Journal Website

Article history:
Received 03 August 2025
Revised 08 December 2025
Accepted 16 December 2025
Published online 01 March 2026

Iranian Journal of Neurodevelopmental Disorders

Volume 5, Issue 1, pp 1-9

Journal of Neurodevelopmental Disorder

E-ISSN: 2980-9681

Effectiveness of the Mindfulness-Based Stress Reduction Program on Quality of Life and Stress in Individuals with Panic Disorder

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Mashhadi Ebrahim, Z., Nikroo, S., Atashani Kouchesfahani, A., Hasannezhad Shahsavandi, Z., & Barekat, A. (2026). Effectiveness of the Mindfulness-Based Stress Reduction Program on Quality of Life and Stress in Individuals with Panic Disorder. *Iranian Journal of Neurodevelopmental Disorders*, *5*(1), 1-9. https://doi.org/10.61838/kman.jndd.664

A B S T R A C T

Purpose: The objective of this study was to evaluate the effectiveness of a Mindfulness-Based Stress Reduction (MBSR) program on reducing stress and improving quality of life among individuals diagnosed with panic disorder.

Methods and Materials: This quasi-experimental study utilized a pretest–posttest design with a control group and included 40 participants diagnosed with panic disorder who were recruited through convenience sampling from a psychotherapy center in Tehran in 2025. Participants were randomly assigned to either the experimental group, which received eight weekly sessions of MBSR, or the control group, which received no intervention. Data were collected using the Perceived Stress Scale and the WHOQOL-BREF quality-of-life questionnaire. Statistical analyses were performed in SPSS 26 using repeated-measures ANOVA, with assumptions of normality, sphericity, and homogeneity tested prior to main analyses.

Findings: Repeated-measures ANOVA indicated significant time effects for both quality of life ($F = 43.16$, $p < .001$, $\eta^2 = .662$) and stress ($F = 25.35$, $p < .001$, $\eta^2 = .535$), along with significant group effects for quality of life ($F = 7816.80$, $p < .001$, $\eta^2 = .897$) and stress ($F = 3083.40$, $p < .001$, $\eta^2 = .761$). Significant time × group interactions were observed for quality of life ($F = 35.73$, $p < .001$, $\eta^2 = .619$) and stress ($F = 31.15$, $p < .001$, $\eta^2 = .586$). Bonferroni post hoc tests revealed significant improvements from pretest to posttest and pretest to follow-up in both outcomes ($p < .001$).

Conclusion: The findings indicate that mindfulness-based stress reduction is an effective intervention for lowering stress and improving quality of life in individuals with panic disorder, with beneficial effects sustained at follow-up.

Keywords: *Mindfulness-Based Stress Reduction, panic disorder, stress, quality of life, psychological intervention*

1. Introduction

Anxiety disorders represent one of the most prevalent categories of mental health conditions worldwide, affecting functioning, well-being, and overall quality of life across diverse age groups and cultural contexts. Among these disorders, panic disorder stands out due to its sudden, intense physiological and cognitive symptoms that significantly impair everyday functioning and subjective well-being. Contemporary clinical literature underscores that disruptions in emotional regulation, heightened physiological reactivity, and dysfunctional cognitive appraisals contribute to the persistence of panic-related symptoms, making treatment a complex and multifaceted challenge (DeGeorge & Johnson, 2022). Although pharmacotherapy remains a common intervention approach, long-term reliance on medication alone has been associated with adverse effects and variable outcomes, prompting the need for integrative, non-pharmacological treatments that target both psychological and physiological dimensions of panic disorder (Hoge et al., 2023). The global increase in stress-related disorders further intensifies the demand for intervention models that can simultaneously address emotional, cognitive, and somatic dysregulation.

Mindfulness-based interventions have gained extensive empirical support as promising approaches for individuals suffering from anxiety disorders, including panic disorder. Early conceptualizations of mindfulness emphasized intentional, non-judgmental awareness of present-moment experiences, which subsequently evolved into structured therapeutic models such as Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT). These interventions aim to enhance cognitive flexibility, decrease automatic reactivity to distressing thoughts and sensations, and foster adaptive coping strategies. Evidence from systematic reviews and meta-analyses highlights the capacity of mindfulness programs to reduce emotional reactivity, modulate neural pathways associated with fear and stress processing, and enhance overall psychological resilience (Calderone & Masi, 2024). Despite the diversity of mindfulness-based programs, MBSR remains one of the most widely validated interventions in clinical populations due to its structured curriculum, reproducibility, and integrative focus on cognitive, emotional, and physiological processes (Shaw & Jones, 2018).

