

Effect of Mindfulness-Based Stress Reduction Program on Psychological Symptoms, Quality of Life, and Symptom Severity in Patients with Somatic Symptom Disorder

Abstract

Background: Patients with somatic symptom disorder (SSD) had a poor quality of life and suffered from depression, anxiety, and stress. Mindfulness-based stress reduction (MBSR) is a psychological treatment with remarkable effects on several psychological disorders. This study aimed to evaluate the effect of the MBSR program on psychological symptoms, quality of life, and symptom severity in patients with SSD. **Materials and Methods:** The patients with SSD were randomly divided into two groups of receiving venlafaxine alone and venlafaxine with an 8-week MBSR program. Depression, anxiety, and stress with their severities were assessed along with the quality of life, the number of physical symptoms and their severities, as well as SSD severity before and after the intervention. Subsequently, the results were compared between the two groups. **Results:** This study included 37 patients with SSD who referred to Shariati Psychosomatic Clinic, Isfahan, Iran, with a mean age of 37.08 ± 8.26 years. It should be noted that 37.8% of the participants were male. The intervention group obtained significantly lower scores in depression, anxiety, stress, and their severities, compared to the control group. Moreover, the number of physical symptoms, their severity, and the severity of SSD were significantly decreased more in the intervention group rather than the controls. **Conclusion:** The MBSR accompanied by prescribing venlafaxine can significantly reduce the severity of SSD, as well as the number and severity of physical symptoms. Moreover, it can reduce depression, anxiety, stress, and their severity. The MBSR can be used as complementary medicine for the treatment of patients with SSD.

Keywords: Depression, stress disorders, pathological conditions, signs and symptoms, quality of life, mental disorders

Fatemeh Zargar,
Leila Rahafrouz¹,
Mohammad Javad
Tarrahi²

Department of Health
Psychology, Isfahan University
of Medical Sciences,
¹Department of Psychiatry,
School of Medicine, Isfahan
University of Medical Sciences,
²Department of Biostatistics
and Epidemiology, Faculty of
Health, Isfahan University of
Medical Sciences, Isfahan, Iran

Introduction

Somatic symptom disorder (SSD) is defined as the presence of one or more physical symptoms lasting 6 months or longer that are associated with excessive thoughts, feelings, or behaviors. According to the Diagnostic and Statistical Manual of Mental Disorders (4th Edition) (DSM-IV), the SSD replaces three somatoform disorders, including somatization, pain, and undifferentiated somatoform disorders and in some cases hypochondriasis. There are three specifications for diagnosing SSD that describe the nature, duration, and severity of symptoms.^[1] In patients with SSD, the diagnostic tests are normal or irrelevant to the clinical symptoms, and the past medical history is negative or unrelated to clinical manifestations.^[2] The prevalence of SSD is around 5% in different societies, and 10%–20% of the health system cost

is annually spent on the treatment of this condition.^[3]

In the UK, 20%–35% of all consultations are associated with a functional somatic syndrome or SSD.^[4,5] Moreover, in The Netherlands, medically unexplained symptoms and somatoform disorders are the fifth most expensive diagnostic category.^[6]

There is evidence that about one-third of SSD patients are suffering from anxiety or depression; moreover, 50% of the cases had these two conditions simultaneously.^[7,8] Depression, anxiety, and SSD have overlap in diagnostic criteria that can lead to an increased likelihood of co-occurrence.^[9] In addition, one of these syndromes can act as a risk factor for other syndromes. On the other hand, anxiety can be a risk factor for depression or SSD.^[10] The Netherlands Study of Depression and Anxiety was conducted on 2008 individuals consisting of 1367 patients with a depressive disorder

Address for correspondence:

Dr. Leila Rahafrouz,
Department of Psychiatry,
School of Medicine, Isfahan
University of Medical Sciences,
Isfahan, Iran.
E-mail: l.afrouz1392@gmail.com

Received: 12 May 2019
Revised: 11 November 2019
Accepted: 13 October 2020
Published: 26 February 2021

Access this article online

Website: www.advbiores.net

DOI: 10.4103/abr.abr_111_19

Quick Response Code:



How to cite this article: Zargar F, Rahafrouz L, Tarrahi MJ. Effect of mindfulness-based stress reduction program on psychological symptoms, quality of life, and symptom severity in patients with somatic symptom disorder. *Adv Biomed Res* 2021;10:9.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

and/or anxiety disorder. The results of the aforementioned study showed that all types of depressive and anxiety disorders were independently related to somatic symptoms, except for dysthymic disorder.^[11]

Patients with SSD are treated with antidepressants, such as selective serotonin reuptake inhibitors and serotonin and norepinephrine reuptake inhibitors in addition to cognitive behavior therapy. This treatment should help SSD patients to reduce the depression, anxiety, symptoms, and their severities along with improving the quality of life.^[12-15] Since medical treatment in SSD patients is not reported to be useful, there is an obvious need for complementary medicine.^[16]

Mindfulness-based stress reduction (MBSR) is a self-regulation approach that was first used to prevent depression recurrence.^[14] The MBSR is also used for stress reduction and emotion management by increasing awareness for what is happening in each moment in an accepting manner without getting caught up in habitual thoughts, emotions, and behavioral patterns.^[15] There are some evidence associated with the effectiveness of MBSR on psychological problems, such as quality of life, sleep disturbance disorders, mood disorders, fatigue, and stress level in different medical conditions, including rheumatoid arthritis,^[16] fibromyalgia,^[17] cancer,^[18] chronic pain,^[19] and multiple sclerosis.^[20-22] Although several studies have shown the efficacy of mindfulness-related therapies on symptoms of SSD patients in recent years,^[22,23] there has been no similar study in the Iranian population.

