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The effect of a Mindfulness-based stress reduction program on the mental health of a sample of Italian healthcare professionals: A quasi-experimental study design

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Abstract

Introduction: Healthcare workers (HCWs) are commonly exposed to work-related stress, potentially leading to burnout syndrome. Mindfulness-based stress reduction (MBSR) is recognized for its potential to alleviate distress, reduce emotional exhaustion, and enhance attention to the present moment. This study evaluates the effectiveness of MBSR in improving stress management and emotional regulation among healthcare workers.

Methods: This study involved 43 hospital employees from Milan, who participated in a structured 8-week Mindfulness-Based Stress Reduction (MBSR) program. Each session lasted 2 hours per week. At the beginning of the study, we collected socio-demographic data along with baseline responses to the following comprehensive questionnaires: the Mindful Attention Awareness Scale (MAAS), the Maslach Burnout Inventory (MBI), the Perceived Stress Scale (PSS-10), the Interpersonal Reactivity Index (IERQ), the Emotion Regulation Questionnaire (ERQ), and the Difficulties in Emotion Regulation Scale (DERS). Post-intervention assessments were completed by 28 of the participants.

Results: The participant demographic included 37.2% nurses, 27.9% doctors, and 34.9% other health professions. Notable improvements were observed in the Mindful Attention Awareness Scale (MAAS) scores, which increased by 8.37 ($p = 0.027$), and the Perceived Stress Scale (PSS-10) scores, which decreased by 4.55 ($p = 0.011$) post-intervention. Changes were less significant in the Interpersonal Reactivity Index (IERQ) with an increase of 0.69 ($p = 0.553$), the Maslach Burnout Inventory (MBI) with a marginal improvement of 0.11 ($p = 0.788$), the Difficulties in Emotion Regulation Scale (DERS) with a decrease of 1.67 ($p = 0.533$), and the Emotion Regulation Questionnaire (ERQ) with a decrease of 1.26 ($p = 0.712$) scores.

Discussion and Conclusion: The findings confirm the effectiveness of the MBSR program in significantly improving mindfulness and reducing stress among healthcare professionals. However, changes in emotional regulation and burnout were less pronounced, suggesting the need for further research in these areas.

Keywords: burnout; mindfulness-stress reduction program, occupational stress

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INTRODUCTION

Mindfulness, as defined by Kabat-Zinn (1994), is "a basic attitude that results from paying attention on purpose and experiencing one's life in the present moment in a non-judgmental way" [1]. This approach to mental training is a form of meditation intended to focus attention and energy to transform one's quality of experience, enhancing relational dynamics with oneself, others, and the surrounding world.

The Mindfulness-Based Stress Reduction (MBSR) protocol stands out among the various mindfulness meditation approaches. Developed at the University of Massachusetts Medical Center in 1979, MBSR is structured around eight weekly group sessions lasting approximately two and a half hours each, with an additional intensive retreat day between the sixth and seventh sessions. This protocol emphasizes core aspects of mindfulness, such as non-judgment, patience, a beginner's mind, trust, and acceptance of one's condition [1].

Research has consistently demonstrated the efficacy of MBSR in reducing stress and alleviating symptoms of mental health conditions like anxiety, panic, and depression. It has been found particularly effective in reprogramming how the brain processes negative emotions under stress, activating the left prefrontal cortex rather than the right, which helps achieve emotional balance and enhance immune system function [1-8].

Further studies focusing on healthcare workers (HCWs) have shown that MBSR significantly improves stress reduction and burnout and increases empathy, mood, and concentration [2]. A longitudinal study from Spain observed these benefits persisting up to 12 months post-training, emphasizing the sustained impact of the intervention on mindfulness and burnout levels [3].

However, while the MBSR protocol is widely recognized as a beneficial intervention for healthcare professionals, certain studies have indicated that improvements in burnout and resilience might require longer timeframes to be more pronounced, suggesting variability based on individual differences [9,10].

Given the mixed findings regarding the long-term effects of MBSR on burnout and resilience among HCWs, our study aims to further investigate the impact of MBSR on emotional regulation, stress management, and overall psychological well-being. Specifically, this pilot study seeks to evaluate the changes in emotional regulation skills, levels of burnout, perceived stress, and dispositional mindfulness in healthcare workers pre- and post-MBSR training to assess the need for ongoing and possibly enhanced MBSR sessions.

