

# Effect of Mindfulness-Based Stress Reduction on Pain Severity and Mindful Awareness in Patients With Tension Headache: A Randomized Controlled Clinical Trial

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**Background:** Programs to improve the pain and health status in illnesses with pain such as headache are still in their infancy. Mindfulness-based stress reduction (MBSR) is a new psychotherapy that appears to be effective in treating chronic pain.

**Objectives:** This study evaluated efficacy of MBSR in improving pain severity and mindful awareness in patients with tension headache.

**Patients and Methods:** This study was a randomized controlled clinical trial that was conducted in 2012 in Shahid Beheshti Hospital of Kashan City. Sixty patients who were diagnosed with tension-type headache according to the International Headache Classification Subcommittee were randomly assigned to treatment as usual (TAU) or MBSR groups. The MBSR group received eight weekly treatments. Any session lasted 120 minutes. The sessions were based on MBSR protocol. Diary scale for measuring headache and Mindful Attention Awareness Scale (MAAS) were administered at pretreatment, and posttreatment, and three-month follow-up in both groups. The data was analyzed using repeated measures analysis of variance.

**Results:** The mean of pain severity was  $7.36 \pm 1.25$  before intervention that was significantly reduced to  $5.62 \pm 1.74$  and  $6.07 \pm 1.08$  after the intervention and follow-up ( $P < 0.001$ ). In addition, the MBSR group showed higher scores in mindful awareness in comparison with the control group at posttest session. The mean of mindful awareness before intervention was  $34.9 \pm 10.5$  and changed to  $53.8 \pm 15.5$  and  $40.7 \pm 10.9$  after the intervention and follow-up sessions ( $P < 0.001$ ).

**Conclusions:** MBSR could reduce pain and improve mindfulness skills in patients with tension headache. It appears that MBSR is an effective psychotherapy for treatment of patients with tension headache.

**Keywords:** Mindfulness; Awareness; Pain; Tension-Type Headache

## 1. Background

A tension headache is a headache that feels like pressure or tension in and around the head. It is the most common type of headache. Tension headaches constitute 90% of total headaches. About 3% of the population is afflicted by chronic tension headache (1). Pain and specially tension headaches are often associated with low quality of life and high levels of psychologic discomfort (2). About half of the patients with chronic pain report that the pain is uncontrollable (3, 4). Lack of full recovery with medication in most types of chronic pain suggests that psychologic factors affect the severity and duration of the pain (5). Mindfulness-based stress reduction (MBSR) is a new psychotherapy that appears to be effective in improving physical performance and psychologic well-being (6-10). Mindfulness meditation training is the main component of MBSR (9). In meditation, participants are trained to be aware of their thoughts, feelings, and physical sensations without prejudice. Mindfulness exercises are taught in two forms of formal and informal meditation practices. In formal type, sitting meditation, body scan, and mind-

ful yoga are trained. In informal meditation, attention and awareness is focused on daily activities, thoughts, feelings and physical sensation that are problematic and painful (11). Studies found that MBSR program had a significant effect on improvement of medical illness with chronic pain such as fibromyalgia, rheumatoid arthritis, chronic musculoskeletal pain, chronic low-back pain, and multiple sclerosis. They demonstrated significant changes in pain intensity, anxiety, depression, somatic complaints, well-being, adaptation, quality of sleep, fatigue, and physical function of those illnesses (8, 9, 12-18). It appears that attention and emotional reaction to pain has an important role in persistence of the pain (19). There are different processes of attention control, which determine the quality and quantity of pain. In other words, emotional and cognitive components can modulate attention to pain, pain-related fear, and pain-related anxiety and result in more intense pain perception, concentration on pain, and worry about pain that disrupt the patients' activities (20, 21). According to the

fear-avoidance model (22), avoidance of activities and negative thoughts and feelings concerning pain can increase distress, disability, and hypervigilance to pain. Recent studies of acceptance-based methods such as mindfulness show improved performance in patients with chronic pain. Mindfulness modulates the pain using non-elaborative awareness of thoughts, feelings, sensations, and an emotionally distanced relationship with internal and external experience (23). Programs for improving the well-being and health status of the illness with pain are still in their infancy. During the last two decades, a group-intervention program known as MBSR has been proposed for managing the pain.

