



The Effect of Group Mindfulness-based Stress Reduction and Consciousness Yoga Program on Quality of Life and Fatigue Severity in Patients with MS

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ABSTRACT

Introduction: The chronic nature of Multiple Sclerosis (MS), have can leave devastating effects on quality of life and fatigue. The present research aimed to study the effect of group Mindfulness-based Stress Reduction (MBSR) and conscious yoga program on the quality of life and fatigue severity among patients with MS.

Methods: This study was quasi-experimental with intervention and control groups. The statistical population included all members to MS Society of Tehran Province, 24 of whom diagnosed with MS were selected as the sample based on the inclusion criteria. The subjects were randomly assigned into the test group (12 patients) and the control group (12 patients). MS Quality of Life-54 (MSQOL-54) and Fatigue Severity Scale (FSS) were used for data collection. Subjects in the test group underwent a MBSR and conscious yoga program in 8 two-hour sessions. The data were analyzed using the SPSS ver.13 software.

Results: The study findings showed that there was a significant difference between subjects in the experimental and control groups in terms of mean score of some subscales of quality of life including physical health, role limitations due to physical and emotional problems, energy, emotional well-being, health distress, health perception, and satisfaction with sexual function, overall quality of life, and fatigue severity.

Conclusion: The results show that the program is effective in reduction of fatigue severity and improving some subscales of quality of life in MS patients. Hence, this supportive method can be used as an effective way for improving quality of life and relieving fatigue in MS patients.

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Introduction

Multiple sclerosis (MS) is a chronic disease that is associated with demyelination of neurons and affects the myelin sheath of neurons in the central nervous system.¹ The cause of this disease is still unknown, but it seems that activation of immune mechanisms against myelin antigen is involved in this regard.² MS usually occurs at ages 20-40 and affects women more than men.

Currently, 2 million people worldwide, including 400,000 Americans, are afflicted with

MS.³ In Iran, 15-30 out of every 100 thousand people are living with this disease.⁴ The emergence of this disease is usually coincident with situations such as family formation, career choice, and providing financial security.

MS threatens a person's independence and ability to effectively participate in society, on the one hand,⁵ and its prognosis and unpredictable periods considerably affect quality of life and health, on the other hand.

MS patients are unable to find an appropriate way to solve problems and

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achieve approaches to improve their quality of life and health.⁶

In chronic diseases, quality of life is highly influenced by severity and duration of disease and drugs taken by the patient. Since MS patients are no exception, complications of this disease, in addition to causing physical discomforts, imposes mental, social, and economic pressures on patients and their family. Moreover, this disease leads to a decline in personal and social performance of patients and thereby greatly affects their roles in life, job status, and quality of life (physical and mental health).⁷ Studies have shown that MS patients have a significantly lower quality of life compared to healthy people and patients with other chronic diseases such as epilepsy, diabetes, and rheumatoid arthritis.^{8,9,10} The findings show that fatigue is one of the most common mental symptoms of MS which negatively affects quality of life, as highest prevalence of fatigue in MS patients is 70-90%.^{11,12} MS patients make complaints of fatigue as the worst and most debilitating symptom of their condition. In fact, MS-related fatigue is a common abnormal lack of energy which dramatically limits one's physical and mental ability, regardless of the level of neurological disability. This fatigue affects the cognitive and motor abilities manifested as loss of energy, illness, motor weakness, and difficulty in maintaining the focus. MS-related fatigue can also negatively affect employment, socialization process, and coping with the disease and thereby reduce the level of daily activities and quality of life of patients.^{13,14}

As reported by previous studies, clinical manifestations of MS play an important role in adaptation of patients to the disease. Hence, psychotherapy interventions aimed at these manifestations can help patients to better cope with this disease.¹⁵ The best treatment for improvement of quality of life and reduction of fatigue is to train patients on self-care and help them adapt to changes in their physical and mental status.¹⁶ One of the most common treatment for decreasing of anxiety, depression, and stress and improving life quality is mindfulness-based stress reduction

program (MBSR) that has been presented by Kabat-Zinn in Medical Centre of Massachusetts University in 1979.¹⁷ This is an 8-week program which every session lasts 2 hours and mindfulness skills for coping with life stresses and raising awareness of the present moment are taught and include thought-related meditation, relaxation and Hatha yoga. Mindfulness means paying attention to the present time in a special, targeted, and without judgment way.¹⁷ One of the main goals of this program is promoting the health and reducing stress. One of the main concepts of mindfulness training is that to be honest to ourselves and our feelings.