METHODS

Study design and procedure

This quasi-experimental study measured the level of awareness and stress among Italian hospital healthcare workers (HCWs) enrolled in an eight-week Mindfulness-Based Stress Reduction (MBSR) program. To establish the study design and identify appropriate questionnaires, a comprehensive literature search was conducted across primary databases (Scopus, Embase, Cinahl, PsycINFO, Medline) from January 2022 to June 2023. Building on this foundation, 43 HCWs in the medical sector were recruited to complete an online survey assessing dispositional mindfulness, perceived stress, and emotional regulation before and after the MBSR protocol.

Population and sampling

Participants were enrolled from February to October 2022 in Milan, Italy. Initially, 43 healthcare personnel completed the pre-protocol questionnaire. At the study's conclusion, 28 participants had completed the corresponding post-protocol questionnaire. The study primarily included HCWs

employed in hospital settings, ensuring that the sample reflected a relevant population for the intervention.

The initial sample size was estimated based on prior studies to achieve a statistical power of 0.80 with a Type I error probability of 0.05, requiring a minimum of 47 participants. However, accounting for an observed drop-out rate of 35%, the recruitment target was adjusted to 73 participants to compensate for potential attrition.

Surveys were administered via Google Forms, and no further selection criteria were applied, resulting in a diverse gender sample, years of work experience, and family situations.

The Protocol in the study

The Mindfulness-Based Stress Reduction (MBSR) protocol implemented in this study consisted of guided sessions conducted over eight weeks, with each session lasting approximately two hours. Participants engaged in various mindfulness practices, including body scans, sitting meditation, and mindful yoga, aimed at cultivating greater awareness and presence. The protocol emphasized practical skills to foster mindfulness in daily activities and stressed the importance of daily practice as an integral component of the training.

Mindfulness meditation in this study is structured around focusing attention on one's natural breathing patterns and physical sensations. When mental distractions occur, the process involves three key steps: recognizing the distraction, releasing it without judgment, and refocusing on the present moment's sensory experiences of breath and body. This repetitive practice enhances the ability to maintain focused attention on a chosen object and to monitor both external events and internal mental activities as they arise, with an accepting, non-judgmental stance [11-13].

Instruments

The survey employed multiple scales to assess emotional awareness, mindfulness levels, and perceived stress. Each instrument was selected based on its relevance and validity, as confirmed by extensive literature reviews:

Mindfulness Attention Awareness Scale (MAAS): This 15-item scale measures the frequency of conscious attention and presence in everyday activities, reflecting individual variations in mindfulness [13]. The MAAS is widely used for its robust psychometric properties.

Interpersonal Emotion Regulation Questionnaire (IERQ): Consisting of 20 items, this scale assesses difficulties in managing emotions in social interactions. Higher scores indicate greater challenges in interpersonal emotion regulation [14].

Emotion Regulation Questionnaire (ERQ): This 10-item scale is used to evaluate two major emotion regulation strategies, namely cognitive reappraisal and expressive suppression, using a Likert scale response format. The Italian version maintains good internal consistency (Cronbach's alpha > .70) [15,16].

Difficulties in Emotion Regulation Scale (DERS): This 19-item scale measures difficulties in managing both positive and negative emotions, a crucial aspect of emotional resilience and mental health [17].

Maslach Burnout Inventory (MBI): Comprising 22 questions across three subscales—Emotional Exhaustion, Depersonalisation, and Personal Accomplishment—the MBI is employed to assess various aspects of burnout. High scores on Emotional Exhaustion and Depersonalisation suggest significant job stress, whereas high scores on Personal Accomplishment indicate better emotional regulation and social skills. This inventory has shown high reliability in previous studies [18].

Perceived Stress Scale (PSS-10): Developed by Cohen in 1983, this 10-item scale measures the extent to which situations in one's life are appraised as stressful over the past month. It includes subscales for Helplessness and Self-efficacy, capturing a bifactorial concept of stress. The PSS-10 is particularly noted for its short-term predictive validity, which spans four to eight weeks [19].

To address gaps in the literature concerning the emotional impact of the MBSR protocol, the DERS, IERQ, and ERQ scales are also incorporated. These tools helped map participants' emotional regulation capacities, enhancing our understanding of how MBSR might affect these aspects, as

indicated by prior research where improvements in empathy were noted in healthcare professionals [20].

This combination of instruments was strategically chosen to provide a comprehensive assessment of the emotional, psychological, and stress-related outcomes of the MBSR program among healthcare workers, aligning with established research methodologies in the field.

Statistical analysis

Descriptive statistics were employed to summarize the baseline characteristics, including means, standard deviations, and frequencies. Correlation analyses examined the relationships between mindfulness, emotional regulation, and stress levels before and after the intervention. Further, inferential statistics such as t-tests or ANOVA were utilized to compare pre- and post-intervention scores, determining the statistical significance of the MBSR program's effects on the participants. All analyses will be performed using statistical software, ensuring data integrity and accuracy.

