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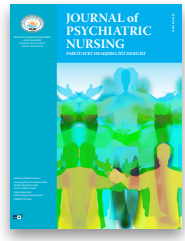

Original Article

The effect of mindfulness-based stress reduction program on nursing students' stress level and emotion regulation: A randomized controlled trial

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Abstract

Objectives: This study was conducted as a pre-test, post-test, follow-up randomized controlled trial to determine the effect of a mindfulness-based stress reduction program on perceived stress levels and cognitive emotion regulation strategies in nursing students.

Methods: The study involved 45 participants, with 22 in the intervention group and 23 in the control group. Data collection tools included a personal characteristics form, the Perceived Stress Scale, and the Cognitive Emotion Regulation Scale. The intervention group attended an online MBSR program once weekly for eight weeks, with sessions lasting 60–90 minutes, while the control group received no intervention. Assessments were conducted at pre-test, post-test, one-month, and three-month follow-ups.

Results: The results revealed a significant reduction in perceived stress scores in the intervention group across all measurement points compared to the control group. On the Cognitive Emotion Regulation Scale, the intervention group showed lower scores in the "rumination" and "self-blame" subscales post-intervention and during follow-ups. Additionally, they scored higher in the "acceptance," "positive refocusing," and "putting into perspective" subscales at similar intervals. Feedback from the intervention group indicated that 33.3% found the program beneficial for stress management, 66% reported enhanced mindfulness, and 33.3% noted increased awareness.

Conclusion: The MBSR program effectively reduced perceived stress levels and encouraged positive cognitive emotion regulation strategies, such as increased acceptance, reduced rumination, and improved perspective-taking among nursing students. These findings suggest that mindfulness practices can be a valuable tool in fostering emotional well-being and stress resilience in this population.

Keywords: Cognitive emotion regulation; mindfulness; perceived stress; psychiatric nursing

Nursing education is a highly challenging and stressful program for nursing students. Difficulties encountered during clinical education, along with personal and social stressors, can contribute to the stress experienced by students. Academic stress can be attributed to the curriculum of nursing education, which combines clinical and theoretical knowledge, requiring students to develop practical skills. Studies have shown that nursing students perceive higher levels of stress compared to students in other programs. This is due to the intensive content of the nursing program, the challenging assignments, and the demanding nature of clinical practice aimed at skill development.[1,2] The academic pressure further increases anxiety among nursing students, particularly due to their fear of failure in exams and evaluations.[3,4]

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Clinical stress also plays a significant role in their overall stress levels. Students often face emotional challenges related to patient care, such as dealing with suffering patients and death.[3,5] Additionally, dynamics within the clinical setting, conflicts with clinical staff, and peer relationships can exacerbate the stress experienced by students.[2,5] Nursing is a demanding and stressful profession.[6,7] Some studies indicate that professional stress among nurses can lead to feelings of inadequacy, self-doubt, low self-esteem, irritability, depression, somatic illnesses, sleep disorders, and burnout.[7,8] For nursing students, emotion regulation is crucial for stress management, maintaining mental health, and delivering effective patient care. The rigorous academic requirements, clinical training, and emotional investments associated with nursing education necessitate the development of emotion regulation skills. Research indicates that when nursing students develop effective emotion regulation skills, it can significantly reduce the stress and anxiety they commonly experience.[9] Mindfulness-Based Stress Reduction (MBSR), which incorporates mindfulness meditation and yoga, can help nursing students enhance their awareness, enabling them to manage stress during their education and in future practice. This, in turn, can lead to improved patient care.[10,11] Mindfulness-based practices serve as a tool for nursing students navigating challenging educational environments, assisting them in stress management and emotion regulation. Recent studies highlight the increasing interest in mindfulness-based practices across various groups for managing stress and enhancing emotion regulation strategies. Mindfulness practices, which focus on staying present, have been reported to mitigate stress responses and support emotional healing. Research has determined that mindfulness-based practices reduce perceived stress levels.[12–14] These practices, conducted with diverse sample groups, support the regulation of emotional responses.[15,16]

Aim and Hypothesis

The aim of this study was to examine the effect of the Mindfulness-Based Stress Reduction Program (MBSR) on perceived stress levels and emotion regulation skills among nursing students.

H1: The perceived stress level scores of nursing students in the intervention group participating in the MBSR will decrease compared to those in the control group.

H2: The perceived stress level post-test and follow-up scores of nursing students in the intervention group participating in the MBSR will decrease compared to their pre-test scores.

H3: The emotion regulation strategies of nursing students in the intervention group participating in the MBSR will show positive changes compared to those of nursing students in the control group.

What is presently known on this subject?

- Nursing students face high levels of stress due to challenging clinical and theoretical education. This stress can negatively impact their emotional well-being and academic performance. Emotion regulation skills and stress management are critically important for maintaining mental health. Mindfulness-based interventions, such as MBSR, have been shown in previous research to reduce stress levels and improve emotion regulation skills in various populations, including nursing students.

What does this article add to the existing knowledge?

