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EFFECTIVENESS OF MINDFULNESS-BASED STRESS REDUCTION PROGRAMS ON CHRONIC PAIN, QUALITY OF LIFE, AND PSYCHOLOGICAL WELL-BEING IN PATIENTS WITH CHRONIC PAIN

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Abstract

Introduction: In recent years, mindfulness-based interventions have gained increasing popularity in the field of pain management, particularly for individuals dealing with chronic conditions. **Objective:** The main objective of the study is to find the effectiveness of mindfulness-based stress reduction programs on chronic pain, quality of life, and psychological well-being in patients with chronic pain. **Methodology:** This retrospective observational study was conducted at MD Health Center, Lahore from May 2023 to January 2024. A total of 127 patients diagnosed with chronic pain were recruited from pain management clinics, primary care facilities, and online platforms targeting individuals with long-term pain conditions. **Results**: Data were collected from 127 patients with a mean age of 45.6 ± 12.1 years across groups (45.2 ± 12.3 years in the intervention group and 46.1 ± 11.8 years in the control group). Gender distribution was similar, with females comprising 54.3% (34 in intervention, 35 in control) and males 45.7% (30 in intervention, 28 in control). Chronic pain duration varied, with 52.0% of participants experiencing pain for over a year (32 in intervention, 34 in control). Primary pain locations were mainly the back (38.6%), followed by limbs (22.0%) and neck (20.5%). Baseline measures, including pain intensity (6.55 ± 1.2), quality of life (52.65 ± 8.1), anxiety (10.2 ± 2.25), depression (9.6 ± 2.55), emotional regulation (45.15 ± 6.25), and resilience (25.4 ± 5.45), were comparable across both groups, indicating balanced characteristics before the intervention. The intervention group demonstrated a significant reduction in pain intensity from a pretest mean of 6.5 ± 1.2 to a posttest mean of 4.2 ± 1.1, with a t-value of 8.4 and a p-value of < .001, indicating a large effect size (Cohen's d = 1.1).**Conclusion:** It is concluded that Mindfulness-Based Stress Reduction (MBSR) is an effective intervention for managing chronic pain, enhancing

quality of life, and improving psychological well-being. The program provides a holistic, non-pharmacological approach that empowers patients to develop healthier responses to pain.

Introduction

In recent years, mindfulness-based interventions have gained increasing popularity in the field of pain management, particularly for individuals dealing with chronic conditions. According to the Population Search, chronic pain is considered as any pain that has occurred for more than 3 months, and affected about 20% of adults worldwide, costing high amount of money in the healthcare facilities [1]. In patients, constant pain provokes a complicated fight of physical, psychological, and social problems that bring deterioration of their quality of life. Some types of medications for pain management work for some patients, but do not come without adverse side effects, can become habit forming, and lose their effectiveness with time especially in the use of opioid medications. These drawbacks have thus led to the search for other and/or complementary ways of handling CHOP, such as the MBSR. The MBSR that originated in the 1970s is one of the earliest intervention strategies that was pioneered by Dr.Jon Kabat- Zinn for the treatment of chronic pain and other conditions for which biomedicine had little effective therapies [2]. MBSR incorporates concepts of mindfulness, meditation, and yoga besides involving the body in movement in an eight-session program. The main approach of MBSR is clients' nonjudgmental acceptance of thoughts, emotions, or sensations, which enables them to change their attitude to the pain. Thus, for instance, mindfulness helps the patients to stop being sensitive to their pain and to experience it as observers, not as suffers. This change from a reactive posture to one that is a bit more accepting along with an imperative to observe is where the true healing of MBSR lies [3].