## 2. Objectives

The Study was conducted to assess the effects of MBSR on pain severity, perceived stress, general mental health, and mindfulness skills in patients with tension headache.

## 3. Materials and Methods

This randomized controlled clinical trial was performed in 2012 in Shahid Beheshti Hospital of Kashan City. Participants of the study included adults with tension headache that were referred by expert psychiatrists and neurologists in Kashan city. The inclusions criteria were: having tension headache according to the International Headache Classification Subcommittee, and tending to participate in the study, do not having a medical diagnosis of organic brain disorder or psychotic disorder and not having a history of psychologic treatment during the preceding six months. Those who did not complete the intervention and missed more than two sessions were excluded from the study. Participants, who signed an informed consent form, completed the measures as a pretest. For estimating the sample size, we referred to another study in which changes in mean of scores of fatigue was  $62 \pm 9.5$  in pre-treatment and  $54.5 \pm 11.5$  in post-treatment (24). Then, through utilizing the respective formula related to the sample size, the sample size was estimated at 33 (with attrition risk) in each group with  $\alpha = 0.95$  and  $1 - \beta = 0.9$ . A total of 66 patients were randomly assigned to two groups of MBSR and treatment as usual (TAU). Finally, three patients were excluded of each group and 60 patients were participated (30 patients in each group). The TAU group was treated by antidepressant medication and clinical management. The MBSR group received MBSR training in addition to TAU. The patients in MBSR group were trained for eight weeks by a psychologist with PhD degree. International Headache Classification Subcommittee Diary Scale for Headache and Mindful Attention Awareness Scale (MAAS) were administered before the first treatment session in MBSR group, after the eighth session (posttest), and three months posttest (follow-up) in both groups. TAU group were invited to Shahid Beheshti Hospital to fill out the questionnaires.

### 3.1. Intervention

The intervention group (MBSR) was trained in the Shahid Beheshti Hospital. The eight weekly sessions were held according to the standard MBSR protocol as developed by Kabat-Zinn (11). Each session lasted 120 minutes. Additional sessions were held for the participants who had missed one or two sessions. At the end of the training and three months later (follow-up), both MBSR and TAU group were invited to Shahid Beheshti Hospital (the place of MBSR trial) and were instructed to complete the questionnaires. The overall content of the sessions were mentioned in Table 1.

**Table 1.** Curriculum for Sessions of Mindfulness-Based Stress Reduction

Session	Contents of Each Session
<b>Session 1</b>	Establish orientation of the session and set the rules, raisin exercise to train being in the present moment, body scan practice, breath focus exercise.
<b>Session 2</b>	Body scan practice, thought and feeling exercise, pleasant event calendar, mindfulness of routine activity.
<b>Session 3</b>	Seeing and hearing exercise, sitting meditation, three-minute breathing space, mindful walking, unpleasant event calendar.
<b>Session 4</b>	Seeing and hearing exercise, sitting meditation, defining the territory of depression, negative automatic thought, diagnosis criteria for depression
<b>Session 5</b>	Sitting meditation, breathing space, reading poems related to mindfulness, introducing the concept of "Acceptance".
<b>Session 6</b>	Sitting meditation, mood, thoughts and alternative points exercise, breathing space, observing thoughts and feelings technique.
<b>Session 7</b>	Sitting meditation, exercise to explore links between activity and mood, behavioral activation (generate a list of pleasure and mastery activities), identifying actions to do in low-mood periods.
<b>Session 8</b>	Body scan practice, review the whole course, discuss how to keep up what has been developed over the past seven weeks, discuss plans and positive reasons for maintaining the practice.

### 3.2. Measurement Tools

#### 3.2.1. International Headache Classification Subcommittee Diary Scale for Headache

Headache was measured by diary scale for headache (25). Patients were asked to record the diary of pain severity on a zero to ten rating scale. Absence of pain and the most intense disabling headache were characterized by

zero and ten, respectively. Mean of headache severity in a week was calculated by dividing the sum of the severity scores by seven. Moreover, mean of headache severity in a month was calculated by dividing the sum of the severity scores by 30. The minimum and maximum scores of headache severity were zero and ten, respectively. Headache diary was given to five patients and a neurologist and a psychiatrists confirmed the content validity of the instrument (26). The reliability coefficient of Farsi version of this scale was calculated at 0.88 (26).