Along with increasing individual's ability to mindfulness, the person can accurately detect what is happening in the body and mind as it is happening in the environment around.¹⁷ It seems that the MBSR and conscious yoga in a group can be useful for MS patients. It is believed that group therapy can be used effectively for most mental disorders, because group therapy is a process through in which the insight of individuals is improved. In addition, patients in a group feel more powerful and have a higher level of self-confidence.¹⁸

Many studies have been conducted on the useful effects of MBSR and Mindfulness-based Cognitive Therapy (MBCT) on chronic diseases such as low back pain, fibromyalgia, breast cancer, and prostate cancer.^{17,19} The results of studies conducted by Gu *et al.*, about the effect of mindfulness on MS patients have indicated that mindfulness caused no significant change in the management of symptoms among MS patients.²⁰ However, the effect of MBSR and conscious yoga program on MS patients has not been studied in the previous studies. In this program, mindfulness means to pay attention to real objectives and being in the present moment in a purposeful manner and devoid of judgment.¹⁹ MBSR is basically designed to facilitate the compliance with and adaptation to medical conditions and considered a self-regulatory approach to stress reduction, emotion management, and health promotion.²¹ If MS patients regularly do

conscious yoga exercises, they will experience some states of balance, relaxation, and in-depth awareness.²⁰ Since high fatigue and low quality of life are prevalent among MS patients and this disease poses many psychological problems not only for patients but also for their family, the present research aimed to study the effect of group mindfulness-based stress reduction and conscious yoga program on the quality of life and fatigue severity among patients with MS.

Materials and methods

The present research was a quasi-experimental study with pretest-posttest design with control and intervention groups and was conducted by authorising from the honorable management of Tehran M.S association. The statistical population included all male and female MS patients aged 20-45 who were a member of MS Society of Tehran, 24 of whom were selected as the sample based on the convenience sampling method and the inclusion criteria. The inclusion criteria were MS diagnosis by a specialist (neurologist), being in the relapse-suppression stage of the disease, independency on wheelchair, a minimum educational attainment of high school diploma, non-use of psychotropic drugs and psychological treatments throughout the study, and being aged 20-45. The exclusion criteria were absence of patients in yoga and meditation classes before and during the study, affliction with acute or chronic problems like severe depression, psychosis, and so on, not obtaining a written consent for participation in the study, and absence of more than two sessions in the program. The samples were selected by convenience sampling method and were randomly (a random sample is drawn from a population by using a probability device. We put everyone's name on a slip of paper, mix thoroughly, and select the number of names we need. The use of a probability device to select the subjects allows us to make valid generalizations from the sample to the population) assigned into experimental and control groups. Each group

consisted of 12 patients. The adequacy of sample size was examined by basic statistical methods (Krejcie and Morgan Table, G-power software) and results of the previous studies,¹⁸ with a confidence level of 95% and error of 5%.

Significance level of less than 5% error rate that we are committed to reject the null hypothesis. Then, after obtaining written informed consent from all participant, pre-test evaluations were conducted. Data were collected by following tools.

A: Clinical Version of the Structured Clinical Interview for Axis I Disorders in DSM-IV (SCID-I/CV) (Diagnostic and Statistical Manual of Mental Disorders-IV): This is a standardized tool for assessment of the major psychiatric disorders based on the definitions and criteria of DSM-IV which has been developed for clinical and research purposes.²²

Implementation of SCID-I/CV requires clinical judgment of the interviewer on the interviewee's responses. Therefore, the interviewer should have enough knowledge on psychopathology. An acceptable validity and reliability of this tool has been reported from various studies.²² For instance, a Cohen's kappa coefficient of above 0.7 has been reported in the diagnostic reliability between raters. According to the findings of another study, the validity of this tool was confirmed by experts and its test-retest reliability, in a week interval, was reported to be 0.95.²² This tool has been translated into Farsi and its validity and reliability has been confirmed by Sharifi et al., in Iran.²²

B: Fatigue Severity Scale (FSS): Fatigue Severity Scale has been developed by Krupp et al., for assessing the severity of fatigue in chronic diseases such as multiple sclerosis and lupus. This scale measures fatigue in 9 items based on 7-point Likert scale and higher scores indicate greater fatigue. Cronbach's alpha of this scale for healthy people, MS patients, and lupus patients has been reported to be 0.88, 0.81, and 0.89, respectively.²³ The internal consistency (Cronbach's alpha) and test-retest reliability of the Farsi version of this scale have been obtained equal to 0.98 and 0.93, respectively.²³ In the present study, test-retest

reliability (within two months) and internal consistency (Cronbach's alpha) of FSS were calculated 0.86 and 0.89, respectively.