MBSR is beneficial for not only pain: The studies have indicated that MBSR also enhances aspects of psychological quality of life. Many types of chronic pains are associated with conditions such as depression, anxiety, and sleep disorders. MBSR may aid patients who with strategies for developing better ways of coping their present-moment awareness and non-reactivity toward the symptoms [4]. For example, when using mindfulness techniques, one may improve their ability to manage pain, and related feelings of hopelessness and anger, which are typical in individuals experiencing chronic pain. In turn, mindfulness has been shown to improve the rider's emotional strength, which is crucial in coping with the long-term difficulties of chronic pain [5]. Many agree with MBSR's ability to improve the quality of life and the state of mind in participant with chronic pain problems. For instance, Reiner et al. Reiner, et al., (2013) observed that those patients who suffer from chronic pain and underwent an MBSR program, got better results on pain intensity, depression, and anxiety levels. Besides, these people also noticed an increase in the quality of their lives and better control over their emotions [6]. Another study by Cherkin et al. (2016) on comparing the efficacy of MBSR to cognitive-behavioral therapy show that the two therapies have produced meaningful and lasting changes in pain and limitations among the participants. Collectively, these results argue for MBSR as a more feasible or at least complementary treatment of pain than conventional strategies [7].

Science in Neuroscience has also made known the possible effects that mindfulness practices might have on the brain and pain relief. Other works that utilized fMRI revealed that mindfulness meditation is capable of altering activity of the rostral anterior cingulate cortex, antenna insula, and part of the superior frontal gyrus [8]. These regions are related to the processing and analysis of pain information and, therefore, the notions that MBSR may modify the way in which the brain responds to pain and therefore reduce the rating of perceived pain intensity. Furthermore, changes in mind activity have also included the default mode network which pertains to self-referential processing and rumination, both of which are common in chronic pain patients [9]. Thus, mindful desensitization may help a person lessen rumination and other negative thoughts in anticipation of which the brain has prepared itself to have increased perception of pain. However, there are some limitation that exists in the current research on MBSR and Chronic pain [10]. In reviews of studies, sample size, measurement techniques, and even indicators of success can greatly differ which precludes a clear determination of the effectiveness of the program in treating different categories of

patients. However, not all patients benefit from MBSR in the same way and the characteristics of positive treatment response provide little information. However, MBSR involves time and commitment that some people can hardly afford to spare, or may find challenging to do. Further studies that will explore how MBSR affect pain and other research that will indicate what makes MBSR effective or ineffective is highly recommended [11].

Objective

The main objective of the study is to find the effectiveness of mindfulness-based stress reduction programs on chronic pain, quality of life, and psychological well-being in patients with chronic pain.

Methodology

This retrospective observational study was conducted at MD Health Center, Lahore from May 2023 to January 2024. A total of 127 patients diagnosed with chronic pain were recruited from pain management clinics, primary care facilities, and online platforms targeting individuals with long-term pain conditions. This work adopts the pretest-posttest design with a control group for comparison. Patients were randomly allocated to the MBSR group who received MBSR program, or the control group who didn't receive any mindfulness based intervention throughout the trial. Participants in both groups completed measures before and after the intervention phase. The intervention group received a MBSR to which they committed themselves for 8 weeks. MBSR program meetings were conducted once weekly, for about 2 hours each with a certified MBSR teacher. In each of the sessions, but mindful meditation, yoga and a group discussion session were conducted. Participants were also given instructions regarding mindfulness exercises to be performed for thirty minutes at home each day, using audio and other provided materials. Weekly session topics were related to body and breath attention, as well as emotional self-regulation in order to strengthen and improve mindfulness abilities and pain management. Participants provided demographic information and completed a set of reliable and standard questionnaires at baseline and at the end of the MBSR program to measure effectiveness of MBSR in reducing chronic pain and improving quality of life and well-being of the adults with CP. For physical symptoms, participants rated their levels of pain and the extent to which pain was problematic with the Brief Pain Inventory (BPI). This questionnaire measures pain intensity and how it interferences with the functioning in physical, social or emotional domains. The World Health Organization Quality of Life-BREF (WHOQOL-BREF) was used to assess participants' quality of life in four domains: Can be classified into physical health status, psychological health, relationship health, and contextual health. Anxiety and depression levels were measured using the Hospital Anxiety and Depression Scale (HADS). Data were analyzed using SPSS v29. Paired t-tests were used to analyze changes in scores within each group, while independent t-tests were employed to compare post-intervention outcomes between the MBSR and control groups.