- This study provides evidence that the eight-week MBSR program implemented for nursing students can effectively reduce perceived stress levels and enhance positive emotion regulation strategies. Unlike other studies that generally aim to reduce overall stress levels, this study focuses on measurable changes in cognitive emotion regulation strategies, such as increasing acceptance, positive refocusing, and perspective-taking, while reducing rumination and self-blame. Additionally, improvements observed up to three months after the intervention highlight the sustainable effects of MBSR over time.

What are the implications for practice?

- The results suggest that integrating the MBSR program into the nursing curriculum could significantly enhance students' stress management and emotion regulation skills, both in their academic journey and future professional practice. Including such programs as elective courses or within the content of the Mental Health and Psychiatric Nursing course could provide long-term benefits.

H4: The emotion regulation strategies of nursing students in the intervention group participating in the MBSR will show positive changes in the post-test and follow-up compared to the pre-test.

While several studies have investigated the effects of Mindfulness-Based Stress Reduction (MBSR) programs on nursing students, most have focused primarily on changes in perceived stress levels. The present study contributes to the literature by also examining cognitive emotion regulation strategies, which have received less attention, particularly in nursing education contexts. Furthermore, the intervention was adapted for online delivery in response to the practical constraints of the COVID-19 pandemic. Although not the first of its kind, this study offers valuable insights into how mindfulness-based approaches may support stress management and emotional coping in nursing students under modern educational conditions.

Materials and Method

Type and Design

This randomized controlled study included treatment and control groups, with pre-test, post-test, and follow-up measures. The aim was to evaluate the impact of the Mindfulness-Based Stress Reduction (MBSR) program on nursing students' stress levels and emotion regulation abilities. Using G*Power 3.1.9.4, a two-tailed test with an alpha level of 0.05 and power (1-β) of 0.80 indicated that a minimum of forty participants was needed for a large effect size (Cohen's d=0.8). To account for potential attrition, the sample size was increased to fifty participants, with twenty-five in each group.

Place and Date

The study was conducted between February 2021 and July 2021 at a private university's School of Nursing in Istanbul.

Population and Sample

The target population consisted of second- and third-year nursing students (n=172) from a foundation university. Participants were recruited via email and online announcements and had to meet criteria such as being over 18 years old, having a PSS score of 26 or more, and having no visual or hearing impairments. The Perceived Stress Scale (PSS), a widely used psychological instrument developed by Cohen, Kamarck, and Mermelstein, [17] was used to assess students' perceived stress levels. Based on the Turkish adaptation of the scale, a score of 26 or higher was used as the cut-off to include students with moderate to high stress. This threshold was selected to ensure that participants were experiencing a level of stress suitable for evaluating the effects of the mindfulness intervention. The recruitment process emphasized voluntary participation, confidentiality, and the right to withdraw without consequence. Eligible students were then randomly assigned to intervention or control groups.

In the Turkish nursing education system, clinical placements typically begin in the second year and intensify during the third year. Therefore, second- and third-year students were selected for the study, as they are actively engaged in clinical practice and more likely to experience stress related to clinical settings. First-year students were excluded because they were still in the process of adapting to university life, had not yet started clinical training, and had limited in-person interaction due to COVID-19 restrictions. Fourth-year students were also excluded as they were in the graduation phase, focusing on clinical internships and thesis writing, which made it difficult for them to participate in the 1-month and 3-month follow-up assessments.

Randomization

Participants were randomly allocated to intervention and control groups using a random number table generated by an unbiased individual not involved in the study design or data analysis. A list of students from 1 to 50 was created, and a simple random sampling method was used for allocation. The group assignments were made using the random number generator tool provided at www.random.org, with the following distribution:

- **Intervention group:** 18, 11, 12, 6, 17, 5, 38, 9, 21, 43, 41, 35, 13, 4, 22, 23, 20, 7, 27, 45, 40, 50, 48, 1, 15
- **Control group:** 31, 44, 8, 24, 36, 3, 42, 34, 29, 25, 33, 26, 10, 19, 32, 2, 37, 30, 14, 39, 46, 47, 16, 49, 28.

Due to the COVID-19 pandemic, both groups continued their education in an online environment, which minimized direct interaction and reduced the risk of contamination or group influence. Additionally, statistical analyses were conducted by an independent statistician to ensure objectivity and reduce potential bias.

Data Collection Tools

Data used for the research were collected using the Individual Characteristics Form (ICF), Perceived Stress Scale (PSS), and Cognitive Emotion Regulation Questionnaire (CERQ).

Individual Characteristics Form

According to Arslan, [18] Azak,[19] and Demir and Gündoğan,[20] information on gender, residence area, grade level attained by participants, parents' education level, location of home, and stress levels was included in the questionnaire prepared with 19 questions by the researcher in line with the literature.