Ethical aspects

Protection and respect of privacy following Legislative Decree 196/2003 (personal data protection code). Adherence to the observational study is voluntary and accompanied by informed consent, which states the research objectives and how the questionnaire will be completed.

The study adheres strictly to privacy and data protection principles as outlined in the Legislative Decree 196/2003 (personal data protection code). Participation in this observational study was entirely voluntary and predicated upon providing informed consent. This consent form clearly described the study's objectives, the nature of the involvement, and how the data was collected and used. Importantly, before the commencement of the study, approval was obtained from the local ethics committee, ensuring that all research procedures meet the current standards of ethical conduct in research involving human subjects. This authorization confirms that the study poses minimal risk to participants and conforms to ethical guidelines for protecting participants' rights and well-being.

RESULTS

Participant enrollment and response rates

In this study, 43 participants were initially enrolled and completed the pre-treatment questionnaire. After the intervention, 28 of these participants responded to the post-intervention questionnaires. Accordingly, the pre-intervention sample comprises 43 participants, whereas the post-intervention sample comprises 28 respondents.

Demographic and employment characteristics

Demographic and employment data for both pre-and post-intervention samples are detailed in Table 1. This includes absolute frequencies and relative percentages across several categories, such as gender, marital status, educational attainment, professional role, and employment in a COVID-19-specific department. Key factors influencing burnout and stress levels, such as years of work experience and age, were also analyzed. Quartile distributions (1st and 3rd) and medians were calculated to provide insights into the demographic skew of the sample.

Analysis of socio-demographic data

According to Table 1, most participants are female. Most reported being married. Educational, professional, and departmental affiliations related to COVID-19 work were evenly distributed among participants. The age and years of work experience within the cohort are notably high. Specifically, the median age of participants is 50 years, with a first quartile at 45 years and a third quartile at 55 years. The median years of work experience stand at 26 years, demonstrating a seasoned group of professionals.

Table 1. Characteristics of participants included in the pre-intervention MBSR and post-intervention MBSR sample.

	Pre-MBSR n = 43	Post-MBSR n = 28
Gender		
Male (M)	5 (11.6%)	3 (10.7%)

Female (F)	38 (88.4%)	25 (89.3%)
Marital status		
Single (S)	15 (34.9%)	8 (28.6%)
Engaged (C)	28 (65.1%)	20 (71.4%)
Education		
High school (1)	12 (27.9%)	8 (28.6%)
University degree (2)	16 (37.2%)	11 (39.3%)
Post-University degree (3)	15 (34.9%)	9 (32.1%)
Profession		
Nurse	16 (37.2%)	9 (32.1%)
Doctor	12 (27.9%)	10 (35.7%)
Other	15 (34.9%)	9 (32.1%)
Working in the COVID department		
Yes	21 (48.8%)	14 (50%)
No	22 (51.2%)	14 (50%)
<hr/>		
Age		
Median (1st-3rd quartile)	51 (45.5-57)	50 (45-53.5)
Years of Work		
Median (1st-3rd quartile)	26 (14-32)	25.5 (18.75-32)

Concerning the inferential statistics analysis, the distributions of the total scores of the scales used, taken before and after the treatment by boxplots, are shown graphically, where the 1st and 3rd quartiles are indicated with the median in the middle. Figure 1 illustrates an increase in the total score for the Mindful Attention Awareness Scale (MAAS) and an improvement on the Perceived Stress Scale (PSS-10), with notable advancements across the median, first, and third quartiles for both scales. Conversely, the scores for the Interpersonal Reactivity Index (IERQ), Emotion Regulation Questionnaire (ERQ), Difficulties in Emotion Regulation Scale (DERS), and Maslach Burnout Inventory (MBI) display marginal improvements. These slight enhancements are observable in the median and the first and third-quartile values.