Results

Data were collected from 127 patients with a mean age of 45.6 ± 12.1 years across groups (45.2 ± 12.3 years in the intervention group and 46.1 ± 11.8 years in the control group). Gender distribution was similar, with females comprising 54.3% (34 in intervention, 35 in control) and males 45.7% (30 in intervention, 28 in control). Chronic pain duration varied, with 52.0% of participants experiencing pain for over a year (32 in intervention, 34 in control). Primary pain locations were mainly the back (38.6%), followed by limbs (22.0%) and neck (20.5%). Baseline measures, including pain intensity (6.55 ± 1.2), quality of life (52.65 ± 8.1), anxiety (10.2 ± 2.25), depression (9.6 ± 2.55), emotional regulation (45.15 ± 6.25), and resilience (25.4 ± 5.45), were comparable across both groups, indicating balanced characteristics before the intervention.

Table 1: Demographic and Baseline Data

Characteristic	Intervention Group (n= 64)	Control Group (n= 63)	Total (n 127)
Age (Mean ± SD)	45.2 ± 12.3 years	46.1 ± 11.8 years	45.6 ± 12.1years
Gender			
- Male	30 (46.9%)	28 (44.4%)	58 (45.7%)
- Female	34 (53.1%)	35 (55.6%)	69 (54.3%)
Duration of Chronic Pain			
- 3-6 months	12 (18.8%)	11 (17.5%)	23 (18.1%)
- 6-12 months	20 (31.3%)	18 (28.6%)	38 (29.9%)
- More than 1 year	32 (50.0%)	34 (54.0%)	66 (52.0%)
Primary Pain Location			
- Back	25 (39.1%)	24 (38.1%)	49 (38.6%)
- Neck	12 (18.8%)	14 (22.2%)	26 (20.5%)
- Limbs	15 (23.4%)	13 (20.6%)	28 (22.0%)
- Other	12 (18.8%)	12 (19.1%)	24 (18.9%)
Baseline Pain Intensity (BPI)	6.5 ± 1.2	6.6 ± 1.2	6.55 ± 1.2
Baseline Quality of Life (WHOQOL-BREF)	52.5 ± 8.0	52.8 ± 8.2	52.65 ± 8.1
Baseline Anxiety (HADS)	10.3 ± 2.3	10.1 ± 2.2	10.2 ± 2.25
Baseline Depression (HADS)	9.5 ± 2.5	9.7 ± 2.6	9.6 ± 2.55
Baseline Emotional Regulation (ERQ)	45.2 ± 6.3	45.1 ± 6.2	45.15 ± 6.25
Baseline Resilience (CD-RISC)	25.3 ± 5.5	25.5 ± 5.4	25.4 ± 5.45

The intervention group demonstrated a significant reduction in pain intensity from a pretest mean of 6.5 ± 1.2 to a posttest mean of 4.2 ± 1.1, with a t-value of 8.4 and a p-value of < .001, indicating a large effect size (Cohen's d = 1.1). In contrast, the control group showed a minimal change in pain intensity from 6.6 ± 1.2 to 6.4 ± 1.1, with a t-value of 1.1 and a non-significant p-value of .29. Between-group analysis further highlighted a significant difference in posttest pain intensity (t = 10.2, p < .001) with a large effect size (Cohen's d = 1.2), confirming the intervention's efficacy in reducing pain.

Table 2: Pain Intensity and Interference (BPI)

Group	Pretest Pain Intensity (Mean±SD)	Posttest Pain Intensity (Mean ± SD)	t-value	p-value	Effect Size (Cohen's d)
Intervention	6.5 ± 1.2	4.2 ± 1.1	8.4	< .001	1.1
Control	6.6 ± 1.2	6.4 ± 1.1	1.1	.29	
Between-Groups	-	-	10.2	< .001	1.2

The intervention group showed a significant improvement in quality of life, with scores increasing from a pretest mean of 52.5 ± 8.0 to a posttest mean of 65.3 ± 7.5. This change was statistically significant (t = 9.6, p < .001) and reflected a large effect size (Cohen's d = 1.3). In comparison, the control group had a negligible change, with pretest and posttest means of 52.8 ± 8.2 and 53.2 ± 8.0, respectively, showing a non-significant t-value of 0.6 and a p-value of .54. Between-group analysis revealed a significant difference in posttest quality of life scores (t = 8.8, p < .001).