Perceived Stress Scale (PSS)

The Perceived Stress Scale (PSS) is a 14-item instrument developed by Cohen, Kamarck, and Mermelstein to assess the degree to which individuals perceive situations in their life as stressful.[17] It is a 5-point Likert-type scale ranging from "Never (0)" to "Very Often (4)." Seven of the items are positively worded and are reverse-coded. The total score defines the overall level of perceived stress, with scores between 11–26 indicating low stress, 27–41 moderate stress, and 42–56 high stress. The Turkish adaptation and validation of the scale was conducted by, [21] demonstrating strong psychometric properties among Turkish university students. In the present study, the Cronbach's alpha coefficient for the PSS was 0.84. Appropriate permission for use was obtained.

Cognitive Emotion Regulation Questionnaire (CERQ)

The Cognitive Emotion Regulation Questionnaire (CERQ) is a 36-item self-report scale developed by Garnefski, Kraaij, and Spinhoven to assess the cognitive strategies individuals use to manage stressful life events.[22] It consists of nine sub-dimensions: self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, and other-blame. Responses are given on a five-point Likert scale ranging from 1 (very untrue of me) to 5 (completely true of me). The Turkish adaptation of the scale was conducted by Tuna and Bozo,[23] who confirmed its validity and reliability in a Turkish student population. In the present study, the Cronbach's alpha coefficient for the CERQ was 0.87. Permission for use of the Turkish version was obtained prior to data collection.

Qualitative Data

In addition to quantitative measures, qualitative data were collected through semi-structured interviews conducted with

Table 1. Categorization of the opinions of nursing students in the intervention group on CERQ

	Positive - negative aspects dual theme					Development theme
CODE	**Coping with stress 1,2**	**Living in the moment 3,4**	**Mindfulness 5,6,7**	**Continuity 8,9**	**Attention 10**	**Application length 11**
*Initial codes						
S1		x	x			
S2	x	x				x
S3	x	x		x		
S4		x	x	x	x	
S5		x		x		
S6		x		x		x

*Initial Codes: 1 Stress management (n=1); 2 Coping with stress (n=1); 3 Living in the moment (n=3); 4 Understanding the emotions (n=1); 5 Recognizing self-potential (n=1); 6 Noticing what has happened (n=1); 7 Noticing what has not been noticed (n=1); 8 Repetitive practices (n=1); 9 Ensuring continuity (n=3); 10 Focusing on practices (n=1); 11 Length of meditation sessions (n=2). CERQ: Cognitive emotion regulation questionnaire.

participants in the intervention group after the completion of the program. The interviews aimed to explore students' perceptions of the program, including its benefits and challenges. The responses were thematically analyzed, and the resulting codes were grouped into categories. The findings of this analysis are presented in Table 1.

Process

During the research design stage, an ID number was obtained from the Office of Management and Budget; ClinicalTrials.gov (ID: NCT05100537) registered the study, which complied with international standards for experimental research. The CONSORT guidelines were followed to ensure transparency and reproducibility during this investigation (Fig. 1).

The Mindfulness-Based Stress Reduction (MBSR) program under this study took less time compared to conventional MBSR courses, as it targeted nursing students who had very busy timetables to enhance accessibility and participation. Each session lasted between 60 and 90 minutes, focusing mainly on body scan meditation, mindful walking, and loving-kindness meditation, which are core mindfulness practices suitable for this modified format.

Ethical Responsibilities

Ethical approval was obtained from Maltepe University Ethics Committee (Decision no: 2021/03-04, Date: 22.01.2021). Participants were informed about the purpose and method of the research, how it would be conducted, that they could withdraw from the research at any time if they wished, that their information would remain confidential, and their questions were answered. Written consent was collected via e-mail, and verbal consent was obtained during the preliminary interview. This study was conducted in accordance with the principles of the Declaration of Helsinki.

Intervention

The intervention consisted of an eight-week Mindfulness-Based Stress Reduction (MBSR) program incorporating mindfulness exercises such as body scan meditation, mindful walking, and loving-kindness meditation (Appendix 1). These activities were chosen based on their proven effectiveness in enhancing mindfulness and reducing stress, as supported by previous studies. The program also included group discussions, allowing participants to reflect on their mindfulness practice experiences and learn more about mindfulness techniques.

While the program was based on the principles of the MBSR model developed by Jon Kabat-Zinn, it did not fully follow the standard MBSR structure. Instead, the structure and content were adapted to meet the needs of nursing students and the practical limitations of online learning during the COVID-19 pandemic. For example, the one-day silent retreat typically included in standard MBSR programs was omitted due to time and delivery constraints. This approach aligns with previous studies demonstrating that modified MBSR programs can remain effective without a retreat component.[24,25]

Participants were asked to maintain weekly logs, recording the duration of daily home practice sessions and noting any significant events during these sessions outside the guided meetings. To ensure consistency and participant engagement in the online environment, specific precautions were taken during the intervention. At the beginning of the program, participants were provided with clear instructions regarding the technical and environmental setup. They were asked to keep their cameras on throughout the sessions, use headphones to minimize external noise, ensure they were in a quiet and private space (preferably alone), and avoid multitasking or engaging with other devices. The facilitator also conducted brief

