

Developing and Compiling a Mindfulness-Based Stress Reduction Program and Evaluating its Effectiveness on Relieving Chronic Pain in the Elderly: A Case Series

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ABSTRACT

Objective: This study was conducted to develop and compile a mindfulness-based stress reduction (MBSR) program within a context of physiotherapy rehabilitation to manage chronic pain in the elderlies in an Iranian clinical setting.

Methods and Materials: The 8-session MBSR treatment protocol was translated, revised for the Iranian elderly, and compiled as a one-on-one therapy using a unique protocol with 20-session physiotherapy. Two volunteers aged 65 (male) and 71 (female) with knee and ankle chronic pain were selected and received the program for 8 consecutive weeks with a 3-month follow-up. Treatment satisfaction levels, adherence to treatment sessions, and patient-reported clinical outcome measures were used at baseline, immediately post-intervention, and three months following the intervention, measuring pain, anxiety, fatigue, sleep disturbance, pain interference levels, and kinesiophobia.

Findings: Participants rated high satisfaction with the treatment and protocol, attending all treatment sessions and assessments. The Patient-Reported Outcomes Measurement Information System results indicated that there was a decrease in anxiety, fatigue, sleep disturbance, and pain interference for both participants.

Conclusion: A brief, one-on-one MBSR program, adapted for the elderly with chronic pain, can be integrated with physiotherapy intervention in an Iranian clinical setting. The program has the potential to alleviate pain severity, kinesiophobia, anxiety, fatigue, sleep disturbances, and pain interference. High treatment satisfaction levels indicate the feasibility of evaluating the program in a future randomized controlled clinical trial to assess its effect on clinical outcomes.

Keywords: Mindfulness-Based Stress Reduction, Chronic pain, Elderly, Physiotherapy

1. Introduction

Chronic pain significantly affects the quality of life (Schumann et al., 2020), and it is a common health

problem (Ribatti et al., 2025; White et al., 2025), with a prevalence ranging from 51% to 83% in older adults (Eggermont et al., 2014; Gerteis et al., 2014; Lapane et al., 2013; Patel et al., 2013). It is believed that, the world's

geriatric population will be increased from 9% to 16% by 2030, and in Iran, 17.5% of the population will be older than 65 (Sharifi & Refahi, 2013).

Chronic pain affects older adults' psychological and social aspects (Javadzade et al., 2024). It is well known that a robust and positive bi-directional relationship exists between mental health and somatic health (Tatta et al., 2022). Therefore, a holistic approach to chronic pain using biopsychosocial programs could result in better outcomes (Schumann et al., 2020). In Iran, elderlies with chronic pain access medical services to ease their pain) Alemi et al., 2021(in most cases, they report using three or more analgesics for pain relief (Schumann et al., 2020), and some receiving physiotherapy while the psychological pain managements are not so common)Alemi et al., 2021(. Physiotherapy is also a common therapeutic procedure for chronic musculoskeletal pain, particularly in the elderly (Dagnino & Campos, 2022).

Physiotherapists have been using several treatment techniques for managing individuals with pain. Physiotherapy treatments are strongly supported by the somatic framework, whereby it is believed that addressing the bodily tissues could improve health outcomes (Suzuki, 2017). Although the somatic approach is popular, it ignores the idea of mind and body in perceiving illness. Therefore, the psychosomatic approach alongside somatic-focused rehabilitation could be a better framework for defining and responding to chronic pain (Dagnino & Campos, 2022). In a psychosomatic approach, mind and body are integrated to shape illness and disorders and contribute to the persistence of illness (Suzuki, 2017). As pain is a complex phenomenon, there is an increasing need in this area to use psychosomatic approaches in addition to somatic approaches to manage patients more effectively and thoroughly (Suzuki, 2017).