Figure 1. Graphical representation of the distributions of the total scores with relative medians of the scales measured in the pre-and post-MBSR protocols

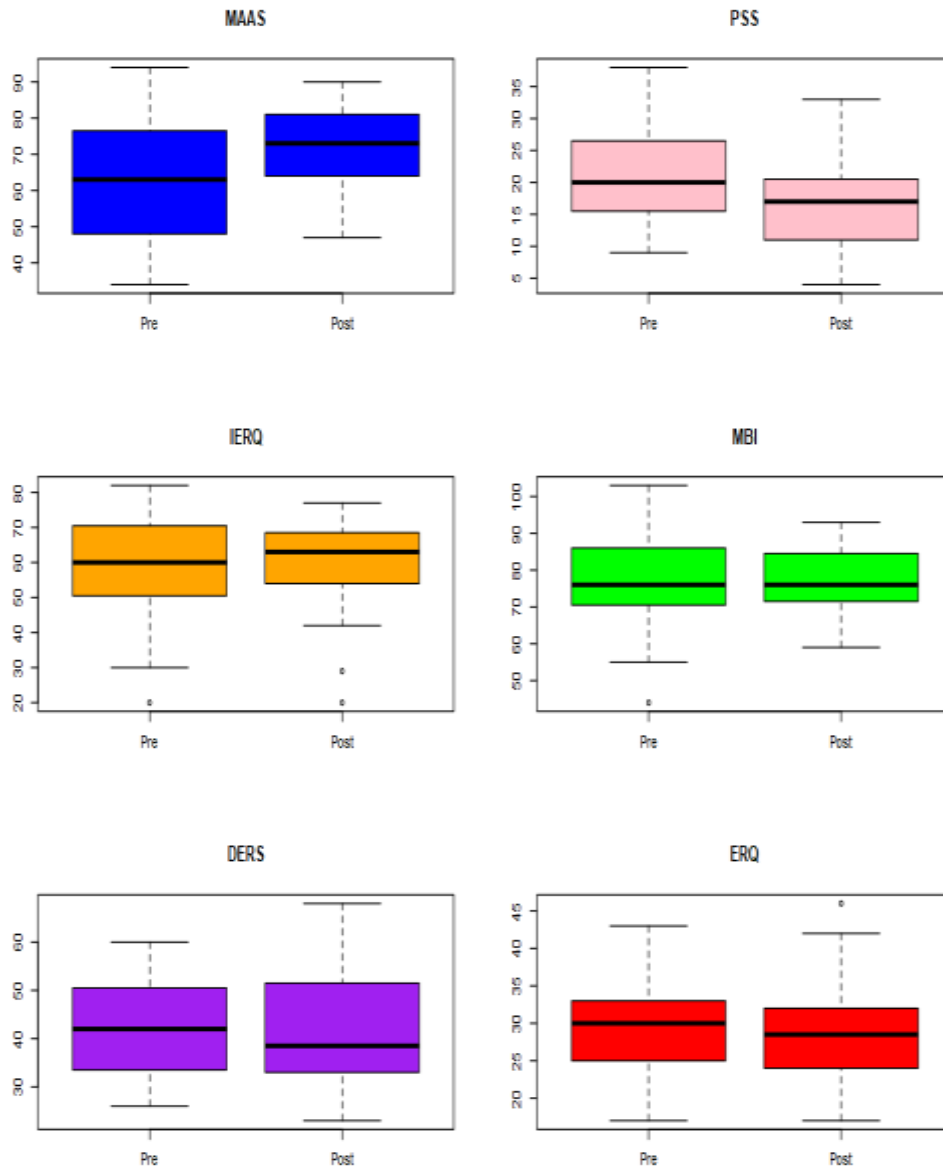


Table 2 presents the average scores from questionnaires completed before and after the Mindfulness-Based Stress Reduction (MBSR) intervention for the 28 participants who completed scales at both baseline (T0) and post-intervention (T1). It provides a detailed breakdown of the subscale scores for each measurement instrument used in the study.

Table 2. Average scores obtained pre- and post-intervention with subscale breakdown.

Measurement instruments	pre-MBSR score (N=28)	post-MBSR score (N=28)
MAAS (awareness)	64.64	72.25
PSS-10 total	20.68	16.42
PSS-10 <i>Self-efficacy</i>	7.86	5.5
PSS-10 <i>Helplessness</i>	12.82	10.93
IERQ total	58.93	59.5
IERQ <i>Social modeling</i>	15.46	15.46
IERQ <i>Soothing</i>	13.53	13.4
IERQ <i>Enhancing Positive Affect</i>	18.18	18.32
IERQ <i>Perspective Taking</i>	11.75	12.32
ERQ total	28.64	28.39
ERQ <i>Cognitive Reappraisal</i>	15.14	14.89