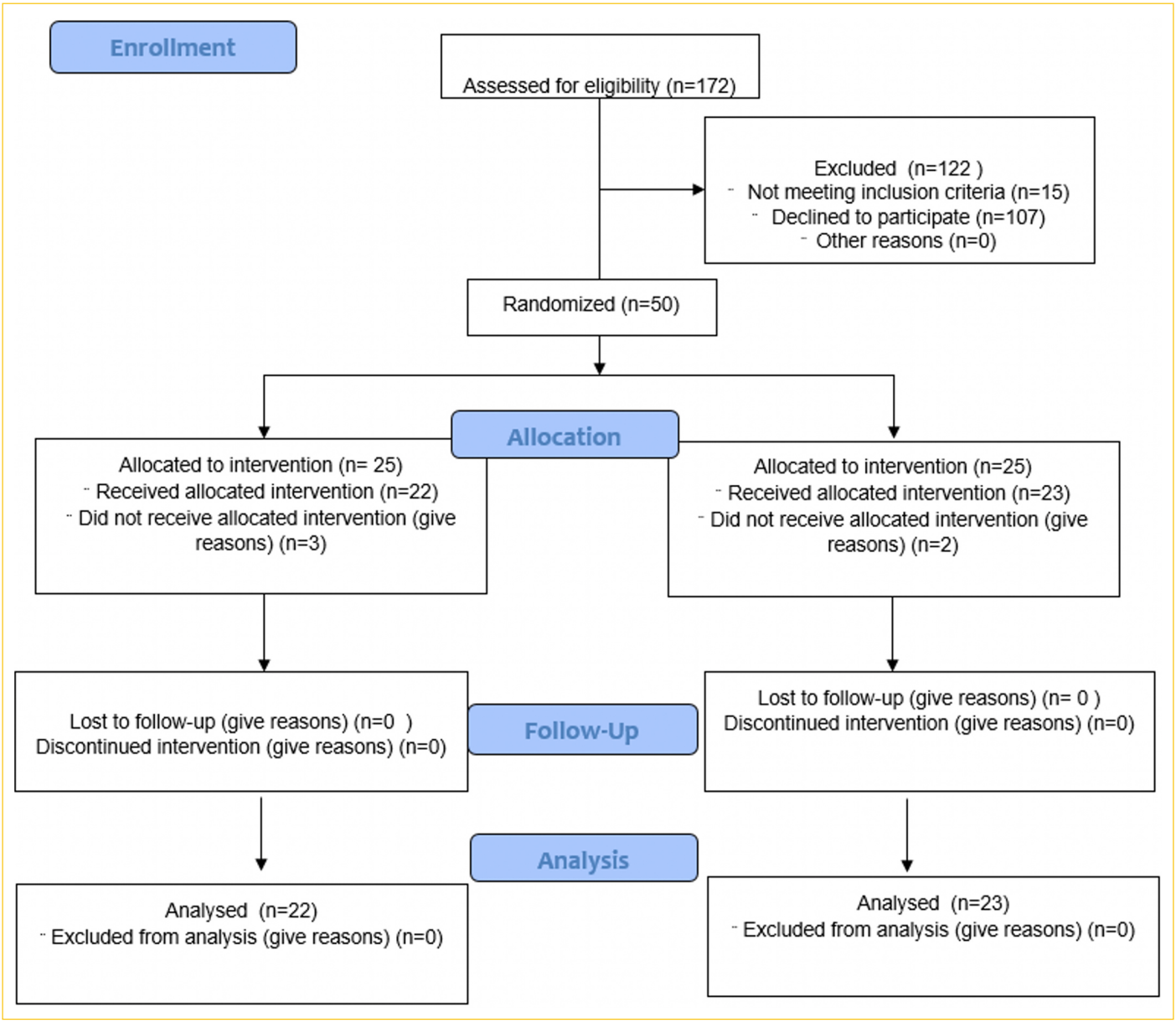

Figure 1. Consort flow diagram.

MBSR: Mindfulness-based stress reduction.

verbal check-ins at the start of each session to confirm that participants were visible and could hear clearly. These measures were taken to simulate a group mindfulness environment as closely as possible despite the online format.

To address potential distress or discomfort from mindfulness exercises, additional support mechanisms were provided, including access to counseling services and a dedicated session to discuss and manage any distressing experiences encountered during the program. The intervention was delivered by the researcher, who had received formal training in mindfulness-based practices and completed certification in MBSR. Although the researcher had not previously conducted mindfulness sessions specifically with students in healthcare fields, their training included practice-oriented modules for educational group settings. The researcher was not teaching or evaluating the participating students during the study period, which helped reduce potential bias.

During the study, three students in the intervention group dropped out after the first session, and two students in the control group completed only the pre-test. The final sample included 22 participants in the intervention group and 23 in the control group.

Control Group

The control group did not receive any intervention during the course of the study but were provided with MBSR program

materials upon completion of the study so that they would receive equal treatment. This helped maintain ethical standards while clearly comparing outcomes between intervention and control groups.