Mindfulness-Based Stress Reduction (MBSR), a form of psychosomatic approach, was developed for individuals with chronic physical problems like pain, low mood, and health-related anxiety (Alsubaie et al., 2020). Mindfulness is defined as "*paying attention in a particular way: on purpose, in the present moment, and non-judgmentally*" (Zinn, 1994). The MBSR program has been used since 1979 to help individuals relieve pain and distress resulting from various chronic health problems (Jon Kabat-Zinn, 1990; J Kabat-Zinn, 1990). Two studies illustrated that MBSR could lead to decreased anxiety, worry, and depression in a randomized controlled trial for individuals with anxiety disorders (Hoge et al., 2015; Vøllestad et al., 2011). Recently, a group of researchers (Javadzade et al., 2024) showed that MBSR

significantly reduced depression and enhanced emotion regulation and sleep quality among elderly individuals. In terms of treating chronic pain, some studies have demonstrated the positive effects of MBSR on pain intensity, medical and psychological symptoms, coping ability, and daily activity inhibition (Rosenzweig et al., 2010), (on daily functioning and pain (Cherkin et al., 2016), pain severity knee or hip osteoarthritis (Marais et al., 2022), and tension headache (Omid & Zargar, 2014). Another study showed significant effects of interdisciplinary therapy on different aspects of physical and emotional functioning related to pain (Scott et al., 2017). Also, a study investigated the effectiveness of an interdisciplinary pain rehabilitation program that combined opioid treatment and showed similar enhancements with opioid dose reductions (Alemi et al., 2021; Darchuk et al., 2010). indicated that when mindfulness therapy was combined with massage and aromatherapy, it could be effective in reducing pain and enhancing the quality of life and sleep quality.

Objectives:

Integrating somatic (i.e., physiotherapy) and psychosomatic approaches into the management of chronic musculoskeletal pain could help improve outcomes in individuals with chronic pain in Iran. However, there is no Iranian adaptation of the originally described MBSR approach to be delivered alongside the physiotherapy intervention. There is also a need to explore the potential influence of adapted MBSR and physiotherapy on patient-reported outcomes. The primary and secondary aims of the investigation include:

1(a). Developing and compiling an MBSR program to be added to a physiotherapy rehabilitation for managing chronic pain in the elderlies.

1(b). Exploring the acceptability of the Patient Global Assessment of Treatment Satisfaction (PGATS) scale in the adapted MBSR treatment protocol alongside physiotherapy rehabilitation for managing chronic pain in the elderly.

2. Evaluating the influence of the adapted MBSR treatment protocol alongside physiotherapy rehabilitation on reducing pain, kinesiphobia, and comorbid depression and anxiety in a sample of elderly individuals with chronic musculoskeletal pain.

2. Methods and Materials

2.1. Design Overview

This paper presents a case series of two older adults who received care at an outpatient physiotherapy clinic in

Mashhad, Iran. The study participants were received eight MBSR training sessions (see below for more details about the treatment) alongside 20 sessions of physiotherapy. Patient-reported outcome measures were administered before and after each treatment session. In addition, participants were encouraged to share their experiences with the treatment and its effects.

2.2. Participants

Two older adults receiving physiotherapy care at a clinic in Mashhad, 2023, volunteered after the research advertisement to participate in the study. The inclusion criteria to participate in this study included aged 65 years or older, , having chronic musculoskeletal pain (persistent bothersome pain occurring on ≥ 45 days out of the past 90 days) confirmed by medical records, reporting an average pain rating of ≥ 4 in the past seven days on a Numeric Rating Scale-11 (NRS-11) (0 = no pain; 10 = worst pain imaginable), being able to read and write in Persian, and signing the written informed consent form. The exclusion criteria was scoring ≤ 23 on the Mini-Mental State Examination (MMSE). (Folstein et al., 1975)

After these considerations, one female (71 years old with chronic ankle pain, referred to as Participant One in this study) and one male (65 years old with chronic knee pain, referred to as Participant Two in this study) volunteered to participate in the research.

2.3. Outcome Measures and Assessor Blinding

Patient-reported outcome measures were collected at baseline, immediately following interventions, and three months after the intervention. All outcomes were collected by an M.Sc. psychology student unaware of the study's primary objective.