Recent research continues to expand understanding of how mindfulness supports emotional stabilization in individuals with anxiety disorders. Neurobiological findings reveal that mindfulness practices generate measurable changes in brain regions implicated in attention regulation, self-referential processing, and autonomic control—most notably the prefrontal cortex, anterior cingulate cortex, and amygdala (Calderone & Masi, 2024). These changes collectively contribute to a reduction in fear-based responding, improved emotional regulation, and enhanced tolerance for physiological sensations such as those commonly experienced during panic attacks. Clinically, mindfulness interventions enable individuals with panic disorder to observe sensations such as palpitations or shortness of breath without catastrophic misinterpretation, thereby disrupting the cycle that leads to full-blown panic episodes (Gkintoni & Papadopoulou, 2025). Studies examining MBCT further demonstrate significant improvements in well-being, self-efficacy, and quality of life across various anxiety-related conditions, reinforcing the therapeutic value of mindfulness-based approaches (Gkintoni & Papadopoulou, 2025).

A growing body of controlled trials supports the efficacy of MBSR in reducing core symptoms of anxiety and improving multiple facets of health-related quality of life. A large-scale randomized clinical trial comparing MBSR with escitalopram for adults with anxiety disorders found that MBSR was non-inferior to pharmacotherapy, suggesting its viability as a frontline treatment option for anxiety management (Hoge et al., 2023). Likewise, systematic reviews have reported consistent reductions in stress, anxiety, depressive symptoms, and impairment following mindfulness interventions, with effects observed across clinical and non-clinical populations (Pan & Liu, 2024). These reviews emphasize that mindfulness promotes long-term changes in habitual emotional responses, enabling individuals to break cycles of avoidance and hypervigilance that often perpetuate anxiety symptoms. Furthermore, meta-analytic findings demonstrate that mindfulness-based programs yield moderate to large improvements in quality of life among individuals with anxiety and related disorders, strengthening the evidence base for their use in therapeutic contexts (Fortes & Silva, 2025).

Panic disorder, in particular, appears highly responsive to mindfulness interventions due to the disorder's characteristic sensitivity to internal bodily sensations. By cultivating a non-reactive stance toward somatic cues, individuals with panic disorder develop greater tolerance for discomfort and reduced catastrophic thinking, which are central mechanisms of change identified in multiple reviews (Chie

E-ISSN: 2980-9681

& Nguyen, 2025). Research indicates that mindfulness reduces the tendency to engage in emotional avoidance and fear-driven interpretation of bodily sensations, which are hallmark maintaining factors of panic disorder. Moreover, mindfulness helps individuals recognize the transient nature of symptoms and fosters metacognitive awareness—skills that contribute to long-term symptom management and improved psychological functioning (Štánerová & Novotná, 2025).

Quality of life, a fundamental outcome variable in mental health research, encompasses physical, emotional, social, and environmental domains. Anxiety disorders, especially panic disorder, often produce marked deterioration across all these domains, underscoring the importance of holistic interventions. Several studies have demonstrated that mindfulness training significantly enhances quality of life by improving emotional well-being, reducing perceived stress, increasing positive affect, and promoting adaptive coping strategies (Sercekman & Yavuz, 2024). For example, research on undergraduate populations during the COVID-19 pandemic reported strong associations between mindfulness, reduced anxiety, and improved quality of life, highlighting the role of mindfulness as a protective psychological resource in periods of heightened stress (Sun & Zhang, 2024). Clinical trials have similarly shown that mindfulness-based programs effectively improve functioning and well-being among individuals living with severe stress and anxiety, suggesting their applicability across diverse age groups and clinical conditions (Alvarado-García & Rodríguez, 2025).