Data Analysis

The research data were analyzed using SPSS 25.0 for Windows. Descriptive statistics provided values for number, percentage, minimum–maximum, mean, and standard deviation. Data normality was assessed using Q-Q plots, with skewness and kurtosis values required to be between ±3 for normal distribution. For normally distributed data, independent t-tests were used to compare two groups, and repeated measures ANOVA was used to compare more than two groups. Bonferroni correction was applied to identify significant differences. The study included 22 participants in the intervention group and 23 in the control group, analyzed at a p=0.05 significance level within a 95% confidence interval.

Regression analysis was utilized to evaluate outcomes from randomized controlled trials and to determine factors influencing perceived stress levels, which was the primary outcome variable. The intervention status (intervention vs. control) was an independent variable in the analysis. Randomization accounted for baseline differences and socio-demographic variables, with analyses adjusted for group variations. Multiple linear regression was employed due to the continuous nature of the primary outcome variable.

The study's credibility depended on the researcher's ability to deliver the program effectively. Prior to the study, the researcher underwent formal training in mindfulness practices and completed a comprehensive MBSR facilitation program. This program included theoretical and practical components, supervised practice sessions, and teaching competence evaluation to ensure quality assurance.

Results

In order to ensure that the treatment and control groups were similar at baseline, various individual characteristics of students in both groups were assessed in detail, as shown in Appendix 2. The scores from the Perceived Stress Scale (PSS) and the Cognitive Emotion Regulation Questionnaire (CERQ) for both groups were analyzed to gain a complete understanding of how the Mindfulness-Based Stress Reduction (MBSR) program affected them.

In addition to the independent t-tests mentioned earlier, an extensive statistical analysis was conducted across all variables and at all time points. This consisted of repeated measures ANOVA in both PSS and CERQ scales for comparing pre-test, post-test, 1-month follow-up, and 3-month follow-up scores within and across groups. The intervention group showed significant improvement in PSS scores from pre-test to post-test, 1-month, and 3-month follow-ups, which indicated a continued decrease in perceived stress levels. There were also significant changes in some of the subscales of the CERQ, including self-blame, acceptance, rumination, and putting into perspective, suggesting an improved ability to regulate emotions.

In the control group, no significant differences were observed in PSS scores over time, indicating that their stress levels remained stable throughout the study period. There was also no significant progress made by the control group in emotion regulation, as shown by CERQ results. These findings were further supported by two-way repeated measures ANOVA, which revealed a strong interaction effect between Time and Group for both PSS and CERQ, indicating that the MBSR program was highly successful in reducing stress among nursing students as well as enhancing their emotion regulation capabilities. All analyses were carried out using SPSS for Windows 25.0, and statistical significance was considered at $p<0.05$. The detailed statistical results for each analysis, including test values and significance levels, are presented in Appendix 3.

Table 1 presents the themes, sub-themes, and initial codes derived from nursing students' reflections on the MBSR program. Two main themes were identified: (1) positive/negative aspects and (2) development. Within the dual theme of positive/negative aspects, five sub-themes emerged: coping with stress, living in the moment, mindfulness, continuity, and attention. The development theme was mainly represented by participants' comments on the length and structure of the intervention.

Discussion

The aim of this study was to examine the effect of the Mindfulness-Based Stress Reduction Program (MBSR) on perceived stress levels and emotion regulation skills among nursing students. The findings revealed that the hypothesis "The perceived stress level scores of nursing students in the intervention group participating in MBSR will decrease compared to nursing students in the control group (H1)" was not supported. This result may be attributed to several factors. First, the relatively small sample size (n=45) may have limited the statistical power to detect significant differences between groups. Second, during the intervention period, both groups were exposed to similar external stressors such as academic workload, online education challenges, and residual pandemic-related anxiety, which may have influenced the control group's stress levels and minimized between-group differences. These points have been acknowledged in the discussion to provide context for the unsupported H1 hypothesis.

However, the hypothesis "The perceived stress level post-test and follow-up scores of nursing students in the intervention group participating in MBSR will decrease compared to their pre-test scores (H2)" was supported. Ratanasiripong et al.[26] randomly divided 89 students in Thailand into three groups: one group received biofeedback, another mindfulness meditation, and the third served as the control group. It was found that the perceived stress levels of students in the mindfulness meditation group decreased. Drew et al.[27] divided first- and third-year students into two groups and applied yoga and mindfulness exercises to the intervention group, reporting that the perceived stress level of the intervention group decreased compared to the control group. Dos Santos et al.[28] conducted a non-controlled study with nursing students, applying a stress reduction program consisting of mindfulness exercises and meditations. It was determined that the perceived stress levels of participants decreased after the program. Similarly, Sparado reported that an eight-week mindfulness program applied to nursing students reduced their perceived stress levels.[29] Burger et al.[30] conducted a randomized controlled study with nursing students, applying mindfulness meditations, and found that stress levels in the intervention group decreased. Studies have shown that mindfulness-based programs reduce stress levels among nursing students.[26,30–40] MBSR, designed to increase self-regulation and personal awareness by staying present in the moment during negative situations, is thought to reduce perceived stress levels.