Table 3: Quality of Life (WHOQOL-BREF)

Group	Pretest Quality of Life (Mean ± SD)	Posttest Quality of Life (Mean ± SD)	t-value	p-value	Effect Size (Cohen's d)
Intervention	52.5 ± 8.0	65.3 ± 7.5	9.6	< .001	1.3
Control	52.8 ± 8.2	53.2 ± 8.0	0.6	.54	-
Between-Groups	-	-	8.8	< .001	1.1

Anxiety scores decreased from a pretest mean of 10.3 ± 2.3 to a posttest mean of 7.2 ± 2.1, with a t-value of 7.9 and a p-value of < .001, indicating a large effect size (Cohen's d = 1.0). Depression scores also showed a notable decrease from 9.5 ± 2.5 to 6.7 ± 2.3, with a t-value of 8.3, p < .001, and an effect size of 1.1. In contrast, the control group showed minimal changes in anxiety (10.1 ± 2.2 to 9.9 ± 2.3, t = 1.2, p = .23) and depression (9.7 ± 2.6 to 9.8 ± 2.5, t = 0.9, p = .37), both non-significant. Between-group comparisons showed significant differences in posttest scores for both anxiety (t = 8.5, p < .001, d = 1.0) and depression (t = 9.0, p < .001, d = 1.1), supporting the intervention's effectiveness in reducing anxiety and depression.

Table 4: Psychological Well-Being (HADS)

Group	Pretest Anxiety (Mean ± SD)	Posttest Anxiety (Mean ± SD)	t-value	p-value	Effect Size (Cohen's d)	Pretest Depression (Mean ± SD)	Posttest Depression (Mean ± SD)	t-value	p-value	Effect Size (Cohen's d)
Intervention	10.3 ± 2.3	7.2 ± 2.1	7.9	< .001	1.0	9.5 ± 2.5	6.7 ± 2.3	8.3	< .001	1.1
Control	10.1 ± 2.2	9.9 ± 2.3	1.2	.23	-	9.7 ± 2.6	9.8 ± 2.5	0.9	.37	-
Between-Groups	-	-	8.5	< .001	1.0	-	-	9.0	< .001	1.1

Emotional regulation scores (ERQ) increased from a pretest mean of 45.2 ± 6.3 to a posttest mean of 50.1 ± 5.8, with a t-value of 6.7 and a p-value of < .001, reflecting a medium effect size (Cohen's d = 0.8). Resilience scores (CD-RISC) rose from 25.3 ± 5.5 to 30.6 ± 5.1, with a t-value of 8.0, p < .001, and a large effect size (Cohen's d = 1.0). The control group displayed negligible changes in both ERQ (45.1 ± 6.2 to 45.0 ± 6.1, t = 0.2, p = .81) and CD-RISC (25.5 ± 5.4 to 25.3 ± 5.5, t = 0.3, p = .76), both non-significant. Between-group analysis confirmed significant posttest differences for ERQ (t = 7.0, p < .001, d = 0.9) and CD-RISC (t = 9.1, p < .001, d = 1.1).

