, year	Title	Sample	Outcome measurements	Intervention	Findings
Osman et al., 2021	Efficacy of a brief online mindfulness-based intervention on the psychological well-being of health care professionals and trainees during the COVID-19 pandemic: A mixed method design	Medical student, intern, and resident physician working within South Africa at the time of the study (n= 47)	Abbreviated Maslach Burnout Inventory (aMBI) Mindful Attention Awareness Scale (MAAS) Perceived Stress Scale (PSS)	Brief 4 sessions online MBI facilitated by two authors and conducted via Zoom, 1-hour group session each.	Decreased burnout level (mean 21.1 to 15.26, Decreased burnout level (mean 21.1 to 15.26, $p<0.001$; Emotional exhaustion reduce from 10.3 to 8.89) supported with increased compassion for self and others and better emotional regulation. Increased mindfulness, attention, and awareness from mean 3.5 to 3.9 leading to calmness and competence
Ditton et al., 2023	Evaluation of an App-Delivered Psychological Flexibility Skill Training Intervention for Medical Student Burnout and Well-being: Randomized Controlled Trial	Medical students from 2 Australian universities (n=143)	Maslach Burnout Inventory Mental Health Continuum-Short Form The Multidimensional Psychological Flexibility Inventory-Short Form The Depression, Anxiety, and Stress Scale-21.	Mindfulness-based intervention of acceptance commitment therapy via the smartphone app BiSi (Build it. Sustain It), 5-week session; 2 stages (Stage 1 Introductory Module, Stage 2 On-Demand Skill Training).	No significant mean differences between baseline and post-intervention suggesting that burnout outcome did not engage with ACT-based application caused by low-level burnout in baseline. A decrease in stress followed by increased psychological flexibility and well-being showed that ACT-based applications might be suitable to improve other psychological qualities.
Danilewitz et al, 2018	Feasibility and effectiveness of an online mindfulness meditation program for medical students	Medical students University of Ottawa (n= 52)	Maslach Burnout Inventory Jefferson Scale of Empathy-Medical Students Five Facet Mindfulness Questionnaire-Short Form Self-Compassion Scale-Short Form.	Online self-administered mindfulness program (MIND-MED) comprised of 7 online modules with duration of 25-35 minutes of completion (video material, reading material, and instruction for meditation practice).	No changes were observed in burnout level although emotional exhaustion level decreased significantly. The level of mindfulness and self-compassion showed a promising change after subjects were given MIND-MED.
Wang et al., 2021	Effect of Online Psychological Intervention on	Medical resident with an MBI score	Maslach Burnout Inventory	Mindfulness decompression intervention: 8-	Emotional exhaustion and depersonalization ameliorate drastically,

Author, year	Title	Sample	Outcome measurements	Intervention	Findings
	Burnout in Medical Residents From Different Majors: An Exploratory Study	between 50-75 working in Shenjiang Hospital of China Medical University (n=63)	The Depression, Anxiety, and Stress Scale-21	week session of audio and video instruction to guide participants throughout the exercise with 30-45 minutes duration Psychoeducation through QQ and WeChat with duration of 1-3 hours.	but no changes in low personal accomplishment and stress among medical residents. This might be happened from the on-going academical and professional pressure.
Cheung et al., 2020	Preliminary Efficacy of a Brief Mindfulness Intervention for Procedural Stress in Medical Intern Simulated Performance: A Randomized Controlled Pilot Trial	Postgraduate year (PGY) 1 internal medicine residents in Northwestern Feinberg School of Medicine, Illinois, United States of America (n=26)	Maslach Burnout Inventory Patient-Reported Outcomes Measurement Information System (PROMIS(R)) Cohen's Global Measure of Perceived Stress Intolerance of Uncertainty Scale Self-consciousness and Five-factor Model of Personality McCarthy's Mindfulness Scale Empatica E4 wristband	PITSTOP intervention (12-minute mindfulness training video) or control group (12-min control video on ways to increase physical activity)	Reduced burnouts mean between baseline and post-intervention (after watching PITSTOP video) indicated better self-regulation and resulted in less visible trembling and lower heart rate.
Taylor et al., 2016	A Mindfulness Intervention for Residents: Relevance for Pediatricians	Thirty-three residents voluntarily joined the pediatric residency program at the University of Chicago (n=33).	Maslach Burnout Inventory Mindful Attention Awareness Scale	Free smartphone application Headspace16 to complete a 10-day program in mindfulness meditation. Each session comprised of a 10-minute video of learning material and a short-directed meditation.	Increased feeling of personal accomplishment followed with residents perceived mindfulness therapy as an effective therapy and adjunct clinical for patients, and expressed willingness to continue mindfulness practice after the research is concluded.
Hanson et al., 2022	Effect of an Online Mindfulness Course for Hospital Doctors During COVID-19	Doctors (trainees and non-trainees) working at a major hospital in West	Oldenburg Burnout Inventory The Warwick-Edinburgh Mental Well-Being Scale	MPC is a bespoke mindfulness-based program created for clinicians	There were no significant changes in scores for burnout, stress, and resilience. However, scores for well-being and