Based on the study findings, the hypotheses "The emotional regulation strategies of nursing students in the intervention group participating in MBSR will differ from those of nursing students in the control group (H3)" and "The emotional regulation strategies of nursing students in the intervention group participating in MBSR will differ in post-tests and follow-ups compared to pre-tests (H4)" were supported. Lee et al.[41] found that as mindfulness levels increased among nursing students, the use of negative emotional regulation strategies decreased, aligning with the study's findings. Li and Qin conducted a randomized controlled study with university students and found that after applying mindfulness exercises to the intervention group, the use of rumination and blaming others as emotional regulation strategies decreased.[42] Demir and Gündoğan observed that after a mindfulness-based cognitive therapy program for university students, the use of negative emotional regulation strategies decreased.[20] Jimenez et al.[43] reported that as mindfulness levels increased among senior university students, the use of positive emotional regulation strategies increased. Gülgez and Gündüz applied a dialectical behavior therapy-based emotional regulation program to university students and found that the use of negative emotional regulation strategies decreased by the end of the program.[44] In the literature, dialectical behavior therapy is regarded as a mindfulness-based approach.[44,45] Rivzi et al.[46] concluded that dialectical behavior therapy-based emotional regulation programs were effective in managing emotional regulation strategies among university students.

One of the aims of MBSR is not to ignore unwanted negative emotions but to help individuals accept both positive and negative emotions. It is thought that mindfulness practices enable the use of positive emotional regulation strategies in negative situations. Qualitative research conducted with students and nurses through MBSR aligns with the findings of this study. Qualitative findings from participant interviews (Appendix 3) provided additional insight into the impact and practicality of the intervention. Many students reported increased awareness of their emotions and stress responses and appreciated the applicability of mindfulness techniques such as body scan and mindful breathing. These strategies were frequently mentioned in the context of clinical practice and personal stress management. However, some participants also expressed difficulties maintaining attention during online sessions and a desire for longer or more interactive content. These insights underscore the value of incorporating student feedback into future program design and suggest that blended or face-to-face formats may enhance engagement.

Van der Riet et al.[47] found that MBSR improved focus and self-awareness. Tarrasch stated that participants' awareness of their emotions, thoughts, and behaviors increased in his study.[48] Ögel[45] reported that mindfulness-based practices improved focus and supported stress management skills. Dos Santos et al.[28] reported that participants stated their focus durations and mindfulness levels increased, and their stress levels decreased after the program. Sparado found that nursing students expressed the need for continuity of mindfulness practices to maintain effectiveness and noted that their awareness, focus duration, and stress management skills increased.[29] Sears et al.[49] found that while some students had doubts about the effectiveness of meditations without continuity, faced challenges with focusing, and reported positive improvements such as increased attention and mindfulness levels, stress levels decreased overall.

Limitations

This study has several limitations that should be acknowledged. First, the relatively small sample size may have reduced the statistical power to detect between-group differences. Second, the absence of a full-day silent retreat, an essential component of the standard MBSR curriculum, may have influenced the intervention's overall impact. Third, the

program was delivered online, which might have affected the depth of engagement and reduced the interpersonal dynamics typically observed in face-to-face sessions. Fourth, both data collection and intervention delivery were carried out by the same researcher, which introduces the potential for bias, despite efforts to standardize procedures. Finally, the study's follow-up period was limited to three months, preventing the assessment of long-term effects. These limitations have been clearly stated to provide context for interpreting the findings and to guide future research.

Conclusion

This study highlights the positive impact of the Mindfulness-Based Stress Reduction (MBSR) program on nursing students' perceived stress levels and cognitive emotion regulation strategies. Despite the lack of significant differences between the intervention and control groups in PSS scores, improvements were observed within the intervention group, particularly in reducing self-blame and rumination while increasing acceptance, positive refocusing, and perspective-taking. Feedback from participants also emphasized the program's benefits in enhancing present-moment awareness and stress coping skills, though concerns about the need for continued practice and session duration were noted. Based on these findings, it is recommended that MBSR programs be integrated into nursing curricula as elective or core components to foster emotion regulation and stress management skills from the early stages of nursing education. Future research should focus on larger sample sizes and comparative analyses with alternative programs to better support the emotional well-being of nursing students.

Ethics Committee Approval: The study was approved by the Maltepe University Ethics Committee (no: 2021/03-04, date: 22/01/2021).

Informed Consent: Informed consent was obtained from all participants.