### 3.2.2. Mindful Attention Awareness Scale

The MAAS is a 15-item scale that measures the individual attention and awareness to events that happen in the present moment. Respondents used a six-point Likert scale from one (almost always) through six (almost never). The minimum and maximum score of Mindful Attention are 15 and 90, respectively. The MAAS is a reliable instrument with a Cronbach's  $\alpha$  of 0.87. Adequate test-retest reliability, and convergent as well as discriminate validity have been reported previously (27). This questionnaire was validated by Kalantari in Iran with adequate reliability and validity (28).

### 3.3. Ethical Considerations

Research Ethics Committee of Kashan University of Medical Sciences had approved this study (IRCT No: 2014061618106N1). Before the start of the study, informed consent was obtained from participants. The participants were assured of the confidentiality of all their personal information.

### 3.4. Data Analysis

The repeated measures analysis of variance was performed to compare the MBSR and TAU groups on measures of pain severity and mindfulness awareness at pretreatment, post treatment, and three-month follow-up. Also, Chi-square test was used to compare the demographics in the two groups. P value less than 0.05 was considered as significant in all testes.

## 4. Results

Among 66 subjects, six participants were excluded because of missing more than two sessions and did not complete the questionnaires. Table 2 showed demographic characteristics of the subjects. No significant differences were found regarding demographic variables (age, sex, marital status, and participation in psychotherapy). Mean pain severity on a rating scale during the previous month was  $7.5 \pm 1.4$ . The median duration of pain was 2.5 years (range, 1.5-5).

Table 3 provides the mean scores of the dependent variables (pain severity and mindful awareness) and comparison of outcome measures at pretreatment, posttreatment, and three-months follow-up.

**Table 2.** Demographic Characteristics of the Subjects<sup>a,b</sup>

Variable	MBSR	TAU	P value
<b>Age</b>	34.5 ± 2.41	32 ± 3.2	0.55
<b>Gender</b>			0.32
Male	5 (8)	7 (12)	
Female	23 (38)	25 (42)	
<b>Education Level</b>			0.47
High School	21 (35)	19 (23)	
Bachelor	9 (15)	11 (18)	
<b>Marital Status</b>			0.71
Married	18 (30)	20 (33)	
Single	12 (20)	10 (17)	
<b>Occupation</b>			0.024
Salaried Employee	13 (22)	12 (20)	
Housewife	17 (28)	18 (30)	

<sup>a</sup> Abbreviations: MBSR, mindfulness-based stress reduction; TAU, treatment as usual.

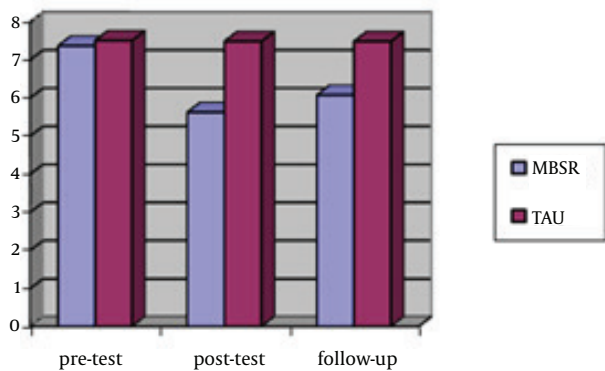
<sup>b</sup> Data are presented as mean ± SD or No. (%).

**Table 3.** Comparison of Outcome Measures at Pretreatment, Posttreatment, and Follow-Up Session in Study Groups<sup>a,b</sup>