C: Multiple Sclerosis Quality of Life- 54 (MSQOL-54): This scale has been developed by Barbara Vickrey for MS patients. It consists of 54 items, modified by adding 18 items to the 36-item short questionnaire, and measures quality of life in 13 areas.²⁴ Each subscale is scored from 0 to 100 and score of each area is determined by calculating the mean scores.²⁴

Two important scores are the score of physical dimensions and score of mental dimensions of quality of life. In a study on MS patients, subscales of quality of life presented a good internal consistency with Cronbach's alpha coefficients between 0.75 and 0.96. To assess the reliability by using the test-retest method, correlation coefficient for subscales was obtained between 0.66 and 0.96. The validity of MSQOL-54 have been assessed and confirmed by faculty member of Tarbiat Modarres University and Medical Universities of Tehran, Iran, and Shahid Beheshti. Split method was used to examine the reliability of this scale and Pearson correlation coefficient was used for determining the correlation level. The reliability of MSQOL-54 using internal consistency and Cronbach's alpha was obtained 0.86 and 0.88, respectively in Patients with MS.²⁵

After sincere cooperation of Tehran MS Society with authors, all members of this society were invited to voluntarily attend in a meeting session in summer 2014. In this meeting, they were provided with research objectives and methodology. Those willing to participate in the study were invited to an interview. After interview and screening, 24 MS patients were selected as the sample considering the inclusion and exclusion criteria. After filling out the questionnaire as the pretest, subjects were assigned into experimental and control groups. It should be noted that 3 subjects in the experimental group showed a decline withdrawal. In the experimental group, a group MBSR program and conscious yoga were performed in 8 two-hour sessions. The content of each session are

as follow: First session: the introduction of automatic guidance system/ knowing how to use present moment awareness of bodily sensation, thoughts and emotions in reducing stress/practicing eating raisins (Object attention training), giving feedback and discussion about the practice/three - minute breathing, giving assignment for next week and distributing leaflets of the first session and CDs of meditation. Second session: re-examining body workout/ giving feedback and discussion about examining body workout/ practicing breathing mindfulness meditation/ yoga stretching exercise/distributing leaflets of the second session and CDs of meditation. Third session: having conscious sitting with awareness of breathing(the sitting meditation)/practicing yoga exercises(in the hospital chapel)/ practicing three -minute breathing /distributing leaflets of the third session and video tape of yoga practices. Fourth session: re-examining body workout /practicing exercises related to conscious yoga(in the hospital chapel)/5-minute practicing of "seeing or hearing"/ re-practicing conscious session with awareness of breathing and body/ distributing leaflets of fourth session and CDs of meditation. Fifth session: practicing breathing /re-practicing conscious session(awareness of breathing ,body, sounds and thoughts)/explaining the stress and identifying participants' reactions to stress/examining awareness of pleasant and unpleasant events on feeling ,thoughts and bodily sensations/practicing conscious yoga exercises/practicing 3-minute breathing /distributing leaflets. Sixth session: practicing conscious yoga/practicing sitting meditation (mindfulness of sounds and thoughts)/distributing leaflets of the sixth session and number 4 video tape to participants. Seventh session: practicing mountain meditation/sleep hygiene/ repeating exercises of the previous session/making a list of enjoyable activities/distributing leaflets of the seventh session. Eighth session: examining body workout /overview of program/examining

and discussing programs /practicing stone, beads and marbles meditation.

At the end of all therapy sessions, the questionnaires were again filled out for all subjects. In addition, due to ethical considerations, subjects in the control group were explained that the implementation of this treatment is will be done for them for a certain period of time (two months). However, they were put in the waiting list and will be invited for treatment after this period. In order to calculate the mean and standard deviation, descriptive statistics were used and data analysis was done using the univariate analysis of covariance. Considering the normal distribution of data and homogeneity of variances, the Univariate Analysis of Covariance was used for analysis. Data were analyzed by SPSS ver.13 software.

Before participating patients in the study, the necessary information on the objects, the duration of study, and how to cooperate during the study was given to the patient and his/her attendant then after receipting them through the written informed consent as written form, they were selected as a research unit. The research units were assured the collected information and results of all patients will remain confidential and they may canceled if they don't want to go on. It was provided a necessary call to contact with researcher if necessary.

Results

Demographic characteristics is listed in the table 1. There was no significant difference between control and experimental groups in terms of mean of demographic characteristics such as sex, age, education, and marital ($P < 0.05$).

The participants 'age ranged between 20 and 45 years. The mean age of the patients in the intervention and control groups was 32.50 (5.14) and 32.13 (5.04) years, respectively.