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Appendix 1. MBSR program content

	Session content	Aim and objective
Week 1		
60–90 min	Getting to know each other, introduction to the program, and basic concepts	To meet the participants and introduce the mindfulness program and its main components
The participants were met and their expectations from the program were learned. Information was given on how the 8-week program would progress. The basic concepts of the program such as the definition of mindfulness, focus, meditation, and awareness were discussed. The raisin meditation was applied to learn the awareness of daily life, which is the basic discipline of the mindfulness program. At the end of the meditation, participants shared their experiences.		
Homework: Performing the daily tasks (brushing teeth, taking a shower, drinking tea and coffee, etc.) during the week with awareness, as in the raisin meditation.		
Week 2		
60–90 min	Body awareness	Developing body awareness in participants, encouraging them to recognize and accept their bodily sensations
Their experiences with last week's homework were discussed. A 40-minute Body Scan Meditation was performed. Participants commented on their experience at the end of the meditation		
Homework: Having a mindful walk for 15–30 minutes every weekday without a special destination.		
Week 3		
60–90 min	Mindful movement, mindful breath	Increasing movement and breath awareness in daily life
The participants spoke about their homework for the previous week. Movement Awareness meditation, Breathing Space Awareness meditation, and Attention Management exercise with the 5 senses were performed. At the end of the meditations, the participants shared their experiences.		
Homework: Watching the water boil in the kettle.		
Week 4		
60–90 min	Mindful thinking, self-love, and self-compassion	Being aware of the thoughts and of the things happening in the environment in daily life, helping participants treat themselves kindly and be aware of their needs.
The participants shared their ideas about last week's homework. Sounds-thoughts meditation and loving kindness meditation for self-compassion were performed. Participants shared their experiences when the session ended.		
Homework: Consciously changing the place you sit at home, at school, and at work every day.		
Week 5		
60–90 min	Coping with difficult emotions	Helping participants cope with the difficulties encountered in daily life by increasing their coping skills
Their experiences with last week's homework were discussed. Difficulty meditation, self-compassion, and shame meditation were applied. At the end of the meditations, the participants shared their experiences.		
Homework: Plant seeds or flowers		
Week 6		
60–90 min	Coping with stress	Helping individuals understand stress, be aware of the stresses they experience in daily life, and gain effective coping methods
The participants spoke about their homework for the previous week. A short body scan and breathing space exercises were done. The methods of coping with stress were discussed with each of the participants. At the end of the meditations, the participants commented on their experiences.		
Homework: Writing a letter to yourself		
Week 7		
60–90 min	Being stuck in the past or living in the present?	Helping participants reduce their negative thoughts about themselves, accept the self, and find peace
The participants shared their opinions about last week's homework. Friendship meditation, soften your attitude towards yourself meditation was performed. Participants commented on their experiences at the end of the meditations.		
Homework: Doing a favor to a random person		
Week 8		
60–90 min	Mindful breath, mindful movement, evaluation of the program	Remembering what has been learned, getting feedback about the program
The participants spoke about their homework for the previous week. Breathing meditation and awareness in movement meditation were applied. Feedback was received about the achievements of the program, its shortcomings, and what can be done to increase its effectiveness.		

MBSR: Mindfulness-based stress reduction

Appendix 2. Individual characteristics of the patients (n=45)

Variables	Intervention		Control		Test value	p
	n	%	n	%		
Gender						
Female	21	95.5	22	95.7	0.001**	0.974
Male	1	4.5	1	4.3		
Grade						
2	10	45.5	16	69.6	2.680**	0.136
3	12	54.5	7	30.4		
Longest area of residence						
Village	2	9.1	2	8.7	1.384**	0.779
District	6	27.3	4	17.4		
City	5	22.7	4	17.4		
Metropolitan	9	40.9	13	56.5		
Education level of mother						
Illiterate	0	0.0	2	8.7	3.094**	0.425
Primary School	16	72.7	12	52.2		
High School	5	22.8	8	34.8		
University	1	4.5	1	4.3		
Education level of father						
Primary School	10	45.5	13	56.5	3.452**	0.164
High School	11	50.0	6	26.1		
University	1	4.5	4	17.4		
Employment status						
Employed	1	4.5	1	4.3	0.001**	0.974
Unemployed	21	95.5	22	95.7		
Place of residence						
Private dorm	3	13.6	0	0.0	3.226**	0.311
Student house	1	4.5	2	8.7		
With family	18	81.9	21	91.3		
A diagnosed psychiatric disorder						
Yes	1	4.5	0	0.0	1.069**	0.489
No	21	95.5	23	100.0		
Stress						
No (≤5)	10	45.5	11	47.8	0.025**	0.873
Yes (>5)	12	54.5	12	52.2		
Economic status						
Income equal to expenses	20	90.9	21	91.3	0.002**	0.963
Income greater than expenses	2	9.1	2	8.7		
Physical condition						
Fair	2	9.1	4	17.4	0.911**	0.758
Good	15	68.2	13	56.5		
Very Good	5	22.7	6	26.1		
Mental health status						
Poor	1	4.5	4	17.4	3.352**	0.359
Fair	6	27.3	9	39.1		
Good	13	59.1	9	39.1		
Very Good	2	9.1	1	4.3		
Academic achievement						
Fair	6	27.3	5	21.7	0.413**	0.859
Good	14	63.6	15	65.3		
Very Good	2	9.1	3	13.0		

Appendix 2. Cont.