ERQ <i>Expressive Suppression</i>	13.5	13.5
DERS total	41.86	41.14
DERS <i>NonAcceptance</i>	5.78	5.39
DERS <i>Goals</i>	5.89	5.35
DERS <i>Impulse</i>	7.18	6.57
DERS <i>Awareness</i>	14.35	12.07
DERS <i>Clarity</i>	8.71	7.21
DERS <i>Strategies</i>	4.93	4.36
MBI total	77.82	77.18
MBI <i>Emotional Exhaustion</i>	30.68	28.1
MBI <i>Depersonalisation</i>	12.28	13.03
MBI <i>Personal Realisation</i>	34.86	36.1
MBI DP + EE	42.96	41.12

The results show significant differences between baseline and post-treatment scores on the MAAS and PSS-10. Specific improvements were noted in subscales such as PSS-10 Self-efficacy, Helplessness, and DERS Awareness. The reduced scores on the Helplessness subscale indicate an improvement in participants' feelings of helplessness. Similarly, the DERS Awareness subscale significantly reduced, indicating enhanced emotional regulation capabilities. MBI Emotional Exhaustion scores decreased, and Personal Achievement scores increased, reflecting reduced burnout and enhanced personal fulfillment post-intervention.

Figure 2 displays the linear correlation coefficients between the total post-intervention scores for each of the six scales used in the study. It highlights the attenuation of the negative correlation between the MAAS and MBI scores. Additionally, a shift from a negative to a positive correlation is noted between the MAAS and IERQ scores. The previously existing positive correlations between the PSS-10 and DERS and the negative correlations between the MAAS and PSS-10 and between the MAAS and DERS remain unchanged.

Figure 2. Linear correlation coefficients for post-intervention MBSR scores.



In Figure 3, each linear correlation coefficient value is represented symmetrically along the diagonal in a matrix format. The color and size of each square are proportional to the correlation strength, detailed in the legend. This figure demonstrates strong negative correlations (red squares) between the pre-intervention scores of the MAAS with the PSS-10, MBI, and DERS, as well as positive correlations (blue squares) between the PSS-10 and DERS, PSS-10 and ERQ, and DERS and ERQ.

Figure 3. Linear correlation coefficients for pre-intervention MBSR scores.



Figure 4 explores the gender differences in the improvements noted on the MAAS and PSS-10 scales post-intervention. It reveals a more pronounced improvement for males compared to females; however, this comparison is limited due to the smaller male sample size.

Figure 4. Gender differences in MAAS and PSS-10 scores post-intervention.

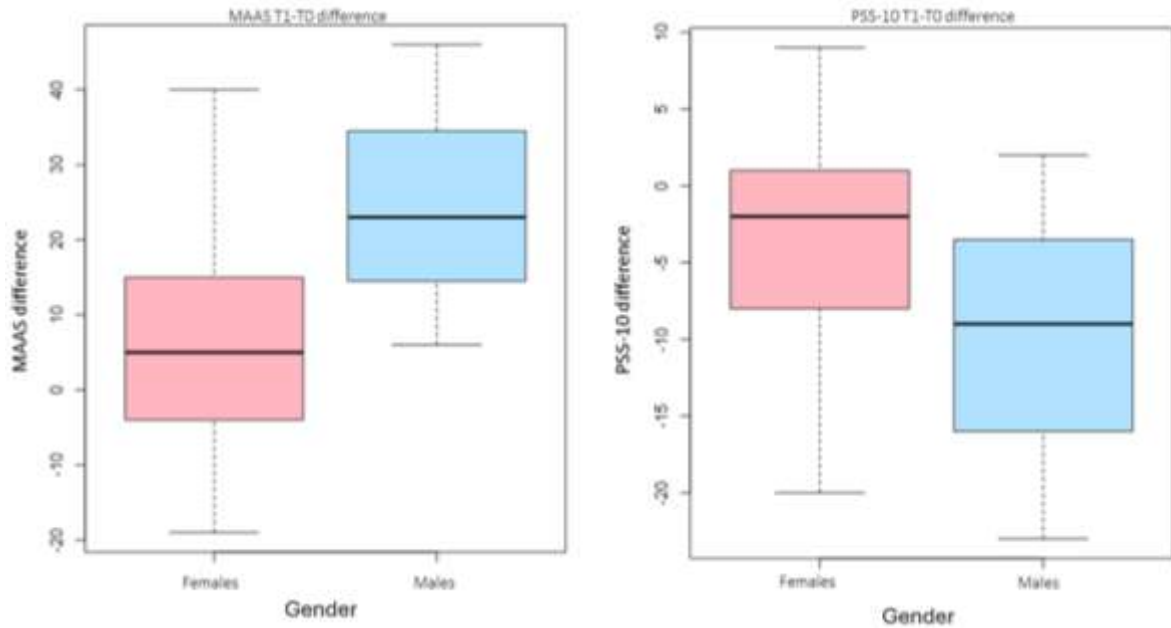


Figure 5 analyzes the impact of years of work experience on the effectiveness of the MBSR intervention. There is a minor difference in MAAS scores concerning years of work. In contrast, a clear improvement in PSS-10 scores is evident among subjects with fewer years of experience, indicating a greater reduction in perceived stress levels in this subgroup.