2.3.1. Screening for Cognitive Function

The MMSE (Folstein et al., 1975) was used in this study for descriptive purposes and to screen for participation. The MMSE, a commonly used screening measure of cognitive function, contains 11 questions to assess five areas of cognitive function: Orientation, registration, attention and calculation, recall, and language. Evidence supports the reliability and validity of the MMSE, as evidenced by high internal consistency (Cronbach's alphas generally) (Khodamoradi et al., 2020). The MMSE score can range from 0 to 30, and getting a score of 23 or lower illustrates

significant cognitive impairment (Khodamoradi et al., 2020).

2.3.2. Adherence to Treatment Sessions

The number of sessions attended by participants was recorded to evaluate any absences or resistance for the program.

2.3.3. The Patient Global Assessment of Treatment Satisfaction (PGATS)

Treatment satisfaction was assessed with six questions asking the participants to rate six domains of treatment satisfaction using a 5-point Likert scale ranging from 0 ("Very dissatisfied") to 4 ("Very satisfied"). Specifically, satisfaction with the combined physiotherapy and MBSR protocol, the duration of the entire protocol, the duration of each treatment session, the content of the treatment sessions, and homework assignments were measured using this tool. Participants were also asked to rate their overall satisfaction with the treatment on the same Likert scale (Shields et al., 2024).

2.3.4. The Numerical Rating Scale-11 (NRS-11)

Average pain intensity in the past week and post-session current pain intensity were assessed at the end of each session using the NRS-11 (0 = "no pain" and 10 = "worst pain imaginable") (Jensen, 2008). This measure has shown high test-retest reliability from before to just after a medical consultation in literate and illiterate patients with rheumatoid arthritis ($r = 0.96$ and 0.95 , respectively) (Jensen, 2008). Before and after medical consultation and construct validity, the NRS-11 has also been shown to be highly correlated (Ferraz et al., 1990).

2.3.5. The Patient Reported Outcomes Measurement Information System (PROMIS-29 v2.0)

Physical function, anxiety, depression, fatigue, sleep disturbances, ability to participate in social roles, and pain interference were assessed using the 4-item short form version of the PROMIS-29 v2.0 (Oskouie et al., 2023). The PROMIS-29 v2.0 has undergone extensive validation for use across various clinical populations, including individuals with physical disabilities, such as spinal cord injury (Cook et al., 2016). Each of the 29 items in the PROMIS-29 provides 6 response options, although the specific anchors listed in the response options are not all the same. Responses

to the items are summed and then transformed (i.e., mean = 50 and standard deviation [SD] = 10 in the normative sample). For all scales, higher scores indicate more of the domain being assessed (e.g., more anxiety severity for the anxiety scale). A growing body of evidence supports the reliability and validity of each domain assessed by the PROMIS-29 (Oskouie et al., 2023).

2.3.6. The Tampa Scale Kinesiophobia (TKS-11)

Fear of movement (i.e., kinesiophobia) was assessed using the brief (11-item) version of the TKS-11 (Woby et al., 2005). Respondents are asked to indicate agreement with each item on a Likert scale from ("strongly disagree") to 4 ("strongly agree"). The items are summed into a total score ranging from 11 to 44. Higher scores indicate a greater fear of movement. Most, but not all, factor-analytic studies indicate that the TSK items assess two domains across various pain conditions related to fear of movement (Roelofs et al., 2004; Roelofs et al., 2007; Roelofs et al., 2011; Woby et al., 2005); Activity avoidance [assessed by the Activity Avoidance scale (TSK-AA)]-the belief that activity may result in (re)injury or increased pain; Somatic focus [assessed by the Somatic Focus scale (TSK-SF)]-a belief that pain is a sign of an underlying and serious medical issue.