According to table 2, the results of the multivariate analysis of covariance showed that there was a significant difference between subjects in the experimental and control

groups in terms of mean score of some subscales of quality of life including physical health ($P=0.001$), role limitations due to physical and emotional problems, energy, emotional well-being, health distress, health perception, satisfaction with sexual function, overall quality of life ($P < 0.05$), and fatigue severity ($P < 0.001$). But about 3 subscales of pain ($P=0.10$), social performance ($P=0.08$) and health change ($P=0.66$) has not seen a significant difference. Therefore, it can be stated that MBSR and conscious yoga caused improvement of the above-mentioned subscales of quality of life and reduction of fatigue severity in subjects of the experimental group compared to those in the control group.

The present study was approved by regional ethics committee at Behavioral Sciences Research Center, Shahid Beheshti University of Medical Sciences (ethics code: 1287).

Discussion

The present research aimed to study the effect of group MBSR and conscious yoga program on the quality of life and fatigue severity among patients with MS. The study findings revealed that group MBSR and conscious yoga program have significantly improved the physical and mental quality of life in MS patients. This is consistent with findings of some other studies.²⁶⁻³⁰ Shapiro et al., concluded that MBSR not only causes a reduction in anxiety and depression symptoms in MS patients but also enhances the quality of life and well-being of individuals. This reduces the recurrence rate in these patients.²⁸ Senders et al., showed that, conventionally mind-body therapies (Mindfulness) can be safe and helpful for treating common MS symptoms and especially non-pharmacological options, but for treating specific MS symptoms, it is needed more rigorously designed trials of mind-body interventions to increase our understanding and awareness on it.²⁹ As an explanation to these findings, it can be acknowledged that group MBSR and conscious yoga program, through meditation and mindfulness techniques, can increase self-

Table 1. Demographic characteristics of patients with MS (each group=12)

Variable	Experimental group	Control group
	N (%)	N (%)
Sex		
Female	6 (0.50)	5(0.41)
Male	6(0.50)	7(0.59)
Education		
Third grade tips	3(0.25)	3(0.25)
School diploma	5(0.41)	6(0.50)
Bachelor	4(0.34)	3(0.25)
Marital		
Single	7(0.59)	6(0.50)
Married	5(0.41)	6(0.50)

Table 2. Comparison of mean quality of life (and its subscales) and fatigue severity between the experimental and control groups based on the multivariate analysis of covariance (each group=12)

Variable	Control group		P [€]	Experimental group		P [€]
	Pre-test Mean (SD)	Post-test Mean (SD)		Pre-test Mean (SD)	Post-test Mean (SD)	
Quality of life (subscales)						
Physical function	80.43(5.15)	82.51(6.11)	0.09	80.23(5.79)	88.33(4.65)	0.001*
Role limitations due to physical problems	86.09(13.45)	85.00(14.88)	0.66	88.61(14.45)	80.58(17.32)	0.01*
Role limitations due to emotional problems	47.83(10.30)	48.06(9.07)	0.10	46.06(10.60)	38.00(10.39)	0.001*
Pain	62.51(3.03)	63.85(4.23)	0.24	65.21(10.73)	63.00(10.85)	0.10
Emotional well-being	49.81(12.56)	48.46(12.44)	0.08	49.25(10.48)	55.52(6.37)	0.001*
Energy	66.55(5.39)	68.60(3.61)	0.20	67.14(8.74)	75.76(9.55)	0.05*
Health perception	34.80(7.49)	33.91(6.61)	0.07	33.89(7.34)	38.40(8.43)	0.05*
Social performance	43.5(5.23)	44.00(2.14)	0.31	44.43(4.86)	44.02(4.96)	0.08
Health change	30.33(10.01)	29.33(8.21)	0.22	31.03(6.35)	28.80(7.54)	0.66
Sexual functioning	39.15(7.72)	40.10(5.37)	0.09	40.59(12.24)	46.90(8.28)	0.02*
Cognitive Functioning	27.09(3.11)	28.21(1.63)	0.11	16.56(4.05)	22.27(1.58)	0.001*
Satisfaction with sexual function	28.07(16.63)	27.00(18.46)	0.06	25.48(10.20)	30.25(13.11)	0.02*
Health distress	59.11(5.07)	60.95(2.57)	0.16	60.41(6.05)	52.07(7.50)	0.05*
Quality of life (physical)	58.07(13.53)	56.63(8.19)	0.33	58.78(12.71)	64.08(12.26)	0.03*
Quality of life (mental)	58.02(18.07)	58.02(13.48)	0.21	58.88(17.12)	65.59(23.82)	0.02*
Overall quality of life	58.03(15.80)	57.32(10.83)	0.08	58.83(14.91)	64.83(18.04)	0.04*
Fatigue severity	49.87(34.50)	50.60(34.51)	0.06	42.02(22.18)	29.08(12.87)	0.001*