Author, year	Title	Sample	Outcome measurements	Intervention	Findings
	Pandemic on Resilience and Coping	Midlands, United States of America (n=12)	Smith's Brief Resilience Scale Cohen's et al. Perceived Stress Scale Cognitive and Affective Mindfulness Scale-Revised.	provided on ZOOM platform from January to March 2021 (6 sessions, 90-minute each)	mindfulness significantly improved (p value<0.05).
Raeuori et al., 2020	Smartphone-Delivered, Therapist-Supported Digital Health Intervention for Physicians with Burnout	Resident physicians with evidence of work-related tension in Palo Alto Foundation Medical Group, United States (n=36)	Single-Item Burnout Measure (highly correlated with Maslach Burnout Inventory) Patient Health Questionnaire 9	The online MHP (Meru Health Program) consists of eight modules of mindfulness meditation and cognitive behavioral therapy delivered in a fixed weekly order through a smartphone application.	Decrease in burnout score and depressive symptoms highly correlated with mindfulness activity for each week of the program.
Weitzman et al., 2021	Incorporating Virtual Reality to Improve Otolaryngology Resident Wellness: One Institution's Experience	Otolaryngology residents, United States of America (n=18)	Maslach Burnout Index	10 minutes of weekly VR-guided meditation using a smartphone app (Coresights VR, Boston, MA) that guided clients across paced exhalation and mindfulness meditation exercises in the scene of three virtual atmospheres: beach, canyon, or forest.	Weekly practice of VR-guided meditation and paced-breathing was related to a substantial reduction in emotive exhaustion subscale score whereas it showed no impact towards depersonalization and personal accomplishment subscale.

A SLR obtained interesting results regarding the usefulness of online mindfulness-based interventions in decreasing burnout among participants. Among the 9 included studies, 6 showed significant success in alleviating burnout, particularly in terms of reducing emotional exhaustion. These positive outcomes were also associated with improvements in other psychological aspects, for example mindfulness, self-compassion, self-regulation, and resilience. However, three studies (Danilewitz et al., 2018; Ditton et al., 2023; Hanson et al., 2022) did not find significant differences between baseline and post-intervention burnout scores. This could be due to the low baseline scores, which created a floor effect, thereby limiting the potential for significant improvements in outcomes (Danilewitz et al., 2018). Difficulties in consistently attending intervention

programs due to the online delivery format also could cause decreased engagement and limited effectiveness (Hanson et al., 2022). Furthermore, the Maslach Burnout Inventory could lack sensitivity in detecting immediate changes in the parameter. In this review, it was important to consider that interventions in these studies could have targeted different psychological outcomes rather than directly focusing on burnout (Ditton et al., 2023).

The majority of the included studies showed consistent results regarding the efficacy of virtual mindfulness-based interventions in diminishing burnout in terms of emotional exhaustion. This aspect was a major predictor of burnout among medical residents and students undergoing clerkship and the preclinical stage (Bin Dahmash et al., 2020; Cotel et al., 2021; Frajerman et al., 2019; Shalaby et al., 2023). Furthermore, a total of 6 articles reported an immediate improvement after interventions. Among these studies, five showed a suggestive reduction in emotional exhaustion, and one recorded a rise in subjective achievement, leading to the use of mindfulness as an adjunct therapy for patients (Taylor et al., 2016).

Reports on online mindfulness-based interventions for medical students yielded different results, showing that the program was not suitable for this population (Danilewitz et al., 2018; Ditton et al., 2023). These findings reported that interventions did not have any effect on burnout due to external factors, such as sample baseline, sample size, and outdated assessment tools. Online treatment showed immediate and more prominent effects in alleviating stress, as burnout took a year to identify based on the assessment tools. The positive correlations between emotional exhaustion and other psychological aspects provided further support for the benefits of the treatments. This consistency in results underscored the conceivability of online mindfulness-based interventions in addressing fatigue among residents and medical students.

Although most studies reported positive outcomes, the presence of three studies with non-significant results showed the presence of disparities. Factors, such as low baseline burnout scores, inconsistent program attendance, lack of engagement, and sensitivity of measurement tools could contribute to these variations. Furthermore, interventions targeting different psychological outcomes could affect the observed results. Despite these differences, the overall similarity lies in their potential to reduce burnout and improve psychological well-being.

These results implied that burnout could directly or indirectly impact individuals or organizations. Furthermore, this condition often leads to a sequence of opposing effects for both persons and organizations. These consequences were often primarily of an emotional nature but could transform into adverse consequences on the physical/biological condition and behaviors of employees, leading to undesired organizational effects. Burnout could also compromise patient safety and negatively impact the clinical, financial, and reputational success of an institution (Edú-valsania et al., 2022; Garcia et al., 2019).

CONCLUSION

In conclusion, this literature review suggested that online mindfulness-based interventions were promising methods for reducing burnout among HCPs and medical students. However, further studies were required to better understand optimal implementation strategies, tailor interventions to specific populations,

and address the limitations identified in reviewed articles. Another consideration was that this study did not include 'gray literature' within review. Literature published in scholarly journals tended to exhibit a bias toward reports yielding positive results. Negative results or unpublished articles often formed part of the 'gray literature,' and their exclusion could lead to a lack of comprehensive understanding (Tincany & Taers, 2019).

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