2.4. Treatment Description

2.4.1. Physiotherapy

Both participants received 20 physiotherapy sessions. The sessions were provided three times per week for the first five weeks and then two sessions per week for the final three weeks of treatment. During each session, the physiotherapist administered the following electrotherapy modalities per

standardized protocols in the clinic: Transcutaneous electrical nerve stimulation (TENS), low-level laser therapy (LLLT), and ultrasound therapy to the painful body region. In addition, they engaged in 15-20 minutes of exercise during each session.

2.4.2. Adaptation of the Mindfulness-Based Stress Reduction Program

The MBSR program was based on Jon Kabat-Zinn's method (J Kabat-Zinn, 1990), usually a weekly 1.5-hour per session group intervention (Alsubaie et al., 2017). The following procedures were conducted to adapt the original MBSR program to satisfy to the specific needs of the elderly population with chronic pain in an Iranian clinical settings. The intervention was first translated into Persian by an expert Persian interpreter. The lead author and the research team members reviewed the translation and made any necessary changes. Recognizing that elderly individuals preferred individual MBSR approximately two times per week (Harris et al., 2023), the sessions were made shorter to be delivered immediately after their physiotherapy sessions. Therefore, the program's content was simplified to last 60 to 70 minutes in each session instead of the standard 90-minute session. The design of each session (Table 1) was planned to involve discussing the homework assignments for the past week, followed by a discussion of the session's content, and then a meditation practice. The sessions concluded with a summary of the material covered, followed by an overview of the homework assignments for the following week. Also, the number of homework assignments was reduced so that they could be completed in about 20 minutes daily at most. Finally, there was no full-day retreat.

Table 1

Mindfulness-Based Stress Reduction, Content of 8 weeks

Number of sessions	Topics and content
1	Awareness: Introduction of MBSR, mindful berating, mini mediation
2	Stress: What is stress, relationship of stress cycle and pain and health, body-scan meditation
3	Pain and suffer: Emotions related to the pain, sitting meditation, body scan
4	Handling Thoughts: Wisdom meditation, introduction to yoga, self-soothing strategies
5	Self-Compassion: Interpersonal relationship, love yourself and acceptance, self- compassion meditation,
6	MBSR and communication: Mindful relationship and talking, Communication as a mediation, sitting meditation
7	Formal vs. informal mediation: extent the manfulness to the whole life, mindful walking, hatha yoga
8	Conclusion: maintenance the manfulness in the life, community recourses, dealing with pain, lake meditation.

2.5. Procedure

Table 2 illustrates the content of the adapted version of MBSR, which was delivered once each week over eight weeks alongside twenty physiotherapy interventions.

In the first session, the research program and plans for outcome assessment were introduced. The participants then signed the research agreement form and were interviewed to obtain information about their pain (i.e., duration, location, and course), their medication(s), and demographics. This was followed by the first 70-80-minute physiotherapy session.

After the first physiotherapy session, participants received their initial MBSR with a trained therapist. As noted in Table 1, the primary focus of the first session was to cultivate awareness through breathing exercises, aiming to change their perception of their body and pain, ultimately

reducing their pain. However, thoughts, emotions, communication, and self-compassion were all targeted to reduce stress. They were then given their assignments for the first week, consisting of the content of that MBSR session. They were also asked to practice the mindfulness exercise they were taught during the session for at least 30 minutes each day before the next session.

Sessions 2 through 8 of the MBSR program had the same format as the first session, except that each session began with a discussion of their experience with the assignment and their meditation practice. The only differences were: (1) The content of the information presented differed for each session, (2) checking the homework assignments, and (3) different meditation.

Finally, three months after the last study session, they were asked to return to the clinic for the follow-up assessment to complete patient-reported outcome measures.

Table 2

Content of each session and follow-up

Week number	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	3 months later
MBSR sessions	1	2	3	4	5	6	7	8	-
Physiotherapy sessions	1-2-3	4-5-6	7-8-9	10-11-12	13-14	15-16	17-18	19-20	-
Assessments	Baseline assessments	NPI	NPI	NPI	NPI	NPI	NPI	Post-test assessments	Follow-up assessments

2.6. Data Analysis

Basic descriptive statistics were calculated for each participant. A blinded assessor who is not one of the research team extracted the results from the raw data.