In addition to clinical outcomes, mindfulness-based programs influence cognitive processes such as attention regulation, metacognitive awareness, and appraisal patterns. These cognitive shifts are highly relevant in panic disorder, where individuals often attend selectively to threat-related cues and interpret them catastrophically. Mindfulness promotes an attentional orientation that is grounded in present-moment awareness rather than fear-driven anticipation, thereby reducing pathological worry and sensitivity to internal stimuli (Simpson & Simpson, 2019). Research further suggests that mindfulness supports cognitive-emotional integration and reduces automatic reactivity, essential changes that enable greater emotional resilience and behavioral flexibility (Shim & Lee, 2020). Such mechanisms are believed to contribute to the sustained therapeutic benefits of mindfulness observed in long-term follow-up studies.

Importantly, the benefits of mindfulness extend beyond clinical populations traditionally targeted in psychological interventions. Evidence shows that mindfulness practices enhance psychological well-being among nurses, caregivers, and individuals facing chronic stress, suggesting their broad applicability and scalability across health systems (Sulosaari & Hämäläinen, 2022). These findings demonstrate that mindfulness cultivates psychological resources necessary for coping effectively with stress, thereby enhancing overall functioning. Similarly, individuals with chronic illnesses show improvements in depression, anxiety, and quality of life when participating in structured mindfulness-based interventions, further affirming their generalizability across diverse health challenges (Štánerová & Novotná, 2025). This breadth of evidence strengthens the rationale for investigating mindfulness within populations experiencing severe anxiety, including individuals diagnosed with panic disorder.

Empirical studies focusing specifically on anxiety disorders consistently highlight mindfulness as an effective intervention modality with sustained benefits. For example, long-term follow-up investigations show that the positive effects of MBSR on quality of life and anxiety symptoms are maintained months after program completion, suggesting durable therapeutic outcomes (Sercekman & Yavuz, 2024). Similarly, meta-analytic evidence confirms that mindfulness training reliably reduces both subjective stress and physiological indicators of anxiety, with substantial improvements noted across multiple follow-up assessments (Fortes & Silva, 2025). These sustained outcomes are particularly relevant to panic disorder, given its chronic and episodic nature, which often requires interventions that promote continued self-management and resilience.

While mindfulness-based interventions have gained considerable empirical support, additional research is required to refine their application for specific anxiety conditions, including panic disorder. Controlled studies focusing explicitly on individuals with panic disorder remain limited compared to broader anxiety-related research. Moreover, cultural, contextual, and demographic factors may influence treatment outcomes, underscoring the need for localized studies examining MBSR effectiveness among diverse populations. As mindfulness practices continue to expand globally, understanding their impact in different clinical settings and cultural contexts becomes increasingly essential.

Given these considerations, and in light of the robust theoretical and empirical support for mindfulness-based

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interventions across anxiety disorders, the present study investigates the effectiveness of a Mindfulness-Based Stress Reduction program on quality of life and stress among individuals diagnosed with panic disorder, with the aim of determining whether structured mindfulness training produces significant improvements in psychological well-being in this population.

2. Methods and Materials

2.1. Study Design and Participants

The statistical population of this study consisted of individuals diagnosed with panic disorder who sought services at a psychotherapy and counseling center in District Five of Tehran in 2025. Inclusion criteria were a diagnosis of panic disorder by a psychiatrist or clinical psychologist, age between 18 and 50 years, not receiving any active psychotherapeutic intervention during the past three months, and the ability to participate in group sessions. Exclusion criteria included the presence of another severe psychiatric disorder, initiation of new anti-anxiety medications during the study, and irregular attendance in sessions. A non-random convenience sampling method was used, meaning that individuals who were present and willing to participate were selected as the sample. The final sample consisted of 40 individuals who were assigned to an experimental group (20 participants) and a control group (20 participants).

2.2. Measures

Perceived Stress Scale: This questionnaire consists of 14 items that assess the level of perceived stress during the past month. Responses are rated on a 5-point Likert scale ranging from “never” to “always.” Higher scores indicate greater stress. The validity and reliability of the Persian version were confirmed by Nikbakht (2018), and its Cronbach’s alpha coefficient was reported as .82.