[€]Univariate analysis of covariance, *statistically significant

acceptance and self-awareness abilities and thereby improve the quality of life. Mindfulness (focus and automatic exercises) and relaxation training (body scan, relaxation and Hatha Yoga), as stress management skills, should be regularly and permanently used in patients' everyday life. Studies have shown that mindfulness has

been effective in improvement of mental and physical well-being and reduction of physical symptoms.^{5,17,18} In another explanation, it can be noted that mindfulness is a balanced and non-judgmental feeling of awareness which helps the clarification and acceptance of physical and emotional phenomena.^{17,18}

Therefore, mindfulness training in patients with MS, who suffer from physical and mental problems, leads to the acceptance of physical and emotional symptoms and this acceptance reduces their excessive sensitivity to their problems.^{17,27} In this regard, the results show that emotional inhibition is considered a negative strategy for regulation of the emotion causing chronic diseases such as MS and cognitive-emotional assessment is regarded a positive strategy for regulation of the emotion leading to the improved mental and physical quality of life and reduction of physical symptoms of specific diseases such as MS.

In contrast, our results are not consistent with the results of Dodd et al.,⁶ and Rampelo et al.,³¹ have shown that quality of life after exercise training program changes as well, but no significant changes. In the present study, MBSR program has not caused significant difference in some of quality of life subscales including pain, social performance and health change. Because it seems that low number of research participants¹² is the reason for achieving different results in few quality of life subscales. Lack of significant difference in social functioning subscale between experimental and control group can be affected by different factors such as family relationships, culture, attitude and economic condition in individuals. Like our study, Henderson et al.,³² Carletto et al.,³³ and Ulrichsen et al.,³⁴ showed that the treatment of MBSR highly affected on the quality of life, well-being, and hope in Traumatic Brain Injury and MS samples and significantly in reducing subscales of depression, anxiety, and hostility.

As the study findings show, group MBSR and conscious yoga program significantly reduced scores of fatigue severity in MS patients. This is consistent with the results of other studies.³⁵⁻³⁸ In addition, the results of Arch and Krask showed that the participants who had 15 minutes of focused breathing (as a common

exercise in MBSR) reported to suffer from less mental fatigue. Yet, fatigue severity causes loss of physical strength and reduction of physical functions on the one hand and reduces the psychological aspects related to quality of life in patients on the other hand.³⁵ Friciska-Nagy' et al., showed that fatigue and depression can significantly impact MS patients 'quality of life. Furthermore, for improving quality of life in MS patients; effective interventions may help, as target fatigue and depression.³⁸ In addition, the results of a study conducted by Flegal et al., indicated that yoga improves the quality of life and reduce fatigue in these individuals.³⁹

As an explanation to the findings, it can be stated that mindfulness training means focusing one's awareness on the present moment, while calmly acknowledging and accepting one's feelings, thoughts, and bodily sensations. In the presence of mind, one learns to be aware of his/her own mental state at any moment and focus on a certain issue. Participants continuously focus on different parts of their body and feelings related to any area of the body are carefully observed. Then, in a relaxed and wide awake state with eyes closed, they focus on breathing senses. Physical senses are also used for training of mindfulness.

Individuals are encouraged to pay attention to their inner experiences at any moment, such as physical sensations, thoughts, and feelings. In addition, focusing on environmental aspects such as sights and sounds are encouraged. Mindfulness should create the attitude in individuals that have a non-judgmental acceptance in the face of affairs and issues. Participants also apply mindfulness and focus during everyday activities such as walking, standing, and eating, be aware of their moods at any moment, and observe without judgment whenever emotions, feelings, and cognitions are processed. When participants find that the mind is wandering in thoughts, memories or speculations, they direct their attention to the present moment

without regard to the content and nature of them. Therefore, participants are taught to pay attention to their thoughts and feelings but do not stick with their content. They are also encouraged to pay attention to judgmental thoughts without judging them.

One of the outcomes of mindfulness exercises is that individuals find that most of feelings, thoughts and emotions are fluctuating or fleeting. On the other hand, these exercises of mindfulness in the present time reduce fatigue severity, because individuals lose energy in the process of past and future thoughts and continuously repeat it during daily activities. This causes fatigue and damage to individuals.

One of the limitation of this research was the lack of treatment follow-up due to time limitations. Therefore, it is recommended that the results of treatment to be followed up in future studies.