3. Findings and Results

Both participants show general satisfaction with the treatment and protocol (Table 3).

Table 3

Treatment/protocol satisfaction

Questions	Participant one	Participant two
Combination of MBSR and physiotherapy	3	4
Length of protocol	3	3
Length of each session of MBSR	3	4
Content of each session of MBSR	3	3
Homework of MBSR	4	3
PGAST	3	3

3.1. Treatment/protocol satisfaction

Both participants attended all treatment sessions and assessments without any absences or resistance for the program. Table 3 illustrates that both participants experienced treatment satisfaction in all aspects which they were asked and the PGAST is high.

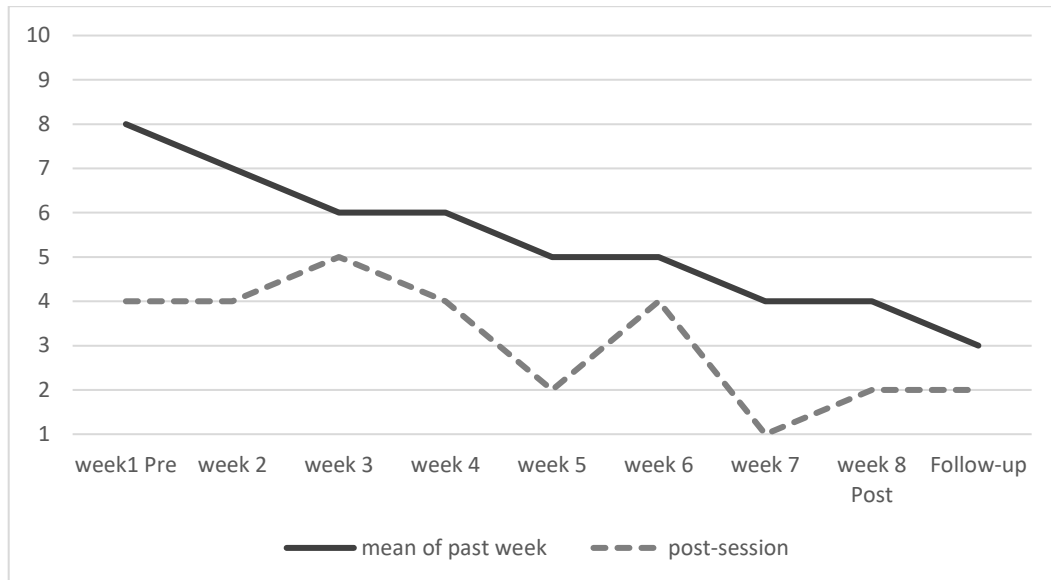
3.2. Numerical Pain Index (NPI)

As the figure 1 shows, the participant one reported a significant reduction in mean of past week and post-session

NPI scores in post-intervention and follow-up assessments compared to baseline.

Figure 1

Numerical Pain Index (female participant)