Quality of Life Questionnaire: This questionnaire is the abbreviated WHOQOL-100 and contains 26 items across four main domains: physical, psychological, social, and environmental. Responses are scored on a 5-point Likert scale, and each domain is scored independently. The Persian version was translated and validated by Sabouri (2019). The instruments were self-administered and completed before and after the intervention for both groups. These questionnaires are recognized as valid tools for clinical research due to their ease of administration, rapid assessment capability, and high participant acceptability. Data were analyzed using SPSS version 26, and to examine differences between the groups, analysis of covariance (ANCOVA) was utilized. A significance level of .05 was considered.

2.3. Intervention

A summary of the eight-session Mindfulness-Based Stress Reduction program is presented below. Session One: Introduction to mindfulness and training in basic principles, including explanation of the concept, purpose, and benefits of mindfulness, familiarization with mindful attention, and initial breathing exercises. Session Two: Breathing practice and body awareness, including deep breathing techniques and body scan exercises to enhance self-awareness and reduce tension. Session Three: Acceptance and non-judgment, including training in observing thoughts and emotions without judgment and recognizing automatic stress reactions. Session Four: Emotion and anxiety regulation, including mindfulness techniques for reducing emotional reactivity and momentary stress. Session Five: Sitting meditation and mindful walking, including training in seated meditation, mindful walking, and daily practices to enhance present-moment awareness. Session Six: Coping with negative thoughts and worries, including identifying negative and anxious thoughts and applying techniques of release and acceptance. Session Seven: Integrating mindfulness into daily life, including applying mindfulness in work, relationships, and daily activities to reduce chronic stress. Session Eight: Review and consolidation of skills, including summarizing techniques, evaluating progress, and providing a personal plan for continued practice after the program.

2.4. Data Analysis

Data analysis was first conducted using descriptive statistics followed by inferential statistics (repeated-measures analysis of variance) in SPSS.

3. Findings and Results

An examination of the frequency distribution of marital status and income in the two groups indicated that demographic variables were equivalent across the experimental and control groups.

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Table 1

Comparison of Mean and Standard Deviation of Pretest–Posttest–Follow-Up Scores for Quality of Life and Stress by Experimental and Control Groups

Dependent Variable	Group	Condition	Experimental Mean	Experimental SD	Control Mean	Control SD
Quality of Life		Pretest	58.74	1.54	58.66	5.90
		Posttest	122.80	2.52	58.40	8.48
		Follow-Up	123.14	4.15	58.91	5.70
Stress		Pretest	137.05	2.90	136.23	2.46
		Posttest	88.37	2.01	137.65	3.36
		Follow-Up	78.80	1.94	136.42	1.21

The results in Table 1 showed that no notable differences were observed among the pretest, posttest, and follow-up scores of the dependent variables in the control group. Furthermore, there were no substantial differences between the pretest scores of the control and experimental groups, confirming homogeneity between the groups. Other findings indicated that, in the experimental group, the mean scores for quality of life increased and stress decreased at posttest and follow-up compared to the control group, suggesting the effectiveness of the mindfulness-based stress reduction program. Before examining the study hypotheses, the normality of the data was assessed separately for each group (control and experimental) and each measurement point (pretest, posttest, follow-up) using the Shapiro–Wilk test. The results showed that the assumption of normality for quality of life and stress at all measurement stages was met ($P > .05$). The results also confirmed homogeneity between the two groups at pretest, and findings indicated that the dependent variables followed a normal distribution. Therefore, repeated-measures ANOVA was used to examine the effectiveness of the mindfulness-based stress reduction program on quality of life and stress. First, the assumptions of repeated-measures ANOVA were assessed. The Box's M test for equality of covariance matrices was significant ($P < .001$, $F = 5.458$, $df = 6$, Box M = 38.499), suggesting a violation of this assumption; however, given the sufficiently large sample size for both groups, this test is considered robust to such violations. Mauchly's test of sphericity indicated that the sphericity assumption was met for quality of life and stress ($P > .05$). Levene's test confirmed the homogeneity of error variances for quality of life and stress ($P > .05$).

