Original Article

The effectiveness of mindfulness-based stress reduction in fatigue severity among patients with multiple sclerosis

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Abstract

Background & Aims: Fatigue is one of the most common problems in MS patients that has many negative effects on their lives. The current investigation scrutinized the effectiveness of mindfulness-based stress reduction intervention on fatigue severity in patients with multiple sclerosis.

Methods and Materials: The study performed in experimental design with control group and pretest, posttest and follow up. Statistical population was all the men and women suffering from multiple sclerosis with a diagnosis of multiple sclerosis who referred to MS Society of Neyshabur in the spring of 2016. The sample consisted of 47 patients. The sampling method was convenience, and then was randomly divided into two experimental groups (n = 22) and the control (n = 25). Fatigue severity questionnaire was used as the instrument. Repeated measures analysis of variance with mixed-design was used to analyze the data. The sampling formula based on G-POWER included the size of the effect and the statistical power of the test.

***Results*:** The results of the univariate test on the effect of time indicated that the effect of time on fatigue was significant (F=59.82, P<0.001). Considering the interactive effect of time and group, it was also found that the interactive effect of time and group on fatigue was significant (F = 35.58, P<0.001).

***Conclusion*:** The obtained results revealed that mindfulness significantly improved fatigue in patients suffering from multiple sclerosis. These findings were consistent in the follow-up.

***Keywords*:** Mindfulness, Stress reduction, Fatigue, Multiple Sclerosis

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Introduction

Multiple Sclerosis (MS) as an inflammatory disease destroys Myelin sheath in the brain and the spinal cord (1). This disease damages the brain nerves' Myelin and the spinal cord and the scars created in these places disrupt the passage of nerve messages. The MS mostly is characterized by irreversible nerve damage that most often continues with progressive nerve damages (2). The

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four main types of MS are relapsing-remitting as the most common type, primary progressive, secondary progressive and relapsing-progressive. About 75% of the patients, in the first stage of contracting the disease, are categorized under this group in which, the patient is inflicted by sudden attacks and one or several parts of his/her body are involved. Then, the patient is completely or greatly recovered and the disease will not progress until the next attack that can be occurred very soon or years later. The most dangerous type of MS is the primary progressive type, regarding which, 15% of the patients diagnosed with MS suffer from it (3).

The MS is not predictable and it is one of the disease that changes the patient's life since it usually damages the best period in the patient's life and causes inability (4, 5). Meanwhile, fatigue is one of the most common symptoms the patients complain about. The Multiple Sclerosis Council of Clinical Practice Guidelines has provided the following definition for MS: "the lack of physical and mental energy which is experienced by the person or caregiver, and affects his/her daily and desirable activities". The research in the United States has shown that 75 to 90% of the patients suffer from fatigue and 50 to 60% of them have reported that different aspects of their lives have been affected. He also showed that fatigue is the cause of the reduction in the life quality and unemployment among these patients (6, 7). The fatigue is in the form of a lack of physical or mental energy which is felt by the patient himself or reported by the caregiver who takes care of the patient or helps him with doing the routine tasks (8). When MS-related fatigue is discussed, the researchers distinguish between the two types of primary and secondary fatigue. The primary fatigue is the fatigue directly caused by the sickness process itself while the secondary fatigue is caused by other symptoms of the disease. Clinically, distinguishing between the primary and secondary fatigue seems to be difficult since their symptoms are the same. However, in case the factors creating secondary fatigue are obviated, the disease's severity can be prevented (9). The fatigue can be somewhat controlled by drugs such as Amantadine, but regarding the problems and adversaries caused by medication, the use of non-pharmacological methods that can reduce the fatigue seems to be logical. In order to obviate the fatigue, common non-pharmacological interventions such as resting, relaxation, doing exercise, consultation, and energy maintenance are recommended (10).