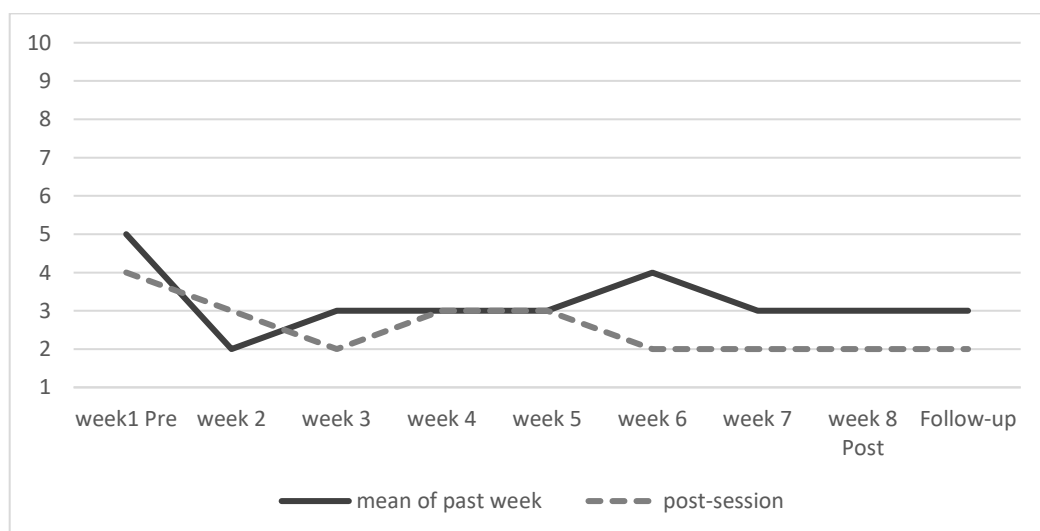


Also, the mean of past week and post-session scores in post-intervention and follow-up assessments in the male participant showed a significant decrease compared to

baseline (see figure 2). However, the reduction in NPI scores was not very high.

Figure 2

Numerical Pain Index (male participant)



3.3. PROMIS-29

Reduction in all subscales of the PROMIS-29 was observed after the 8-week program (see table 4). However, the data illustrated that the ability to satisfaction with

participation in social roles (participant one), sleep disturbances, fatigue, and anxiety decreased more in the post-test than in the baseline. The results of the follow-up assessment revealed no significant differences from those of the post-intervention assessment.

Table 4

PROMIS-29 results

	T-score pre	T-score post	T-score Follow
Physical function 1	43.4	40.4	41.8
Physical function 2	30.7	29.1	29.1
Anxiety 1	71.2	63.4	65.3
Anxiety 2	53.7	40.3	48
Depression 1	57.3	55.7	53.9
Depression 2	41	41	49
Fatigue 1	66.7	57	55.1
Fatigue 2	43.1	33.7	33.7
Sleep Disturbance 1	61.7	54.3	50.5
Sleep Disturbance 2	50.5	32	37.5
Ability to Satisfaction in participation in social roles 1	53.7	38.8	38.8
Ability to Satisfaction in participation in social roles 2	27.5	27.5	31.8
Pain Interference 1	65.2	63.8	61.2
Pain Interference 2	59.9	53.9	55.6

3.4. Tampa Scale Kinesiophobia (TKS-11)

The table 5 indicates the TKS-11 data for both participants. The baseline total scores are 35 and 31 in participant one and participant two respectively, which indicates high kinesiophobia. The score was decreased

dramatically in both participants in the post-test and remained approximately the same after three months in the follow-up, indicating moderate kinesiophobia. Declines in the subscales (the somatic focus and the activity avoidance) were same as the total score in participants and the dropping after 8-week program remained unchanged in follow-up phase.

Table 5

TKS-11 results

Participants	Total score Pre	Somatic Focus Pre	Activity Avoidance Pre	Total score Post	Somatic Focus Post	Activity Avoidance Post	Total score Follow	Somatic Focus Follow	Activity Avoidance Follow
One	35	18	17	26	14	12	24	12	12
Two	31	16	15	11	6	5	13	7	6

4. Discussion

This study developed and compiled an 8-session MBSR program consisting of 20 sessions of physiotherapy rehabilitation for managing chronic pain in older adults and assessed the acceptability of this modified program when delivered in an interdisciplinary clinical setting.

The fundamental changes to the MBSR program included reducing the duration of each session, decreasing assignments, and eliminating the full-day retreat. In addition to weekly physiotherapy sessions, participants were required to spend three hours in the physiotherapy clinic to receive the MBSR program and engage in nearly three hours of MBSR practice at home. The program was found to be

acceptable by a sample of older adults with chronic musculoskeletal pain. No dropouts were observed during the treatment sessions. More importantly, their overall satisfaction scores were three out of four, indicating their satisfaction with the program. Therefore, it could be possible to change the regular and one-dimensional therapy for chronic pain in the elderly to an interdisciplinary program. However, more studies on various age groups and other types of chronic pain will be needed.