Table 2

Results of Multivariate Tests for Examining the Effectiveness of the Mindfulness-Based Stress Reduction Program

Source of Variance	Test	Value	F	df Error	Sig.	Eta²
Time	Pillai's Trace	.81	45.61	21	.001	.813
	Wilks' Lambda	.19	45.61	21	.001	.813
	Hotelling's Trace	4.34	45.61	21	.001	.813
	Roy's Largest Root	4.34	45.61	21	.001	.813
Time × Group	Pillai's Trace	.78	37.32	21	.001	.780
	Wilks' Lambda	.22	37.32	21	.001	.780
	Hotelling's Trace	3.55	37.32	21	.001	.780
	Roy's Largest Root	3.55	37.32	21	.001	.780

The multivariate test results in Table 2 showed that the mindfulness-based stress reduction program had a significant effect on the factor of time ($Eta^2 = .813$, $P < .001$, $F = 45.61$) and on the interaction of time and group ($Eta^2 = .780$, $P < .001$, $F = 37.32$). These results indicate that the intervention significantly influenced the studied dimensions.

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Table 3

Results of Tests for Comparing Within-Group and Between-Group Effects in Experimental and Control Groups

Dependent Variable	Source of Variation	SS	df	MS	F	Sig.	Eta²
Quality of Life	Group	4101.03	1	4101.03	7816.80	.001	.897
	Time	2559.07	2	1279.53	43.16	.001	.662
	Time × Group	2118.68	2	1059.34	35.73	.001	.619
Stress	Group	1240.39	1	1240.39	3083.40	.001	.761
	Time	1041.66	2	520.83	25.35	.001	.535
	Time × Group	1280.03	2	640.01	31.15	.001	.586

The between-group test results in Table 3 showed significant differences between the experimental and control groups for both quality of life (P < .001, F = 8327.2) and stress (P < .001, F = 3083.4). The within-group test results indicated that the effect of time was significant for both quality of life (P < .001, F = 7451.9) and stress (P < .001, F = 25.35). The time × group interaction was also significant, with full results presented in Table 7. These findings confirm the effectiveness of the mindfulness-based stress reduction program, as mean comparisons indicated increased quality of life and decreased stress in the experimental group relative to the control group. After establishing significant time, group, and interaction effects, Bonferroni post-hoc tests were conducted to compare the three conditions (pretest, posttest, follow-up) pairwise for each variable. The results are presented in Table 4.

Table 4

Bonferroni Post-Hoc Test Results for Examining the Effectiveness of the Mindfulness-Based Stress Reduction Program Over Time

Comparison	Quality of Life Mean Difference	SE	Sig.	Stress Mean Difference	SE	Sig.
Pretest – Posttest	14.60	1.49	.001	8.13	1.33	.001
Posttest – Follow-Up	4.42	1.62	.001	0.13	1.14	.930
Pretest – Follow-Up	7.17	1.59	.001	8.003	1.42	.001

The findings in Table 4 indicate significant differences between pretest and posttest for both quality of life and stress (P < .001), confirming the effectiveness of the intervention. Significant differences were also observed between pretest and follow-up scores (P < .001), indicating the sustained effect of time. Additionally, differences between posttest and follow-up for both quality of life and stress were significant (P < .001).

4. Discussion and Conclusion

The present study examined the effectiveness of a Mindfulness-Based Stress Reduction (MBSR) program on stress levels and quality of life among individuals with panic disorder. The statistical findings demonstrated significant improvements in both primary outcomes for participants in the experimental group compared with the control group, across posttest and follow-up assessments. The observed increases in quality of life and corresponding decreases in stress provide strong support for the therapeutic utility of mindfulness interventions in treating panic disorder. These results align with previous empirical evidence showing that mindfulness practices promote emotional regulation, reduce physiological hyperarousal, and enhance overall well-being among individuals suffering from anxiety disorders (Chie & Nguyen, 2025). The pattern of findings across repeated measurements indicates not only immediate therapeutic benefit but also continued maintenance of gains, reinforcing the long-term value of structured mindfulness training for individuals with chronic anxiety.