Regarding the extreme problems and complications caused by the medication, the non-pharmacological methods that can reduce the patient's anxiety and stress seem to be logical. Therefore, during recent years, the non-pharmacological methods have grabbed the attention of the patients, including those suffering from MS, which is known as a supplementary treatment. The supplementary treatments are treatments with a holistic nature which are used to increase the patients' physical and mental comfort. One of these stress-reducing programs is the Mindfulness-Based Stress Reduction abbreviated with MBSR (11). The mindfulness is a consideration of the actual objectives and being in the present time in a way that is effective and without judgment (12). This program is aimed at facilitating the adoption and accommodation to the diseases and is considered as a self-regulating approach to reduce stress, manage excitement, and promote health, and if yoga exercises are done regularly, the MS patients would experience the states of deep balance, comfort, and awareness, as well as a good feeling. Therefore, deteriorated quality of life is widespread among MS patients and causes many mental problems for not only the patients but also for their families (13). Mindfulness requires the improvement of three qualities as avoiding judgment, intentional awareness, and focusing on the moment among which, the focus on the moment leads to the processing of all aspects of immediate experiences

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including the cognitive, physiological, or behavioral experiences. Through doing exercise and techniques based on mindfulness, the person finds self-awareness of his daily activities, becomes familiar with the automatic functions of the mind in the past and future, and through the momentary awareness of the thoughts, feelings, and physical states, he takes control over them and frees himself from the daily and the automatic mind which is focused on the past and the future (14). There have been several studies conducted on mindfulness-based stress reduction. Nila et al. (15) investigated the effectiveness of mindfulness-based stress reduction on the change in thoughts and an increase in the use of talents and abilities. This study was conducted with 49 samples. The method was the pretest-posttest. 20 samples were placed in the test group and the protocol was done on them. 29 of them were placed in the control group and they didn't receive any treatments. The results showed that mindfulness-based stress reduction led to an increase in self-awareness and higher use of innate abilities by the person.

A study by Flugel Colle et al. dealt with the investigation of the life quality of people who had participated in the mindfulness-based stress reduction program at Mayo Clinic for the first time. The results indicated that statistically, there has been a general improvement created in life quality, welfare, mental health, physical welfare, excitement welfare, and the rate of social activities and spiritual welfare of these people. Also, positive changes in the pain amount, pain severity, burnout rates, level of support of the family and friends, and the financial and legal concerns were observed (16).

Regarding what was mentioned and what has done so far, different treatments have been used in these patients, and the absence of a treatment that can affect different factors of the disease and impose the minimum costs on the patient is felt. Therefore, the current study aimed to answer the question of whether mindfulness-based stress reduction intervention is effective in the reduction of fatigue in patients suffering MS or not?

Methods and Materials

The design of the current study was an experiment with the control group and the pretest, posttest, and follow-up. The research was done with a random assignment of the samples into the intervention and control groups. The statistical population included all men and women diagnosed with MS who had referred to the Multiple Sclerosis Council of Neisahbur in the spring of 2017. The number of patients was 120 persons. The samples included 47 patients diagnosed with MS in the Multiple Sclerosis Council of Neishabur, who declared to be ready to participate after a public announcement for participation in the program. They were screened according to the research criteria. These people were chosen by the convenience sampling method and were randomly assigned to the experimental (22 patients) and control (25 patients) groups. The sampling formula was based on the G-POWER, effect size, and statistical power of the test. The inclusion criteria were: age range of 20 to 55, diagnosis of the MS by the specialist based on the medical tests, at least being able to read and write, and passage of at least 6 to 12 months of the disease. The exclusion criteria included: receiving psychological interventions in the past one year and having the record of taking psychiatric drugs (the reason why this criterion was chosen was that such drugs, due to the adversaries, they have for the patient, can disrupt the treatment process), suffering different types of mental retardation that would make it difficult for patients to understand the treatment process and self-treatment, mental illness that disrupts treatment sessions, serious suicidal thoughts, and a history of drugs abuse.

The data collection instrument was the Fatigue Severity Scale (FSS) questionnaire which was developed by Cropp et al (17) to be used for MS patients.

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The FSS is widely used to investigate the rate and severity of fatigue. It has 9 scales and the primary emphasis of it is on the motor aspects of fatigue, and the rate of the patients' fatigue, which can affect the daily activities of them. It has a response range of 1 to 7 based on the Likert scale. The average score of these 9 scales is the person's FSS score. The cut-off point of the questionnaire is 4, since less than 5% of the patients scored higher than this value while 60 to 90% of the patients with medical disorders have experienced a fatigue rate above this value. The classifications are in a way that people who score less than 4 are those without fatigue. Those scoring from 4 to 6 have average fatigue, and those scoring above 6 have severe fatigue. There is a significant correlation between the FSS and other health-related parameters. For example, the depression, pain, and life quality of the patients can be noted. The divergent validity is confirmed by the FSS differences between the MS patients and the control group. FSS indicated that the results had a high internal correlation and the alpha-Cronbach value was also at an acceptable level. The internal consistency of the FSS questionnaire items has been reported to be 0.96 by the use of alpha-Cronbach, thus these items measured the same concept.