Figure 5. Differences in MAAS and PSS-10 scores by years of work experience post-intervention.

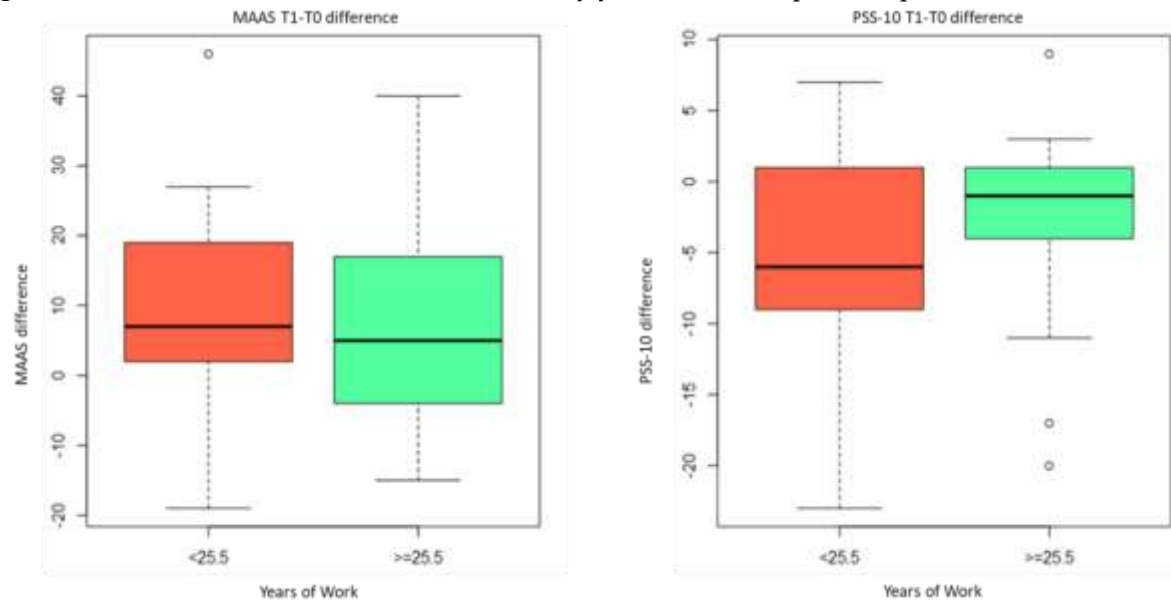
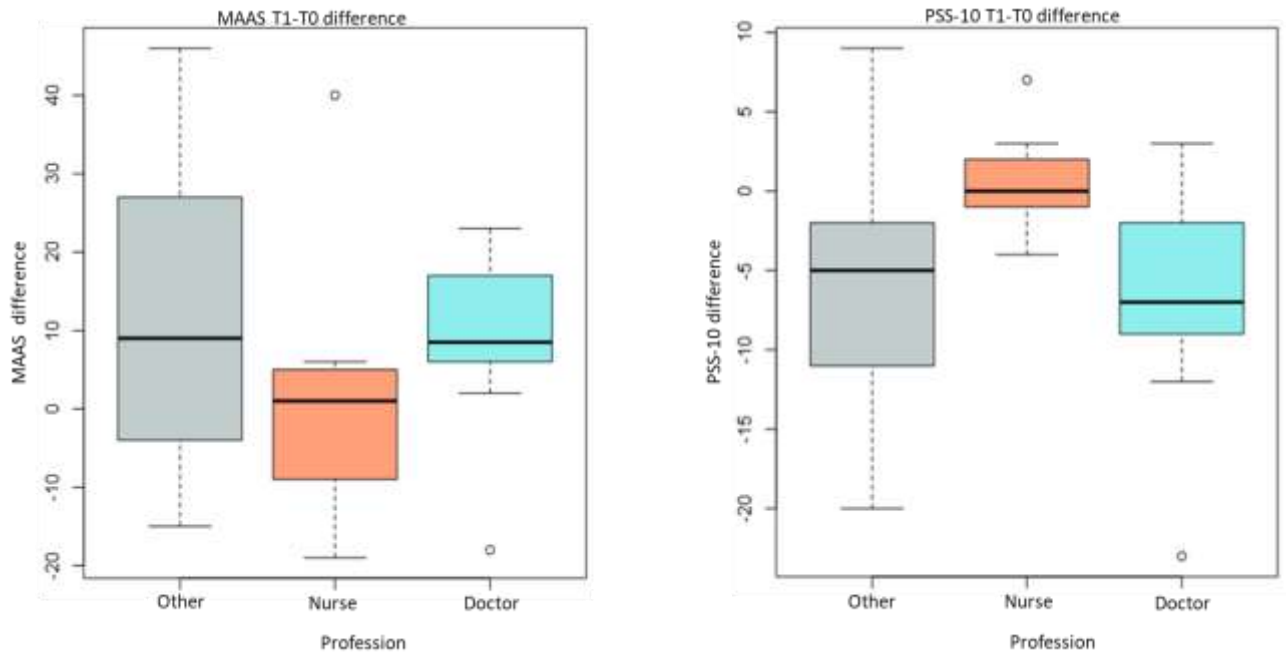