Conclusion

In this research the Group Mindfulness-based Stress Reduction Program and Consciousness Yoga improved the mental and physical aspects of quality of life and reduced the fatigue in patients with MS. Therefore this intervention can be used in patient with MS.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

References

1. McCabe MP. Mood and self-esteem of persons with multiple sclerosis following

- an exacerbation. *J Psychosom Res* 2005; 59 (3): 161-6
2. Haussleiter IS, Brüne M, Juckel G. Psychopathology in Multiple Sclerosis. *Ther Adv Neurol Disord* 2009; 2 (1): 13–29. doi: [10.1177/1756285608100325](https://doi.org/10.1177/1756285608100325)
3. Stuifbergen AK, Blozis SA, Harrison TC, Becker HA. Exercise, functional limitation, and quality of life: a longitudinal study of person with multiple sclerosis. *Arch Phys Med Rehabil* 2006; 87 (7): 935-43. doi: [10.1016/j.apmr.2006.04.003](https://doi.org/10.1016/j.apmr.2006.04.003)
4. Sosnoff JJ, Finlayson M, McAuley E, Morrison S, Motl RW. Home-based exercise program and fall-risk reduction in older adults with multiple sclerosis: phase 1 randomized controlled trial. *Clinical Rehabilitation* 2014; 28 (3): 254-63. doi: [10.1177/0269215513501092](https://doi.org/10.1177/0269215513501092).
5. Nourbakhsh B, Julian L, Waubant E. Fatigue and depression predict quality of life in patients with early multiple sclerosis: a longitudinal study. *Eur J Neurol* 2016; 23 (9): 1482-6. doi: [10.1111/ene.13102](https://doi.org/10.1111/ene.13102).
6. Dodd KJ, Taylor NF, Shields N, Prasad D, McDonald E, Gillon A. Progressive resistance training did not improve walking but can improve muscle performance, quality of life and fatigue in adults with multiple sclerosis: a randomized controlled trial. *Mult Scler*. 2011; 17 (11): 1362-74. doi: [10.1177/1352458511409084](https://doi.org/10.1177/1352458511409084)
7. Benedict RH, Wahling E, Bakshi R, Fishman I, Munschauer F, Zivadinov R, et al. Predicting quality of life in multiple sclerosis: accounting For physical disability, fatigue, cognition, mood disorder, personality, and behavior change. *J Neurol Sci* 2005; 231 (1-2): 29 – 34. doi: [10.1016/j.jns.2004.12.009](https://doi.org/10.1016/j.jns.2004.12.009)
8. Pittock SJ, Mayr WT, McClelland RL, Jorgensen NW, Weigand SD, Noseworthy JH, et al. Quality of life is favorable for most patients with multiple sclerosis: a population-based cohort

