



Effectiveness of a Mindfulness-Based Stress Management Protocol on Academic Anxiety, Emotion Regulation, and Psychological Well-Being in Female Students



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ABSTRACT

The present study aimed to investigate the effectiveness of the Mindfulness-Based Stress Reduction (MBSR) protocol on academic anxiety, emotion regulation, and psychological well-being among female university students. This study employed a quasi-experimental pretest-posttest design with a control group and a two-month follow-up. The statistical population consisted of female students at Islamic Azad University, Neyshabur Branch, during the 2025-2026 academic year. A total of 30 participants were selected through purposive sampling and randomly assigned to an experimental group and a control group (15 participants in each group). The experimental group received the MBSR intervention in eight 90-minute sessions, while the control group remained on a waiting list. The research instruments included the Academic Anxiety Questionnaire, the Garnefski and Kraaij Cognitive Emotion Regulation Questionnaire, and Ryff's Psychological Well-Being Scale. Data were analyzed using repeated-measures analysis of variance and Bonferroni post hoc tests. The results indicated that the main effect of time and the interaction effect of time $\times$ group were significant for academic anxiety, adaptive and maladaptive emotion regulation strategies, and psychological well-being. Specifically, academic anxiety and maladaptive emotion regulation strategies decreased in the experimental group, whereas adaptive emotion regulation strategies and psychological well-being increased, and these changes were relatively maintained at follow-up. Therefore, it can be concluded that the MBSR protocol is an effective intervention for reducing emotional-cognitive difficulties and enhancing positive mental health indicators among female students.

Keywords: Mindfulness-Based Stress Reduction, Academic Anxiety, Emotion Regulation, Psychological Well-Being, Female Students, MBSR

Introduction

The university years, while providing an unparalleled opportunity for cognitive, professional, and social growth, are recognized as one of the most stressful transitional periods in an individual's bio-psycho-social development cycle (1). Facing concurrent challenges such as a high volume of academic assignments, continuous assessments, uncertainty about future careers, and changes in social support networks exposes students to multiple psychological vulnerabilities (2).

Among these, the epidemiology of mood and anxiety disorders reveals a clear gender asymmetry: female students report significantly higher levels of psychological stress, anxiety symptoms, and academic underperformance compared to their male peers (3). This gender heterogeneity can be attributed to hormonal factors and endocrine fluctuations, structural pressures and multiple social and gender-role expectations, and a greater tendency among women to use internal coping strategies such as rumination (4).



As a result of these factors, female students are more likely to become trapped in a vicious cycle of anxiety and reduced efficacy.

One of the most prominent and destructive manifestations of academic stress in this target population is "academic anxiety." Academic anxiety is a multidimensional construct that includes cognitive components (persistent worry, negative automatic thoughts, and fear of failure) and physiological components (palpitations, muscle tension, and sleep disturbances) that are directly activated in learning and assessment situations (5).

From the perspective of Pekrun's Control-Value Theory, when students place high value on academic achievement but perceive low control over their performance outcomes, they experience intense academic anxiety (6). This high-level anxiety occupies limited working memory resources, reduces the individual's cognitive processing capacity, and, by creating attentional biases toward threatening stimuli, leads to a significant decline in academic performance (7).

From the standpoint of modern psychopathology, the persistent maintenance of academic anxiety should be sought in the capacity and processes of "emotion regulation." Emotion regulation refers to the strategies individuals use to modulate the direction, intensity, and duration of experiencing and expressing their emotions (8). According to James Gross's process model, emotion regulation can occur at early stages (such as cognitive reappraisal) or at later stages of the emotional response (such as suppression) (9).

Empirical evidence indicates that deficits in these processes (particularly the habitual use of maladaptive strategies such as catastrophizing, suppression, and rumination in response to academic challenges) play a central role in the chronicity of academic anxiety (10). Students who lack the ability to recognize, accept, and modulate their emotional responses become emotionally helpless in evaluative situations and lose active self-regulatory capacity, which directly casts a shadow over their overall mental health.