Figure 6 demonstrates a notable improvement in the MAAS scores among doctors and other professionals. However, the PSS-10 scores significantly improve, primarily in the medical doctor group. This suggests that the intervention might have varying impacts on stress and mindfulness across different professions within the healthcare sector.

Figure 6. Differences in MAAS and PSS-10 scores by profession post-intervention.



Statistical analysis

The statistical analysis included the Wilcoxon test of the sum of ranks for independent samples, which assessed differences between post- and pre-intervention scores across different demographic and professional categories. The analysis revealed:

Gender differences: The differences between males and females in MAAS (P-value 0.094) and PSS-10 (P-value 0.372) scores were not statistically significant, suggesting similar effects of the intervention across genders.

Experience level: No significant differences were found between participants with less than 25.5 years of work experience compared to those with more (MAAS P-value 0.520; PSS-10 P-value 0.311), indicating the intervention's uniform efficacy across different experience levels.

Professional differences: A Kruskal-Wallis test was conducted to compare the medians across three groups: nurses, doctors, and other healthcare professionals. The test for MAAS differences did not reveal significant variations (P-value 0.173), while the PSS-10 showed significant differences (P-value 0.029). Further analysis using Wilcoxon's test with Bonferroni correction highlighted a significant improvement in PSS-10 scores between doctors and nurses (P-value 0.016), suggesting that doctors may benefit more from the intervention regarding stress reduction than nurses.

Correlation analysis: The correlation coefficients for the helplessness and self-efficacy subscales of the PSS-10 improved from pre- to post-intervention (from 0.649 to 0.738), indicating an increase in perceived self-efficacy and a decrease in feelings of helplessness post-treatment.

Sample size consideration for future studies: The analysis of effect size from pre- and post-intervention data (0.42) and the observed drop-out rate (35%) led to a revised minimum sample size estimate. To achieve a statistical power of 0.80 at a Type I error probability of 0.05, at least 73 participants are needed. This calculation is crucial for planning future studies to ensure reliable and generalizable results.

DISCUSSION

The present study aimed to evaluate the effects of the Mindfulness-Based Stress Reduction (MBSR) protocol on work-related stress management, burnout levels, emotional regulation, and mindfulness. Previous literature identifies MBSR as an effective intervention for improving emotional exhaustion [5], reducing stress [22-29], enhancing mindfulness [10], and increasing attention [4].

Our study employed descriptive and inferential analysis on a predominantly female sample (89.3%), with a significant portion married or cohabiting (71.4%). The demographic characteristics reflect those found in Hofheinz's work, which suggests married or cohabiting individuals may have

a lower propensity for burnout syndrome [30-32]. The sample's median work experience was 25.5 years, with a median age of 50, indicating a mature and experienced group of participants.

Initial assessments using the Mindful Attention Awareness Scale (MAAS) indicated a baseline mindfulness score of 64.64, significantly increasing to 72.25 post-intervention ($p=0.027$). This improvement significantly surpasses the incremental gains noted in Clinger's observational study, where the average MAAS increase was only 1.73 ($p=0.28$) (21). It aligns more closely with Cohen's high-variation standard mean difference of 1.1 (0.17-2.04) [10].

The Perceived Stress Scale (PSS-10) results also showed a substantial reduction in stress levels, dropping from an average of 20.7 pre-intervention to 16.4 post-intervention, which is statistically significant (P -value = 0.011). This decrease in stress is more substantial than the changes observed in other pilot studies [6,33,34], indicating the MBSR protocol's potent effect on stress reduction.