In order to conduct the study on the patients suffering MS, the credible sources and research on this subject have been also used so that the training session would be appropriate for such patients. This program facilitates compatibility with medical diseases and is a self-regulatory approach to reduce stress, emotion management and health promotion. So it is a appropriate psychological treatment to reduce fatigue in MS patients.

The founders of this therapy are Segal, Williams, and Tisdel, whose program was translated and modified by Mohammadkhani. Segal et al. (18) protocol have been used in order to train the mindfulness-based cognitive therapy. The content of the program was commensurate with the cultural and demographic conditions of the patients

This protocol includes 8 sessions. A summary of the sessions has been provided in Table 1.

Table 1. The summary of mindfulness-based cognitive therapy training sessions

Session	Contents of the training sessions
First session	Automatic guidance, the exercise of focusing on raising alongside the presence of mind, meditation, and checking the body
Second session	Confronting the obstacles, meditation and checking the body, 10 minutes of the presence of mindful respiratory flow
Third session	Presence of mind on the breathing and body while moving, doing tensile exercise and breathing with the presence of mind, meditation on breathing state and sitting tensile movement focused on the awareness of the breathing and body, three minutes breathing space
Fourth session	Staying in the present time, exercising for 5 minutes in the visual or auditory presence of mind, meditation in the sitting state, awareness of breathing, body, voices, thoughts, and unbiased awareness, three minutes of breathing space
Fifth session	Awareness of the body and breathing, emphasis on the acceptance and allowance, presence permit, meditation in the sitting state, the introduction of a difficult state in the exercise and evaluation of its effects on the body and mind, three minutes of breathing space
Sixth session	Awareness of the body and breathing, the introduction of the problem of thoughts and not the truths, meditation in the sitting state related to the exercise and finding its effects on the body and mind, three minutes of breathing space

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Seventh session	How can I protect myself the best? Meditation in the sitting state, aware of the breathing, body, voices, thoughts, and excitements, three minutes of breathing space, and arising a faced problem while doing the exercise, and finding its effects on the body and mind
Eighth session	Using what has been learned to cope with the mood states in the future, the exercise of checking the body, conclusion, ending the sessions

Results

The participants in this research were 47 patients among which 22 patients were assigned to the experimental group (46.80%) and 25 were assigned to the control group (53.19%). The average age of the whole sample was 38.8 years old. It was 38.5 for the experimental group and 39.45 for the control group. The results of repeated measures analysis of variance with mixed-design presented as follow.

Table 2. The mean and standard deviation of the research variables divided by the group and test

Component(s)	Group	Test	Mean	Standard deviation
Fatigue	Control	Pretest	44.36	3.63
		Posttest	43.96	4.61
		Follow-up	41.16	3.71
	Experimental	Pretest	43.86	7.13
		Posttest	30.77	9.62
		Follow-up	31.22	6.99

In the followings, and in order to investigate the time-variable error variances in different stages of the study, the Levene's test has been used. The results indicated that the error variance in different stages of fatigue was F=4.63 and p=0.037 for pretest, F=12.55 and P=0.001 for the posttest, and F=9.52 and P=0.003 for follow-up. As can be seen, the results were not the same.

Table 3. The result of the within group effect of time and group and time interaction

Effect	Test	Component	Sum of squares	Df	Mean square	F	Sig.	Eta Squares	Test power
Time	Greenhouse–Geisser	Fatigue	1709.64	1.66	1025.41	59.82	0.001	0.571	1.00
Time-group interactive effect	Greenhouse–Geisser	Fatigue	1016.89	1.66	609.91	35.58	0.001	0.442	1.00

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The single variable t-test results indicated that time effects on the fatigue component were significant (F=59.82, P<0.001). In terms of the interactive effect of the time and the group also, it was revealed that this effect on the fatigue was significant (F=35.58 and P=0.001).