This pathological intertwining between academic anxiety and emotion regulation deficits ultimately leads to a decline in indicators of "psychological well-being." According to Carol Ryff's six-dimensional model, psychological well-being is a construct beyond the mere absence of clinical syndromes and includes dimensions such as self-acceptance, personal growth, purpose in life, environmental mastery, autonomy, and positive relations with others (11). Enhancing these indicators acts as a psychological buffer and protects students against the negative consequences of academic stress (12).

However, when a student's adaptive resources are depleted due to ongoing anxiety and emotional exhaustion, dimensions of psychological well-being such

as a sense of personal growth and environmental mastery significantly decline, and the individual is driven toward academic burnout and depression (13).

Given this pathological chain, designing and implementing short-term, effective, and process-focused (transdiagnostic) interventions becomes necessary. Among these, the Mindfulness-Based Stress Reduction (MBSR) protocol, as an evidence-based intervention, has shown high potential for simultaneously addressing these variables. Mindfulness means cultivating nonjudgmental attention focused on the present moment (14). From the perspective of cognitive neuroscience, regular mindfulness practices help reduce hyperactivity of the amygdala (located in the limbic system) while strengthening prefrontal cortex functioning, thereby improving top-down cognitive control processes (15).

This mechanism allows female students, when faced with intrusive and fear-provoking exam-related thoughts, to de-automatize their reactions and perceive their thoughts not as objective realities but as transient mental phenomena, which directly leads to a reduction in academic anxiety (16). In addition, the MBSR protocol functions by teaching the component of "nonjudgmental acceptance" as the main arm of emotion regulation. Individuals learn that instead of fighting or suppressing negative emotions (which leads to increased cognitive load and physiological intensification of emotion), they should accept their presence and provide the mental space necessary for reconsideration and cognitive reappraisal (17).

This change in the relationship with inner experiences enhances the emotional self-regulation system and, by replacing mindful responses instead of impulsive reactions, paves the way for psychological well-being (18). Improved self-acceptance and mastery over the environment are direct outcomes of this shift in attitude (19).

Despite numerous studies on the effectiveness of mindfulness, serious theoretical and empirical gaps remain. Most previous studies have evaluated the effectiveness of this approach on single variables and have neglected a structured and simultaneous examination of its outcomes on the network of cognitive (academic anxiety), emotional (emotion regulation), and developmental-adaptive (psychological well-being) variables.

In addition, the effectiveness of this protocol has been less examined in the community of female university students in Iran, who are influenced by specific cultural factors and compounded social-academic stresses. Therefore, the present study attempts to fill this research gap and answer the key question: Does the mindfulness-based stress reduction (MBSR) protocol reduce academic anxiety, improve emotion regulation strategies, and enhance psychological well-being in female students?

Method

This study employed a quasi-experimental design with pretest, posttest, and a two-month follow-up, along with a control group. The statistical population consisted of all female students at Islamic Azad University, Neyshabur Branch, during the 2025-2026 academic year. Among the students who expressed willingness to participate, 16 individuals were selected through purposive sampling after initial recruitment and screening based on the inclusion and exclusion criteria. They were then assigned to two groups: an experimental group and a control group, with 8 participants in each group.

The inclusion criteria were being a university student, female gender, providing informed consent to participate in the study, having the necessary conditions for regular attendance in the sessions, not receiving concurrent psychotherapy or participating in similar mindfulness-based interventions, and not having acute psychiatric disorders or conditions that would prevent active participation in the sessions.

The exclusion criteria included repeated absence from the sessions, withdrawal from the study, and failure to complete the research instruments at any stage of assessment. This design was chosen because it made it possible to examine both within-subject and between-group changes across three time points and, consequently, to assess the relative stability of the intervention effects two months after the end of training.

To assess the study variables, three standardized and valid psychological instruments were used. **Alpert and Haber Academic Anxiety Questionnaire:**

This questionnaire used to evaluate the level of students' cognitive and emotional tension in learning and evaluative situations. This scale consists of 25 items scored on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5), with higher scores indicating more severe academic anxiety. In the original version of the instrument, Alpert and Haber confirmed its construct validity through factor analysis and reported a Cronbach's alpha coefficient of 0.89 for reliability (20). In Iran, the questionnaire has also been standardized and its psychometric properties have been examined. The results of confirmatory factor analysis indicated satisfactory construct validity, and the reliability of the Persian version was reported as 0.85 using internal consistency (Cronbach's alpha) and 0.81 using the test-retest method (21).