The secondary aim of this study was to evaluate the program's influence on clinical outcomes. The program produced some meaningful changes in pain severity; the PROMIS-29 sub-scales and the TKS-11 scores were reduced in both participants following eight sessions of the program and after a 3-month follow-up compared to the baseline assessment. These data suggest that the program may be effective in reducing the pain of the elderly, but further studies with control group is required. The program was effective in reducing anxiety, sleep problems, and pain interference; however, a noticeable change was not observed in the depression subscale. It should be considered that depression in elderlies could have various causes other than chronic pain (Zis et al., 2017). One other significant observation is that the program was effective in reducing kinesiphobia post-intervention and in follow-up. Moreover, the ability to satisfaction participation in social participants showed different trends in their reduction. The difference between their age and gender could be a possible explanation for that (Dagnino & Campos, 2022). These results indicate that an interdisciplinary program could enhance psychological effects on well-being. In the follow-up phase, when we asked them, "*Did you have any supplementary therapy during these three months?*" both participants reported using MBSR techniques and mindfulness as much as they did in their natural environments, suggesting improved self-efficacy.

5. Conclusion

This investigation suggests that an 8-session MBSR program delivered alongside physiotherapy sessions could enhance treatment satisfaction among older adults with chronic musculoskeletal pain. The program resulted in a significant decrease in pain levels, fear of movement, anxiety, pain interference, fatigue, and sleep disturbances. The findings highlight the necessity for a randomized controlled clinical trial to evaluate the program's

effectiveness on clinical outcomes in elderly individuals dealing with chronic pain.

6. Limitations & Suggestions

This study should be interpreted in light of several limitations. First, the case-series design and inclusion of only two elderly participants substantially limit the generalizability of the findings and do not allow causal conclusions about the effectiveness of the adapted MBSR program. Second, the absence of a control or comparison group makes it difficult to determine whether the observed improvements were due to the MBSR component, physiotherapy, participant expectations, therapist attention, natural recovery, or the combined effect of these factors. Third, the participants had different pain conditions, gender, and age characteristics, which may have influenced their responses to treatment. Fourth, although patient-reported outcome measures were appropriate for assessing pain-related psychological and functional changes, the study did not include objective physical performance indicators or long-term clinical records. Finally, the follow-up period was limited to three months, and treatment fidelity, home-practice quality, and possible external therapeutic activities were not systematically controlled, which may have affected the stability and interpretation of the outcomes.

Future studies should evaluate this adapted MBSR-plus-physiotherapy protocol through adequately powered randomized controlled trials with larger and more diverse samples of older adults with chronic musculoskeletal pain. It is recommended that future trials include comparison groups such as physiotherapy alone, standard MBSR, usual care, or active psychological control conditions to clarify the specific and additive contribution of mindfulness training. Researchers should also examine whether treatment effects differ according to age, gender, type and duration of pain, baseline kinesiphobia, anxiety, depression, sleep problems, and physical functioning. Longer follow-up assessments, such as six-month and twelve-month follow-ups, would help determine whether the observed improvements are maintained over time.

Clinicians working with elderly individuals with chronic pain may consider integrating brief, simplified, and culturally adapted mindfulness-based strategies into physiotherapy rehabilitation programs. Given the possible burden of long sessions for older adults, shorter one-on-one sessions, reduced homework load, clear Persian-language instructions, and gradual practice of breathing, body scan,

self-compassion, mindful movement, and pain acceptance techniques may improve feasibility and adherence. Physiotherapy clinics should also assess psychological and behavioral pain-related factors such as fear of movement, anxiety, fatigue, sleep disturbance, and pain interference, because addressing these domains alongside physical rehabilitation may support more comprehensive pain management in older adults.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. The Research Ethics Committee of the Faculty of Psychology and Education at University of Tehran approved this study (IR.UT.PSYEDU.REC.1402.042). Participants consented to participate in the study.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed in this article.

Declaration

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

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