- study. *Arch Neurol* 2004; 61 (5): 679–86. doi: [10.1001/archneur.61.5.679](https://doi.org/10.1001/archneur.61.5.679)
9. Mikula P, Nagyova I, Krokavcova M, Vitkova M, Rosenberger J, Szilasiova J, et al. The mediating effect of coping on the association between fatigue and quality of life in patients with multiple sclerosis. *Psychol Health Med* 2015; 20 (6): 653-61. doi: [10.1080/13548506.2015.1032310](https://doi.org/10.1080/13548506.2015.1032310)
 10. Zernicke KA, Campbell TS, Blustein PK, Fung TS, Johnson JA, Bacon SL, et al. Mindfulness-based stress reduction for the treatment of irritable bowel syndrome symptoms: a randomized wait-list controlled trial. *Int J Behav Med* 2013; 20 (3): 385-96. doi: [10.1007/s12529-012-9241-6](https://doi.org/10.1007/s12529-012-9241-6).
 11. Neill J, Belan I, Ried K. Effectiveness of non-pharmacological interventions for fatigue in adults with multiple sclerosis, rheumatoid arthritis, or systemic lupus erythematosus: a systematic review. *J Adv Nur* 2006; 56 (6): 617–35. doi: [10.1111/j.1365-2648.2006.04054.x](https://doi.org/10.1111/j.1365-2648.2006.04054.x)
 12. Surakka J, Romberg A, Ruutiainen J, Aunola S, Virtanen A, Karppi SL, et al. Effects of aerobic and strength exercise on motor fatigue in men and women with multiple sclerosis: a randomized controlled trial. *Clin Rehabil* 2004; 18 (7):737-46.
 13. Pittion-Vouyovitch S, Debouverie M, Guillemin F, Vandenberghe N, Anxionnat R, Vespignani H. Fatigue in Multiple Sclerosis is related to disability, depression and quality of life. *J Neuro Sci* 2006; 243 (1-2): 39-45. doi: [10.1016/j.jns.2005.11.025](https://doi.org/10.1016/j.jns.2005.11.025)
 14. Kalron A. Association between perceived fatigue and gait parameters measured by an instrumented treadmill in people with multiple sclerosis: a cross-sectional study. *J Neuroeng Rehabil* 2015; 2 (12): 34. doi: [10.1186/s12984-015-0028-2](https://doi.org/10.1186/s12984-015-0028-2).
 15. Sadja J, Mills P J. Effects of yoga interventions on fatigue in cancer patients and survivors: a systematic review of randomized controlled trials. *The Journal of Science and Healing* 2013; 9 (4): 232–43.
 16. Fernández O, Baumstarck – Barrau K, Simeoni MC, Auquier P. Patient characteristics and determinants of quality of life in an international population with multiple sclerosis: assessment using the MusiQoL and SF-36 questionnaires with psoriasis. *Mult Scler* 2011; 17 (10): 1238-49. doi: [10.1177/1352458511407951](https://doi.org/10.1177/1352458511407951).
 17. Brake CA, Sauer-Zavala S, Boswell JF, Gallagher MW, Farchione TJ, Barlow DH. Mindfulness-based exposure strategies as a transdiagnostic mechanism of change: an exploratory alternating treatment design. *Behav Ther* 2016; 47 (2): 225-38. doi: [10.1016/j.beth.2015.10.008](https://doi.org/10.1016/j.beth.2015.10.008). Epub 2015 Nov 7.
 18. Imel Z, Baldwin S, Bouns K, MacCoon D. Beyond the individual: Group effects in mindfulness-based stress reduction. *Psychotherapy Research* 2008; 18 (6):735-42. doi: [10.1080/10503300802326038](https://doi.org/10.1080/10503300802326038).
 19. Specia M, Carlson L, Goodey E, Angen M. A randomized wait-list controlled clinical trial: The effect of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients. *Psychosomatic Med* 2000; 62 (5): 613-22.
 20. Gu J, Strauss C, Bond R, Cavanagh K. Corrigendum to “How do Mindfulness-Based Cognitive Therapy and Mindfulness-Based Stress Reduction Improve Mental Health and Wellbeing? A Systematic Review and Meta-Analysis of Mediation Studies” [Clinical Psychology Review 37 (2015) 1–12]. *Clinical Psychology Review* 2016; 49: 119. doi: [doi:10.1016/j.cpr.2016.09.011](https://doi.org/10.1016/j.cpr.2016.09.011)
 21. Fjorback LO, Arendt M, Ørnbøl E, Fink P, Walach H. Mindfulness-based stress reduction and mindfulness-based cognitive therapy: a systematic review of randomized controlled trials. *Acta Psychiatrica Scandinavica* 2011; 124 (2): 102–19. doi: [10.1111/j.1600-0447.2011.01704](https://doi.org/10.1111/j.1600-0447.2011.01704).