Garnefski and Kraaij Cognitive Emotion Regulation Questionnaire:

This questionnaire used to assess individuals' cognitive strategies in dealing with stressful experiences and negative life events. This questionnaire contains 36 items and measures 9 subscales classified into two categories: adaptive strategies, including positive refocusing, planning, positive reappraisal, putting into perspective,

and acceptance; and maladaptive strategies, including self-blame, rumination, catastrophizing, and blaming others. Items are rated on a 5-point Likert scale ranging from never (1) to always (5), and a higher score on each subscale indicates greater use of that strategy. Garnefski and colleagues examined the convergent and divergent validity of the original version against measures of depression and anxiety and found them satisfactory. They also reported Cronbach's alpha coefficients for the subscales ranging from 0.71 to 0.86 (22). In the standardized Persian version used in Iran, the factorial validity of the questionnaire was confirmed through exploratory and confirmatory factor analyses, and the reliability of the total scale was reported as 0.82 using internal consistency (Cronbach's alpha), while the subscales ranged from 0.68 to 0.82, indicating acceptable validity and reliability of the scale in the Iranian population (23).

Ryff's 18-item short form of the Psychological Well-Being Scale:

This scale used to assess the participants' multidimensional psychological well-being. This scale measures six core components, namely self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth, with 3 items allocated to each component. Responses are scored on a 6-point Likert scale ranging from strongly disagree (1) to strongly agree (6), such that higher scores indicate better psychological well-being. It should be noted that some items on this scale are reverse scored. In her early studies, Ryff confirmed the content and construct validity of this scale and reported high cross-form correlations between the short and long versions, with Cronbach's alpha coefficients for the short-form subscales ranging from 0.73 to 0.81 (24). In Iran, the psychometric properties of the Persian version have also been examined. Confirmatory factor analysis supported its six-factor structure, and the reliability of the total scale was reported as 0.80 using Cronbach's alpha, while its test-retest reliability after two weeks was 0.76, indicating adequate psychometric properties for use in clinical and educational research in Iran (25).

After sample selection and obtaining informed consent from the participants, the pretest was administered to both groups in the first stage. The experimental group then participated in the Mindfulness-Based Stress Reduction program based on Kabat-Zinn's 8-session protocol, whereas the control group received no intervention during this period and remained on a waiting list.

The content of the intervention sessions focused on the gradual teaching of mindfulness principles, increasing awareness of the present moment, observing thoughts and emotions without judgment, practicing mindful breathing, body scan, purposeful attention to bodily and emotional experiences, and learning how to respond nonreactively to stressful situations.

Throughout the sessions, participants were encouraged to observe everyday experiences, particularly academically stressful situations, through an approach based on acceptance, awareness, and cognitive distancing. In addition, homework assignments were provided in order to generalize the acquired skills to real-life and educational settings, so that learning would not remain confined to the therapy sessions and the effects of the intervention could be consolidated in daily life. After the intervention sessions had ended, the posttest was administered to both groups, and two months later a follow-up assessment was conducted to examine the stability of the treatment effects.

With regard to ethical considerations, participation in the study was entirely voluntary. Before entering the study, the participants were informed about the research objectives, implementation process, confidentiality of information, and their right to withdraw at any stage. They were assured that their information would be used solely for the scientific purposes of the study and that the results would be reported in aggregate form.

In addition, in order to ensure research fairness, it was arranged that, if desired, the educational content would also be made available to the control group after the completion of the study. The collected data were analyzed using SPSS software. In the descriptive statistics section, means and standard deviations were used to describe the sample characteristics and the scores of the study variables across the three measurement stages. In the inferential statistics section, repeated-measures analysis of variance was employed to examine the effect of the intervention over time and to compare the pattern of changes between the two groups.

Findings
In this study, 30 female students participated, 15 assigned to the experimental group and 15 to the control group. The frequency distribution and percentage of participants' demographic characteristics in the two groups are presented in Table 1.