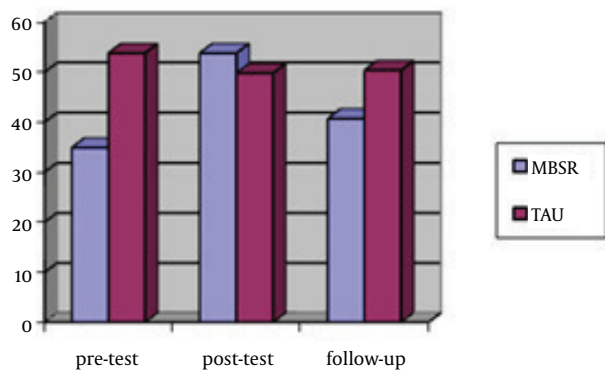
Outcome Measure	Pretest	Posttest	Follow-up	P Value	
				Time	Time × Group
<b>Pain Severity</b>				P < 0.001	P < 0.001
MBSR	7.36 ± 1.25	5.62 ± 1.74	6.07 ± 1.08		
TAU	7.5 ± 1.35	7.48 ± 1.27	7.48 ± 1.18		
<b>Mindful Awareness</b>				P < 0.001	P < 0.001
MBSR	34.9 ± 10.5	53.8 ± 15.5	40.7 ± 10.9		
TAU	53.8 ± 18.1	49.8 ± 13.4	50.36 ± 14.1		

<sup>a</sup> Abbreviations: MBSR, mindfulness-based stress reduction; TAU, treatment as usual.

<sup>b</sup> Data are presented as mean ± SD.



**Figure 1.** Mean of Pain Severity in Mindfulness-Based Stress Reduction and Control Groups at Pretest, Posttest, and Follow-Up Session.



**Figure 2.** Mean of Mindfulness Awareness in Mindfulness-Based Stress Reduction and Control Groups in Pretest, Posttest, and Follow-Up Session

According to presented data in Table 3, there was more reduction in pain severity in the intervention group (MBSR) in comparison with TAU group; in fact, the reduction in pain was not observed in TAU group. The mindful awareness in MBSR group had a significant increase in comparison to TAU group. The results revealed the significant effect of time and interaction between time and type of treatment on the changes of scores ( $P < 0.001$ ). Figure 1 and 2 present mean of pain severity and mindful awareness for MBSR and TAU groups at posttest and follow-up session.

### 5. Discussion

This study compared the efficacy of MBSR and TAU in improving pain severity and mindful awareness of patients with tension headache. Although MBSR is recognized as an effective treatment for stress symptoms and pain, its efficacy should be examined in the treatment of tension headache, which is one of the most common complaints in the population. In our study, significant improvement in self-reported tension headache was documented by diary scale checklist. This finding was similar to previous studies of mind-body-related interventions for chronic pain (29). The present study showed that MBSR might

be an effective treatment for tension headache. According to theories, mindfulness practice through various pathways affects the pain (28, 30). First, manipulating of attention in meditation practices might impress both sensory and affective components of pain perception. Second, mindfulness reduces the reactivity to distressing thoughts and feelings that accompany and strengthen pain perception. Third, mindfulness reduces psychological symptoms such as comorbid anxiety and depression. Fourth, mindfulness promotes physical self-monitoring and body awareness, which might lead to improved body mechanisms and self-care. Fifth, mindfulness meditation increases parasympathetic activity, which can promote deep muscle relaxation that may reduce pain. Finally, mindfulness may decrease stress and mood dysfunction-related psychophysiological activation by strengthening positive reappraisal and emotion regulation skills.

In our study, significant effects on mindful awareness were seen in MBSR group in comparison with control group. Observed improvements were consistent with reported studies by other researchers (31, 32). MBSR exerts its effects by fostering increased awareness for what is happening in each moment with an accepting attitude and without getting caught up in habitual thoughts, emotions, and behavior patterns. The increased awareness then gives rise to new ways to respond and cope with oneself and the world around (33, 34). Our study supports the hypothesis that patients with tension headache can enhance their mindful awareness and alleviate pain by participating in MBSR program.

In summary, the results of the present study suggest that MBSR can reduce pain-related anxiety and interference in daily activities in the short term. It is suggested to perform future studies to compare efficacy of MBSR with other traditional and newer cognitive behavioral therapies in patients with tension headache. Based on this study, MBSR is recommended as an effective psychotherapy for reducing the pain in patients with tension headache and other illness with pain.

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### Author's Contribution

Abdollah Omidi conceived and designed the evaluation, collected the clinical data, interpreted them, and helped to draft the manuscript. Fatemeh Zargar participated in designing the evaluation and revised the manuscript.

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