The significant reduction in stress observed in the experimental group is consistent with prior meta-analytic research demonstrating that mindfulness-based interventions lead to meaningful decreases in perceived stress and anxiety across clinical populations (Fortes & Silva, 2025). Mindfulness programs influence multiple psychophysiological mechanisms, including reducing sympathetic nervous system activation, altering maladaptive cognitive appraisal styles, and enhancing attentional control. These mechanisms are particularly relevant in panic disorder, where individuals often demonstrate heightened reactivity to internal bodily cues and show a tendency to interpret such cues catastrophically. The current study supports this theoretical framework, as participants exposed to MBSR showed marked reductions in stress, suggesting

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that mindfulness helped individuals develop a non-judgmental awareness of bodily sensations and thoughts, thereby diminishing automatic panic-related responses. Similar therapeutic effects have been documented in randomized trials showing that mindfulness significantly reduces anxiety symptoms and improves daily functioning in adults (Hoge et al., 2023).

One of the most notable findings of the study was the substantial improvement in quality of life among participants who completed the MBSR program. The increase in quality-of-life scores at both posttest and follow-up mirrors outcomes reported in numerous clinical studies. Research has shown that mindfulness-based interventions improve multiple domains of quality of life—including physical health, psychological functioning, social relationships, and environmental satisfaction—by fostering adaptive coping strategies and enhancing emotional resilience (Gkintoni & Papadopoulou, 2025). A systematic review focusing on mindfulness for individuals with anxiety disorders similarly identified improvements in quality of life as a consistent and robust outcome of mindfulness-based interventions (Fortes & Silva, 2025). In the context of panic disorder, these improvements are particularly important, as individuals often experience significant impairments in daily functioning due to persistent fear, avoidance behaviors, and emotional exhaustion. The results of this study support the conclusion that MBSR facilitates broader psychological and behavioral adjustments that extend beyond symptom reduction, promoting a more comprehensive enhancement of life quality.

The findings also support neurobiological evidence suggesting that mindfulness practices result in functional and structural changes in brain regions associated with stress regulation and cognitive control. Research indicates that mindfulness training increases activation in the prefrontal cortex and anterior cingulate cortex—regions associated with executive functioning and emotion regulation—while reducing activation in the amygdala, which is central to fear and arousal responses (Calderone & Masi, 2024). These neural adaptations may help explain why participants in the present study reported decreased stress and improved quality of life after the intervention, as improved emotional processing and reduced limbic reactivity would be expected to buffer the physiological and cognitive processes underlying panic disorder. Additionally, longitudinal findings reveal that repeated mindfulness practice strengthens neural pathways associated with sustained attention and metacognitive awareness, outcomes that correspond with the improvements observed in the current study (Sercekman & Yavuz, 2024).

The current findings are also supported by research on mindfulness among diverse populations facing stress and emotional dysregulation. For example, a randomized controlled trial assessing mindfulness training among university students demonstrated significant reductions in stress and anxiety accompanied by improvements in life satisfaction (Alvarado-García & Rodríguez, 2025). Although the population differs, the mechanisms of change—enhanced emotional regulation, increased awareness, and cognitive reframing—are consistent with those presumed to underlie the changes observed among participants in the present study. Moreover, during periods of global stress, such as the COVID-19 pandemic, mindfulness was shown to be a protective factor, improving quality of life and reducing anxiety among medical and non-medical students (Sun & Zhang, 2024). These cross-population findings reinforce the generalizability of mindfulness-based strategies and their ability to improve well-being across diverse settings, lending additional support to the intervention outcomes observed in this study.

Comparisons with systematic reviews on anxiety disorders further validate the intervention's effectiveness. A comprehensive review of MBSR for anxiety disorders found consistent reductions in anxiety and stress and identified improvements in quality of life across a wide range of clinical samples (Chie & Nguyen, 2025). Similarly, mindfulness-based interventions for individuals with chronic illnesses, including those experiencing comorbid anxiety and depression, demonstrate comparable improvements in emotional well-being and life satisfaction (Štánerová & Novotná, 2025). These findings highlight the broad applicability of mindfulness techniques in populations suffering from emotional distress and chronic stress conditions. The present study’s outcomes therefore not only replicate established results but extend them to a population specifically diagnosed with panic disorder, which remains comparatively underrepresented in mindfulness intervention research.