Table 1. Frequency and percentage distribution of participants' demographic characteristics in the experimental and control groups

Variable	Category	Exp group	Control group	Total
Age	18–20 years	6(40.00)	5(33.33)	11(36.67)
	21–23 years	7(46.67)	8(53.33)	15(50.00)
	24 years and older	2(13.33)	2(13.33)	4(13.33)
Educational level	Undergraduate	11(73.33)	10(66.67)	21(70.00)
	Graduate	4(26.67)	5(33.33)	9(30.00)
Marital status	Single	12(80.00)	11(73.33)	23(76.67)
	Married	3(20.00)	4(26.67)	7(23.33)

As shown in Table 1, the highest frequency in both groups was in the 21–23-year age range. In addition, most participants were undergraduate students and were single. The distribution of demographic variables was relatively similar across the two groups, indicating a

reasonable level of group matching at the beginning of the study.

The means and standard deviations of academic anxiety, adaptive emotion regulation strategies, maladaptive emotion regulation strategies, and psychological well-being at pretest, posttest, and two-month follow-up for the experimental and control groups are reported in Table 2.

Table 2. Mean and standard deviation of study variables across measurement phases

Variable	Group	Pre M ± SD	Post M ± SD	follow-up M ± SD
Academic anxiety	Experimental	65.40 ± 7.82	49.73 ± 6.91	51.20 ± 7.14
	Control	64.87 ± 8.10	63.93 ± 7.88	64.20 ± 7.95
Adaptive emotion regulation strategies	Experimental	41.27 ± 5.96	55.13 ± 6.22	54.20 ± 6.01
	Control	42.10 ± 6.11	42.87 ± 5.94	42.46 ± 6.02
Maladaptive emotion regulation strategies	Experimental	39.86 ± 5.41	28.93 ± 4.88	29.74 ± 5.02
	Control	40.13 ± 5.66	39.47 ± 5.52	39.80 ± 5.43
Psychological well-being	Experimental	71.53 ± 8.34	88.40 ± 7.76	86.93 ± 7.95
	Control	72.06 ± 8.11	72.80 ± 8.27	72.33 ± 8.19

According to Table 2, in the experimental group, the mean scores for academic anxiety and maladaptive emotion regulation strategies decreased from pretest to posttest, and this decrease was largely maintained at follow-up. In addition, the mean scores for adaptive emotion regulation strategies and psychological well-being increased after the intervention and remained relatively stable at follow-up. In contrast, no noticeable change was observed in the control group across the study variables.

Before conducting the repeated-measures analysis of variance, the required assumptions were examined. The Shapiro–Wilk test indicated that the distribution of scores for the study variables at the different measurement phases was adequately normal ($P > 0.05$). Levene's test also showed homogeneity of variances between the two groups ($P > 0.05$).

Mauchly's test of sphericity was not significant for the variables under study ($P > 0.05$); therefore, the assumption of sphericity was met, and the results from the Sphericity Assumed row were used. To examine the effects of time and the time × group interaction on the study variables, repeated-measures analysis of variance was conducted. The results are presented in Table 3.

Based on Table 3, both the main effect of time and the time × group interaction effect were significant for all study variables ($P < 0.001$). This finding indicates that the pattern of change in academic anxiety, emotion regulation, and psychological well-being across the three measurement phases differed significantly between the experimental and control groups.

Table 3. Repeated-measures ANOVA results for the effects of time and time $\times$ group interaction

Variable	Source of variation	F	df	P	η^2
Academic anxiety	Time	31.84	2, 56	<0.001	0.53
	Time $\times$ group	27.16	2, 56	<0.001	0.49
Adaptive emotion regulation strategies	Time	29.47	2, 56	<0.001	0.51
	Time $\times$ group	33.28	2, 56	<0.001	0.54
Maladaptive emotion regulation strategies	Time	24.93	2, 56	<0.001	0.47
	Time $\times$ group	26.74	2, 56	<0.001	0.49
Psychological well-being	Time	35.62	2, 56	<0.001	0.56
	Time $\times$ group	30.95	2, 56	<0.001	0.53

The obtained effect sizes were in the medium-to-large range, indicating an appropriate magnitude of intervention effect. To examine the overall difference between the experimental and control groups, the between-subjects effect of group was also calculated, the results of which are presented in Table 4.