Subscale analysis of PSS-10 revealed significant improvements in helplessness and self-efficacy, with decreases in the helplessness score from 12.82 to 10.9 and in the self-efficacy score from 7.86 to 5.5. These results underscore a marked enhancement in stress management, particularly in increasing self-efficacy.

Further analysis showed that health professionals with fewer years of experience achieved better outcomes with the MBSR protocol, as evidenced by the greater T1-T0 difference among participants with less than 25.5 years of experience (-5.36) compared to those with more experience (-3.14) [31].

The Maslach Burnout Inventory (MBI) results did not show statistically significant changes ($p=0.788$), with only minor improvements in emotional exhaustion and personal accomplishment. This finding contrasts with Poulin's study, in which significant reductions in emotional exhaustion were noted [5].

Additional measures, such as the Interpersonal Reactivity Index (IERQ) and the Emotion Regulation Questionnaire (ERQ), showed slight improvements, especially in subscales related to enhancing positive affect and cognitive reappraisal, suggesting subtle but positive shifts in emotional regulation post-MBSR [34,35].

Lastly, the correlations between baseline and post-intervention scores maintained consistent patterns, highlighting the MBSR's consistent impact across various psychological dimensions despite the varied magnitude of change.

In summary, while the MBSR protocol has shown significant benefits in terms of mindfulness enhancement and stress reduction, its effects on burnout and broader emotional regulation are less pronounced. This suggests the need for additional research or potential protocol adjustments to maximize benefits across all targeted areas of professional well-being.

Study limitations

This study encountered several limitations that may impact the generalizability and interpretability of the results. Firstly, the non-randomization of the sample and the absence of a control group limit the robustness of the findings, as these factors restrict the number of analyses that can be performed and the conclusions that can be confidently drawn. Additionally, there was a significant drop-out rate; although all participants completed the MBSR protocol, only 65% completed the post-intervention questionnaire. This high drop-out rate raises concerns about potential bias in the reported outcomes. Future research should consider a larger, randomized controlled trial design to address these issues. Furthermore, since ongoing practice is crucial for sustained benefits from MBSR, assessing the long-term effects with follow-up evaluations six months after the intervention would be beneficial.

Strengths of the study

Despite these limitations, this study has several strengths. It directly addresses the acute need for effective interventions in the healthcare setting, especially in the wake of increased stress and burnout during the SARS-COVID-19 pandemic. Using validated scales to measure outcomes like mindfulness, stress, and burnout adds reliability to the findings. Moreover, this research contributes valuable data on the immediate effects of mindfulness training, highlighting its potential to reduce feelings of helplessness and improve stress management among healthcare professionals.

Relevance to clinical practice

The findings from this study are particularly relevant to clinical practice, offering practical insights into managing work-related stress among healthcare professionals. Mindfulness training has shown promise in significantly reducing the sense of helplessness, work-related stress, and emotional exhaustion that often lead to burnout. This is especially critical in the current climate, where such challenges are pervasive and under-addressed in healthcare settings.

Practical implications

The practical implications of this research suggest that implementing structured mindfulness interventions like the MBSR protocol can be an effective strategy for healthcare institutions aiming to improve employee well-being. Hospitals and other healthcare environments could consider integrating regular mindfulness training sessions to alleviate stress, enhance overall job satisfaction, and possibly reduce turnover. Additionally, by demonstrating the effectiveness of such interventions, this study supports allocating resources toward mental health and wellness programs, which could lead to more sustainable healthcare practices and better patient care outcomes.

CONCLUSIONS

This study assessed stress management and emotional regulation changes following the Mindfulness-Based Stress Reduction (MBSR) intervention. Consistent with existing literature, our analysis of questionnaire data demonstrated statistically significant improvements in awareness, self-efficacy, and a reduction in feelings of helplessness among participants who underwent the MBSR protocol. Moreover, demographic variables such as gender, marital status, and years of professional experience correlate with either increased awareness or decreased stress levels.

MBSR notably enhanced stress management, mainly through increased self-efficacy and helplessness reductions, and effectively reduced emotional exhaustion linked to burnout. However, while there was an observable improvement in the difficulty of emotional awareness, the data did not conclusively show a broader change in emotional regulation across the study sample.

In summary, the MBSR intervention has proven effective in improving certain aspects of psychological well-being among healthcare professionals, particularly in managing stress and enhancing mindfulness. Despite these positive outcomes, further research is needed to explore the impact of MBSR on emotional regulation more comprehensively and to substantiate these findings across more diverse populations and settings.

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