22. Sharifi V, Assadi SM, Mohammadi MR, Amini H, Kaviani H, Semnani Y, et al. Structured clinical interview for DSM-IV (SCID): Persian translation and cultural adaptation. *Iranian Journal of Psychiatry* 2007; 1: 46-48.
23. Shahvarughi Farahani A, Azimian M, Fallahpour M, Karimlou M. Fatigue severity scale (fss): evaluation of reliability of the Persian version among persons with multiple sclerosis. *Journal of Rehabilitation* 2010; 10 (4): 46-51. (Persian)
24. Flachenecker P, Vogel U, Simeoni MC, Auquier P, Rieckmann P. MusiQoL: international questionnaire investigating quality of life in multiple sclerosis: validation results for the German subpopulation in an international comparison. *Nervenarzt* 2011; 82 (10): 1281-9. doi:[10.1007/s00115-011-3276-9](https://doi.org/10.1007/s00115-011-3276-9).
25. Ghajarzadeh M, Azizi S, Moghadasi AN, Sahraian MA, Azimi A, Mohammadifar M, et al. Validity and reliability of the Persian version of the perception de la sclérose en plaques et de ses poussées questionnaire evaluating multiple sclerosis-related quality of life. *Int J Prev Med* 2016; 22(7): 25. doi: [10.4103/2008-7802.174773](https://doi.org/10.4103/2008-7802.174773).
26. Ziemssen T, Engelmann U, Jahn S, Leptich A, Kern R, Hassoun L, et al. Rationale, design, and methods of a non-interventional study to establish safety, effectiveness, quality of life, cognition, health-related and work capacity data on Alemtuzumab in multiple sclerosis patients in Germany (TREAT-MS). *BMC Neurol* 2016; 19 (16): 109. doi: [10.1186/s12883-016-0629-9](https://doi.org/10.1186/s12883-016-0629-9).
27. Flugel Colle K F, Cha S S, Loehrer L, Bauer B A, Wahner-Roedler D L. Measurement of quality of life and participant experience with the mindfulness-based stress reduction program. *Complementary. Complement Ther Clin Pract* 2010; 16 (1): 36-40. doi: [10.1016/j.ctcp.2009.06.008](https://doi.org/10.1016/j.ctcp.2009.06.008)
28. Shapiro SL, Oman D, Thoresen CE, Plante TG, Flinders T. Cultivating mindfulness: effects on well-being. *J Clin Psychol* 2008; 64 (7): 840-62. doi: [10.1002/jclp.20491](https://doi.org/10.1002/jclp.20491).
29. Senders A, Wahben H, Spain R, Shinto L. Mind-body medicine for multiple sclerosis: a systematic review. *Autoimmune Diseases* 2012; 2012 (2012): 12. doi: [10.1155/2012/567324](https://doi.org/10.1155/2012/567324).
30. Garg H, Bush S, Gappmaier E. Associations between fatigue and disability, functional mobility, depression, and quality of life in people with multiple sclerosis. *Int J MS Care* 2016; 18 (2):71-7. doi: [10.7224/1537-2073.2015-013](https://doi.org/10.7224/1537-2073.2015-013).
31. Rampello A, Franceschini M, Piepoli M, Antenucci R, Lenti G, Olivieri D, et al. Effect of aerobic training on walking capacity and maximal exercise tolerance in patients with multiple sclerosis: a randomized crossover controlled study. *Phys Ther* 2007; 87 (5): 545-55. doi: [10.2522/ptj.20060085](https://doi.org/10.2522/ptj.20060085).
32. Henderson VP, Clemow L, Massion AO, Hurley TG, Druker S, Hébert JR. The effects of mindfulness-based stress reduction on psychosocial outcomes and quality of life in early-stage breast cancer patients: a randomized trial. *Breast cancer research and treatment* 2012; 131 (1): 99-109. doi:[10.1007/s10549-011-1738-1](https://doi.org/10.1007/s10549-011-1738-1).
33. Carletto S, Borghi M, Francone D, Scavelli F, Bertino G, Cavallo M. The efficacy of a Mindfulness Based Intervention for depressive symptoms in patients with Multiple Sclerosis and their caregivers: study protocol for a randomized controlled clinical trial. *BMC Neurology* 2016. 16:7. doi: [10.1186/s12883-016-0528-0](https://doi.org/10.1186/s12883-016-0528-0).
34. Ulrichsen KM, Kaufmann T, Dørum ES, Kolskår KK, Richard G, Alnæs D. Clinical utility of mindfulness training in the treatment of fatigue after stroke, traumatic brain injury and multiple sclerosis: a systematic literature review and meta-analysis. *Front Psychol* 2016; 7: 912. doi: [10.3389/fpsyg.2016.00912](https://doi.org/10.3389/fpsyg.2016.00912)

35. Arch J, Craske MG. Mechanisms of mindfulness: emotion regulation following a focused breathing induction. *Behav Res Ther* 2006; 44 (12): 1849-58. doi: [10.1016/j.brat.2005.12.007](https://doi.org/10.1016/j.brat.2005.12.007)
36. Gulick EE. Bowel management related quality of life in people with multiple sclerosis: psychometric evaluation of the QoL-BM measure. *Int J Nurs Stud* 2011; 48 (9): 1066-70. doi: [10.1016/j.ijnurstu.2011.02.002](https://doi.org/10.1016/j.ijnurstu.2011.02.002).
37. Grossman P, Kappos L, Gensicke H, et al. MS quality of life, depression, and fatigue improve after mindfulness training: a randomized trial. *Neurology* 2010; 75 (13): 1141-9. doi: [10.1212/WNL.0b013e3181f4d80d](https://doi.org/10.1212/WNL.0b013e3181f4d80d).
38. Fricska-Nagy Z, Füvesi J, Rózsa C, Komoly S, Jakab G, Csépany T, et al. The effects of fatigue, depression and the level of disability on the health-related quality of life of glatiramer acetate-treated relapsing-remitting patients with multiple sclerosis in Hungary. *Mult Scler Relat Disord* 2016; 7: 26-32. doi: [10.1016/j.msard.2016.02.006](https://doi.org/10.1016/j.msard.2016.02.006).
39. Flegal KE, Kishiyama S, Zajdel D, Haas M, Oken BS. Adherence to yoga and exercise interventions in a 6-month clinical trial. *BMC Complement Altern Med* 2007; 9 (7): 37. doi: [10.1186/1472-6882-7-3](https://doi.org/10.1186/1472-6882-7-3).