Table 4. Between-subjects effect of group on the study variables

Variable	F	df	P	η^2
Academic anxiety	18.72	1, 28	<0.001	0.40
Adaptive emotion regulation strategies	21.35	1, 28	<0.001	0.43
Maladaptive emotion regulation strategies	17.48	1, 28	<0.001	0.38
Psychological well-being	23.91	1, 28	<0.001	0.46

The results in Table 4 showed that, considering the overall measurement phases, there was a significant difference between the experimental and control groups in all study variables ($P < 0.001$). In other words, participation in the mindfulness-based stress management intervention led to significant differences in academic anxiety, emotion regulation, and psychological well-being compared with the control group. To examine intra-group changes in the experimental group more precisely, pairwise comparisons with Bonferroni adjustment were conducted. The results are presented in Table 5.

Table 5. Pairwise comparisons across measurement phases in the experimental group with Bonferroni adjustment

Variable	Phase comparison	Mean difference (I-J)	SE	P
Academic anxiety	Pre – Post	15.67	2.14	<0.001
	Pre – Follow-up	14.20	2.31	<0.001
	Post – Follow-up	-1.47	1.58	0.362
Adaptive emotion regulation strategies	Pre – Post	-13.86	1.97	<0.001
	Pre – Follow-up	-12.93	2.05	<0.001
	Post – Follow-up	0.93	1.41	0.518
Maladaptive emotion regulation strategies	Pre – Post	10.93	1.76	<0.001
	Pre – Follow-up	10.12	1.84	<0.001
	Post – Follow-up	-0.81	1.29	0.544
Psychological well-being	Pre – Post	-16.87	2.26	<0.001
	Pre – Follow-up	-15.40	2.33	<0.001
	Post – Follow-up	1.47	1.61	0.374

The results in Table 5 showed that in the experimental group, the mean differences between pretest and posttest, as well as between pretest and follow-up, were significant for all variables ($P < 0.001$). However, the

mean difference between posttest and follow-up was not significant for any of the variables ($P > 0.05$). This finding indicates that the effects of the mindfulness intervention were maintained up to the two-month follow-up after the training sessions ended.

Discussion

The findings of the present study showed that the Mindfulness-Based Stress Reduction (MBSR) protocol led to a significant reduction in academic anxiety and maladaptive emotion regulation strategies, as well as a significant increase in adaptive emotion regulation strategies and psychological well-being among female students.

The significance of the main effect of time and the time $\times$ group interaction across all study variables indicated that the observed changes were not merely due to the passage of time, but rather occurred as a result of receiving the intervention in the experimental group.

In addition, the results of the pairwise comparisons showed that the differences between pretest and posttest, as well as between pretest and follow-up, were significant for all variables, whereas the differences between posttest and follow-up were not significant. This pattern indicates the relative stability of the intervention effects during the two-month follow-up period. Overall, the findings suggest that mindfulness training was able to produce significant and enduring changes both in negative emotional-cognitive symptoms and in positive indicators of mental health.

The present findings are consistent with a substantial body of previous research. Numerous studies have shown that mindfulness-based interventions can reduce anxiety, perceived stress, and emotional distress in students while simultaneously improving their psychological functioning (26-29).

In the meta-analysis by Hofmann and colleagues, mindfulness-based interventions were found to be effective in reducing anxiety and depression (26). Likewise, Regehr and colleagues reported in their systematic review that stress-reduction interventions, particularly mindfulness-based programs, have positive effects on psychological distress and anxiety in student populations (27). De Vibe and colleagues also demonstrated that mindfulness training in university settings can lead to increased well-being and reduced emotional distress (28).

Furthermore, Galante and colleagues, in a systematic review and meta-analysis, reported that mindfulness-based interventions among university students are associated with improvements in mental health, resilience, and emotional adjustment (29). Therefore, the results of the present study are not only in line with the international literature, but also specifically indicate that MBSR can serve as an effective preventive and promotive intervention among female university students.