The consistency of the intervention effects with prior findings suggests that mindfulness may address fundamental mechanisms underlying panic disorder. One of these mechanisms involves the regulation of attentional biases toward threat. Individuals with panic disorder frequently misinterpret benign bodily sensations as indicators of imminent danger. Mindfulness fosters a shift in attentional focus that allows individuals to experience bodily sensations

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without reflexive catastrophizing. Several studies, including those examining caregivers and medical populations, show that mindfulness enhances attentional control and reduces emotional exhaustion, thereby supporting adaptive engagement with stressors (Sulosaari & Hämäläinen, 2022). This conceptualization aligns with the observed reduction in stress in the current study and provides a theoretical explanation for why MBSR may be particularly beneficial for panic disorder.

Another mechanism supported by previous literature involves reductions in experiential avoidance. Avoidance of distressing sensations plays a central role in maintaining panic disorder, as such avoidance prevents disconfirmation of fear-based beliefs. Mindfulness encourages acceptance rather than avoidance, enabling individuals to develop tolerance for discomfort. Research in neurological and chronic disease populations indicates that mindfulness supports emotional acceptance and enhances subjective well-being (Shim & Lee, 2020; Simpson & Simpson, 2019). This aligns with the improvements in quality of life identified in the present study, as increased acceptance may reduce the emotional burden associated with panic-related distress and avoidance behaviors.

Furthermore, systematic reviews reveal that mindfulness interventions often produce sustained benefits, with improvements in psychological well-being persisting long after the intervention period has ended (Sercekman & Yavuz, 2024). The follow-up results in this study—where improvements in quality of life and reductions in stress were maintained—mirror these findings and demonstrate that the intervention fosters skills that participants continue to apply in their daily lives. Sustained effects may reflect lasting changes in cognitive and emotional processes, suggesting that MBSR functions not merely as a short-term intervention but as a catalyst for enduring psychological growth.

Overall, the alignment between the present results and the extensive body of literature reinforces the conclusion that mindfulness-based programs offer an effective, multi-dimensional treatment for panic disorder. Improvements observed across stress and quality-of-life measures underscore the capacity of mindfulness to support emotional regulation, cognitive reframing, and adaptive functioning. By demonstrating measurable, sustained benefits, this study contributes to the expanding evidence supporting mindfulness interventions as clinically valuable components of anxiety treatment frameworks.

The study demonstrates valuable findings; however, several limitations should be considered when interpreting the results. First, the sample size was relatively small, which may limit the generalizability of the findings to broader clinical populations. Second, the use of convenience sampling may introduce selection bias, as participants willing to engage in mindfulness training may differ systematically from those who decline participation. Third, although the follow-up period provided meaningful information about sustained outcomes, a longer follow-up interval would allow for a more comprehensive assessment of long-term intervention effects. Additionally, the study relied exclusively on self-report measures, which may be influenced by response biases, including social desirability and subjective interpretation of questionnaire items. Finally, the intervention was delivered in a group format, which may introduce group-related therapeutic factors not directly attributable to mindfulness practices.

Future research should prioritize larger randomized controlled trials with more diverse samples to enhance external validity. Longitudinal studies with extended follow-up periods would provide deeper insight into the durability of mindfulness-related changes, particularly for chronic conditions such as panic disorder. Future investigations should also incorporate physiological markers, neurobiological assessments, or behavioral measures to triangulate findings and reduce reliance on self-report tools. Comparative studies examining the differential effectiveness of MBSR versus other evidence-based interventions—such as cognitive-behavioral therapy or pharmacotherapy—would further clarify the unique contributions of mindfulness-based approaches. Additionally, research exploring digital or app-based adaptations of mindfulness training could provide direction for scalable intervention models accessible to broader populations.

Clinicians may consider incorporating mindfulness-based approaches as complementary interventions within treatment plans for individuals with panic disorder, particularly those seeking non-pharmacological treatment options. Mental health professionals should receive specialized training to ensure competent and standardized delivery of MBSR programs. Health systems may also benefit from integrating mindfulness workshops or routine stress-management programs into community mental health services to enhance accessibility. Finally, individuals diagnosed with panic disorder may experience improved outcomes when mindfulness practices are combined with

E-ISSN: 2980-9681

ongoing psychoeducation, lifestyle modifications, and supportive therapeutic environments.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We hereby thank all individuals for participating and cooperating us in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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E-ISSN: 2980-9681