Table 5: Emotional Regulation and Resilience (ERQ and CD-RISC)

Group	Pretest ERQ Score (Mean ± SD)	Posttest ERQ Score (Mean ± SD)	t-value	p-value	Effect Size (Cohen's d)	Pretest CD-RISC Score (Mean ± SD)	Posttest CD-RISC Score (Mean ± SD)	t-value	p-value	Effect Size (Cohen's d)
Intervention	45.2 ± 6.3	50.1 ± 5.8	6.7	< .001	0.8	25.3 ± 5.5	30.6 ± 5.1	8.0	< .001	1.0
Control	45.1 ± 6.2	45.0 ± 6.1	0.2	.81	-	25.5 ± 5.4	25.3 ± 5.5	0.3	.76	-
Between-Groups	-	-	7.0	< .001	0.9	-	-	9.1	< .001	1.1

Discussion

The findings of this study suggest that Mindfulness-Based Stress Reduction (MBSR) is an effective intervention for reducing pain intensity and interference, enhancing quality of life, and improving psychological well-being in individuals suffering from chronic pain. In comparison with the control group, the intervention group reported a better outcome in terms of pain intensity, quality of life,

anxiety and depression, emotional regulation and resilience, which makes the MBSR intervention seem like a rich addition to existing pain management approaches [12]. The decrease in the pain related variables based on the findings consistent with earlier studies on MBSR intervention in exploring the mindfulness based approaches for pain management. MBSR makes patients distance themselves from their regular pain responses, and thus, lessen both estimated pain and interference of pain with daily tasks[13]. It relates with research that has found that presence and practice of mindfulness can change the stretches of the mind that regulate pain, therefore reducing the pain sensations. In addition, increased quality of life over time in the intervention group is an obvious finding because chronic pain causes severe deficits in physical, emotional, and social functioning [14]. The concept of mindfulness maybe reversed as structured mindfulness practices in MBSR may have assisted participant's to gain authoritative control on their experiences thereby showing enhanced positive orientation towards well being among the participants. Research may suggest that MBSRs can enable people to cope with aspects of pain stressors hence enhancing their perceived life satisfaction and meaningfulness. The achieved decreases of anxiety and depression are highly significant here because these psychological disorders often accompany chronic pain. classes in mindfulness have been reported to improve coping with stress improving the capacity of the participant to manage emotions [15]. Said this, it can explain why the participants of the MBSR group pointed to improvements in their ability to cope with such facets of pain as sensitization of negative thoughts feeling-distress link and negative affect inclusion, thus pointing to enhancement of such aspects of emotional regulation as adaptability and fragility. These changes in the anxiety and depressive symptoms are in concordance with an earlier study which showed that mindfulness had beneficial effects for mental health by reducing rumination and enhancing emotional regulation [16]. There are probably numerous ways through which MBSR interferes with chronic pain. A number of neuroimaging techniques show that the findings derived from middle-level theories of mindfulness practices do indeed alter cerebral activity in structures associated with the experience of pain: namely, the anterior cingulate cortex and prefrontal cortex [17]. These changes might assist people to experience pain differently and, thus, experienced sensory as well as affective features of pain less intensely. Further, mindfulness exercise leads to deactivation of the default mode network (DMN), a cognitive control network that is engaged in Self and rumination, more in chronic pain patients [18]. MBSR may free the participants from the tendency towards DMN activity and, therefore, reduce the psychological aspect of chronic pain. Moreover, potential benefits of MBSR involve or may affect pain coping styles [19]. Mindfulness creates acceptance and thus a positive attitude that people change the way they handle pain and other forms of uncomfortable feelings. It may decrease the psychological and social unbearable character of a constant pain which helps the person continue with the usual activities despite the pain [20]. However, there are some imperfections to this study, which should be taken into consideration. First, the use of self-report measures for forms of treatment outcome such as pain and or psychological well-being inherent in the study may have response bias in that participants' response can be determined by factors such as their mood at the time of self-reporting or general desire to give positive impressions. The studies that could follow, should use more objective outcome measures, stress-related markers for instance, to increase external validity.

Conclusion

It is concluded that Mindfulness-Based Stress Reduction (MBSR) is an effective intervention for managing chronic pain, enhancing quality of life, and improving psychological well-being. The program provides a holistic, non-pharmacological approach that empowers patients to develop healthier responses to pain. These findings support the integration of MBSR into comprehensive pain management plans as a valuable complement to traditional treatments.

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