Table 4. The between group variance analysis results for experimental and control groups

Reference	Scale	Sum of squares	Df	Mean square	F	Sig.	Eta squares	Test power
Group	Fatigue	2175.51	1	2175.51	25.01	0.001	0.35	0.99
Error		3914.41	45	86.98				

P<0.05

As it is seen in Table 4, the intergroup variance analysis indicated that there was a significant difference in fatigue component between the experimental and control groups (P<0.05). Table 5 shows the paired comparison of the interactive effect of the time on the fatigue component.

Table 5. Pair comparison analysis of time interactive effect

Component	Test	Group	Means' difference	Df	Sig.
Fatigue	Pretest	Posttest	6.75	0.87	0.001
		Follow-up	7.91	0.85	0.001
	Posttest	Follow-up	1.17	0.582	0.15

Table 5's results showed that there was a significant difference in fatigue component between the pretest, posttest, and follow-up stages (p<0.001), however, this difference was not significant between the posttest and follow-up. In this regard, it is revealed that mindfulness-based stress reduction intervention effectiveness on fatigue led to a significant difference between the two groups after application of the intervention and this effect has been continued in the follow-up stage. Chart 1 shows the comparison of the fatigue means between the three stages of evaluation.

Discussion

The current investigation scrutinized the effectiveness of mindfulness-based stress reduction intervention on fatigue severity in patients with multiple sclerosis.

Multiple sclerosis (MS) is a disease of the central nervous system with devastating effects (19).

The cause of MS is idiopathic; however, it is hypothesized to be a result of an auto-immune, inflammatory attack on the myelin coating of the nerves, the oligodendrocytes (which make myelin), and the nerve fibers (20).

Of all the symptoms that affected individuals must cope with, fatigue is considered the most common and most debilitating symptom (21).

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Fatigue is experienced by about 80% of the MS population, according to the MS society. Previously, it was estimated that between 70% and 92% of the MS population experienced some type of fatigue (22).

The results of the current study showed that mindfulness-based stress reduction therapy has been effective on the fatigue severity of the patients suffering MS, and this effect has continued to the follow-up stage. The group mindfulness intervention led to an increase in self-awareness and self-acceptance in the patients. Mindfulness is not a method or technique, rather it is an available way to reduce physical tension, micro vision, and as a result, improves mental health and welfare (23).

The results of the current study were in line with those of Zamani and Rahmati's study who expressed that teaching the stress-management with a cognitive-behavioral method is effective on stress, depression, and cognitive disorder in the patients suffering MS (24).

Also, based on the results of Arch and Graske in 2006, the participants who had 15 minutes of focused breathing (one of the common exercises in MBSR) experienced lower fatigue severity (25).

Yet, the fatigue severity reduces the physical strength and consequently, the physical functions on the one hand, and on the other hand, this program has reduced the life quality-related mental aspects in the patients. Therefore, the mindfulness exercises significantly affect the reduction of fatigue severity in the MS patients through increasing the awareness of the present tie, body and mind control techniques, and non-judgment approaches (26). Besides, based on Orken et al. (27) study titled "the effects of Yoga on the cognitive performance, fatigue, mood, and life quality of the men", yoga reduces the fatigue in these people.

Elaborating on the above results, the cognitive therapy nature of mindfulness should be taken into consideration. Many of the health psychology studies are about the methods on the mental and behavioral processes such as controlling and accepting the negative excitements, reduction of stimulation, reduction of the inner alarm, the methods based on amelioration, and the problem-solving skills can help the people confront the damaging conditions. Based on the anticipation, mindfulness-based stress reduction therapy was effective on the fatigue in patients suffering MS due to variables such as increasing inner peace and awareness through mindfulness techniques, reducing negative emotions related to the experience of unpleasant thoughts and emotions, increasing the toleration of distress and fatigue, and training how to identify and replace ineffective and negative thoughts and beliefs. It is suggested to compare this approach with other approaches to reduce the psychological problems of such patients. Also, it is suggested that in future studies, the effects of this therapy can be investigated on each type of MS.

As was seen, the results indicated that the mindfulness-based stress reduction intervention led to a decrease in MS patients' fatigue severity. The results of the current study and past research on the mindfulness-based stress reduction methods and interventions supported the improvement of MS patients' abilities and psychological state.

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