Variables	Intervention		Control		Test value	p
	n	%	n	%		
Studying Nursing was my decision						
Yes	19	86.4	23	100.0	3.360**	0.109
No	3	13.6	0	0.0		
I love my profession						
Yes	21	95.5	22	95.7	0.001**	0.974
No	1	4.5	1	4.3		
School life satisfaction						
Very dissatisfied	1	4.5	0	0.0	1.346**	0.650
Somewhat satisfied	11	50.0	14	60.9		
Very satisfied	10	45.5	9	39.1		
Relatives						
No	1	4.5	2	8.7	0.311**	0.577
Yes	21	95.5	21	91.3		
Friends						
No	6	27.3	3	13.0	1.423**	0.284
Yes	16	72.7	20	87.0		
Total	22	100.0	23	100.0		

**: Independent t-test.

Appendix 3. Comparison of the PSS and CERQ sub-dimension pre-test, post-test, 1-month, and 3-month follow-up scores of the nursing students in the intervention and control groups

	Pre-test (1)		Post-test (2)		1-Month (3)		3-Month (4)		Test value	p	Bonferroni
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
Perceived stress scale											
Intervention	29.18	8.54	21.27	6.99	19.86	7.17	22.68	11.39	6.051***	0.001*	1>2,1>3,1>4
Control	28.04	7.41	28.08	7.92	28.13	8.83	29.39	8.70	2.763***	0.051	
Test value	0.478**	-1.260**	-1.358**	0.428**							
p	0.635	0.214	0.181	0.671							
Cognitive emotion regulation questionnaire											
Self-blame											
Intervention	9.90	3.08	8.18	2.42	7.36	1.94	7.59	2.03	5.368***	0.002	1>3, 1>4
Control	10.39	3.66	9.60	3.49	10.26	3.67	9.39	3.35	0.526***	0.666	
Test value	-0.476**	-1.583**	-3.288**	-2.164**							
p	0.636	0.121	0.002*	0.036							
Acceptance											
Intervention	10.68	2.47	14.59	2.48	15.54	2.48	10.95	2.85	31.169***	0.000	3>1, 2>1,4>1
Control	10.95	2.93	11.43	3.21	12.17	3.22	11.13	2.51	0.710***	0.549	
Test value	-0.339**	3.673**	3.914**	-0.220**							
p	0.736	0.001	0.000	0.827							
Rumination											
Intervention	12.95	3.56	9.13	2.74	9.00	2.81	8.54	2.57	17.949***	0.000	1>2,1>3,1>4
Control	13.17	3.27	13.00	3.63	13.04	3.81	11.82	3.35	0.777***	0.511	
Test value	-0.215**	-4.151**	-3.891**	-3.668**							
p	0.831	0.000	0.000	0.001							
Positive refocusing											
Intervention	9.72	2.37	11.04	3.79	11.68	4.14	11.09	3.59	1.290***	0.286	
Control	9.56	3.52	11.73	4.19	11.86	4.28	11.17	4.35	1.784***	0.159	
Test value	0.180**	-0.581**	-0.149**	-0.070**							
p	0.858	0.564	0.882	0.945							
Refocus on planning											
Intervention	13.22	3.11	13.72	3.34	11.68	4.14	12.90	3.57	0.240***	0.868	
Control	13.08	3.48	14.82	3.74	11.86	4.28	14.17	3.99	1.636***	0.190	
Test value	0.142**	-1.036**	-0.149**	-1.118**							
p	0.888	0.306	0.882	0.270							
Positive reappraisal											
Intervention	12.45	2.84	18.77	1.020	18.54	1.76	15.90	3.23	38.082***	0.000	1<2,1<3
Control	13.04	3.97	14.04	3.58	14.56	3.51	13.91	4.03	0.700***	0.555	
Test value	-0.570**	5.956**	4.767**	1.826**							
p	0.572	0.000	0.000	0.075							
Putting into perspective											
Intervention	11.59	3.11	16.54	2.38	17.04	2.51	11.72	3.71	22.248***	0.000	1<2,1<3,2
Control	11.95	3.61	12.86	3.58	12.78	3.84	11.60	4.09	0.581***	0.629	
Test value	-0.363**	4.031**	4.376**	0.102**							
p	0.718	0.000	0.000	0.920							
Catastrophizing											
Intervention	8.36	3.81	6.81	2.70	6.81	3.40	8.22	3.33	1.645***	0.188	
Control	8.65	3.78	8.00	3.66	7.86	4.04	7.30	3.77	0.454***	0.715	
Test value	-0.255**	-1.226**	-0.941**	0.868**							
p	0.800	0.227	0.352	0.390							
Other-Blame											
Intervention	8.00	2.76	7.09	3.42	7.13	3.66	8.13	2.98	0.686***	0.564	
Control	8.17	2.62	8.39	3.97	8.47	2.92	8.39	3.53	0.032***	0.992	
Test value	-0.217**	-1.174**	-1.361**	-0.261**							
p	0.829	0.247	0.181	0.796							

: Independent t-test; *: Variance analysis for the repeated measurements(1) pretest (2) post-test (3) 1-month follow-up (4) 3-month follow-up. PSS: Perceived stress scale; CERQ: Cognitive emotion regulation questionnaire; SD: Standard deviation.