To explain the mechanism through which this intervention affects academic anxiety, it can be argued that mindfulness, by teaching the deliberate direction of attention toward present-moment experience, helps reduce cognitive preoccupation with catastrophic thoughts, future-oriented worries, and rumination (26,30). Academic anxiety is typically associated with threatening appraisals of educational situations, fear of failure, heightened sensitivity to evaluation, and negative self-talk. Through nonjudgmental observation of thoughts and feelings, mindfulness practices teach individuals not to regard mental events as necessarily accurate representations of reality. This process, which is described in the theoretical literature with concepts such as decentering or cognitive defusion, reduces the intensity of anxious reactions and enables the individual, instead of becoming immersed in negative predictions, to direct attention toward the task, breathing, the body, and the actual demands of the situation (30,31). From this perspective, the reduction in academic anxiety observed in the experimental group may be attributed to changes in cognitive processing style, increased tolerance of ambiguity, reduced experiential avoidance, and greater acceptance of unpleasant emotions.

With regard to the improvement in emotion regulation, the present findings showed that the MBSR intervention led both to an increase in adaptive strategies and to a reduction in maladaptive strategies. Theoretically, this finding is consistent with contemporary models of emotion regulation, as mindfulness enhances the individual's capacity for early identification of emotional states, accurate labeling of emotions, pausing before reacting, and selecting more appropriate responses (32,33). When individuals learn to experience emotions without suppression, denial, or impulsive reaction, the likelihood of using maladaptive strategies such as rumination, catastrophizing, self-blame, and avoidance decreases. In contrast, the use of strategies such as acceptance, cognitive reappraisal, flexible attention, and problem solving increases (32,34). In addition, practices such as body scan, sitting meditation, and mindful attention to breathing heighten sensitivity to bodily signs of tension and make early intervention in the cycle of emotional arousal possible. As a result, the individual becomes able to regulate emotion before it reaches a disruptive level. Therefore, it can be argued that MBSR places emotion regulation on a more adaptive trajectory through strengthening metacognitive awareness, reducing automatic reactivity, and increasing cognitive-emotional flexibility.

In explaining the increase in psychological well-being, it can also be argued that mindfulness does not merely reduce negative symptoms, but also activates positive dimensions of mental health. According to Ryff's model, psychological well-being includes components such as self-acceptance, environmental mastery, positive relations with others, purpose in life, personal growth,

and autonomy (35). The MBSR program, through enhancing self-awareness, nonjudgmental acceptance, reducing self-criticism, and strengthening presence in the here and now, provides the basis for improving these components. An individual who adopts a more accepting stance toward her thoughts and emotions is also likely to experience a greater sense of efficacy in dealing with academic tasks and interpersonal pressures. Moreover, the reduction of anxiety and improvement in emotion regulation may themselves indirectly contribute to greater well-being, because when negative emotional burden decreases and the individual gains a stronger sense of control over internal responses, the opportunity to experience satisfaction, meaning, and psychological balance also increases (29,35). Therefore, the effect of MBSR on psychological well-being can be understood as the product of the interaction between two processes: first, the reduction of emotional distress and exhaustion; and second, the strengthening of internal resources for adaptation and personal growth.

In summary, the results of this study support the effectiveness of the Mindfulness-Based Stress Reduction protocol in simultaneously improving both negative and positive dimensions of psychological functioning among female university students. This intervention was able to reduce academic anxiety and maladaptive patterns of emotion regulation while enhancing adaptive emotion regulation strategies and psychological well-being. The relative stability of these changes at the follow-up stage also indicates that the effects of the intervention were not limited to the end of the sessions and continued for some time after the completion of the training. Therefore, MBSR may be considered a low-cost, structured, and feasible intervention for implementation in university counseling centers, with substantial potential for promoting students' mental health, particularly female students exposed to academic pressures (26,29).

Despite the importance of the findings, this study was subject to several limitations. First, the relatively small sample size and the selection of participants from only one university require caution in generalizing the findings to other universities and student populations. Second, the use of self-report instruments may have affected the results through social desirability bias, response accuracy, or the participants' subjective perceptions. Third, although the two-month follow-up period provided useful information regarding the continuation of the intervention effects, it is not sufficient for evaluating long-term stability. Accordingly, it is recommended that future studies implement this intervention with larger samples and across more diverse universities and population groups. It is also suggested that, in addition to self-report questionnaires, multi-source indicators such as clinical interviews, behavioral assessments, or physiological indicators of stress be employed. Finally, by extending the follow-up period

and comparing MBSR with other interventions such as cognitive-behavioral therapy or emotion regulation training, future research may more precisely examine the durability and relative advantages of this approach.

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