Given the effectiveness of MBSR intervention on several psychiatric and physical health problems and the co-occurrence of SSD, depression, anxiety, and other

psychiatric problems, no studies have evaluated the effectiveness of this program on SSD patients in Iran. Therefore, this study aimed to evaluate the effect of adding the MBSR program to the treatment process with venlafaxine on psychological symptoms, quality of life, and symptom severity in SSD patients.

Materials and Methods

This open-label randomized controlled clinical trial was conducted on SSD patients who were referred by all physicians to Shariati Psychosomatic Clinic and the Psychiatric Clinic of Noor Hospital affiliated to Isfahan University of Medical Sciences, Isfahan, Iran, during 2017–2018. The definitive diagnosis was made by a specialist or resident psychiatrist according to a clinical interview based on the DSM.

The sample size of this study was calculated as 46 patients (23 patients per group) based on a comparison of two mean formulas (95% confidence interval: 1.96, Type II error: 0.2, SD: 9.16 and 8.75).

The patients were selected using convenience sampling methods. Then, the patients were assigned randomly into two groups of MBSR + venlafaxine or venlafaxine alone through randomization block design (10 blocks with size of 2 in order to compose two groups of 20) [Figure 1].

The inclusion criteria were documented diagnosis of SSD based on the DSM IV criteria, educational level higher than primary school, age range between 20 and 50 years, lack of diagnosis of other major psychiatry disorders based on the clinical interviews, and willingness to participate in the study. On the other hand, the patients with a history of

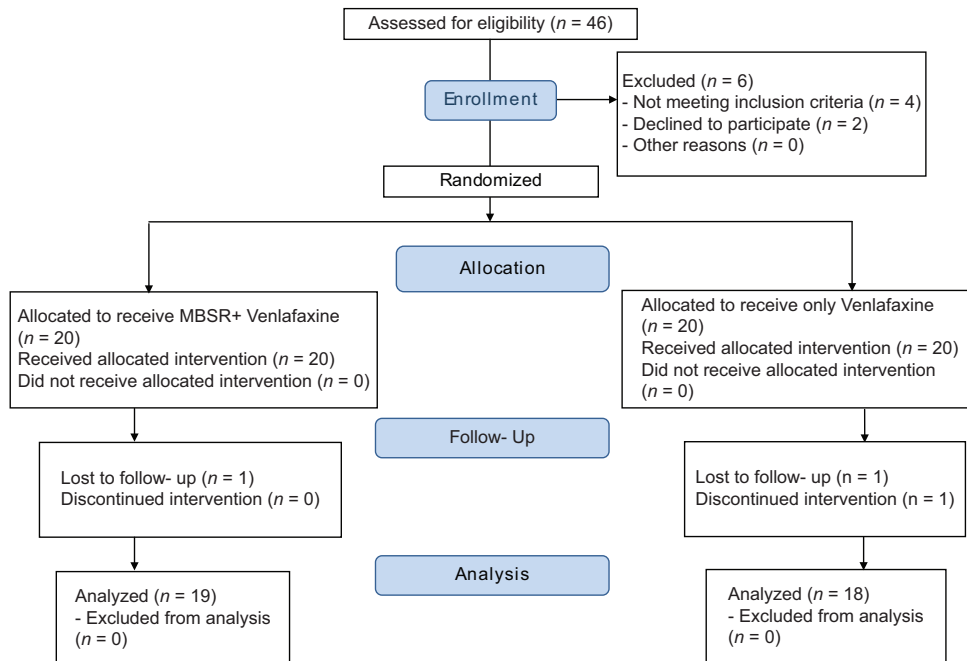


Figure 1: Consort flowchart diagram

suicide and those who experienced psychotherapy during the last 6 months, discontinued the treatment, and were unwilling to continue this study were excluded from the research process.

Written informed consent was obtained from all patients, and they were all informed of the research procedure. The study protocol was approved by the Ethics Committee of Isfahan University of Medical Sciences (ethics approval code: IR.MUI.REC.1397.3.107), Isfahan, Iran, and also registered in IRCT (IRCT20180909040974N2).

The intervention group was treated with venlafaxine, and they participated in eight 2-h sessions of the MBSR program on a weekly basis. On the other hand, the control group was treated with venlafaxine alone (Venabid ER®, ABIDI Company, Tehran, Iran). Venlafaxine was prescribed 37.5–150 mg daily for 8 weeks.^[14] Initially, all patients in the two groups received 37.5 mg venlafaxine daily, followed by a weekly dosage of 37.5 mg, which continued to a maximum daily dosage of 150 mg until the end of the 8th week.

Table 1 illustrates the protocol of MBSR. The demographic characteristic form covered such information such as age and gender. The patients in both the intervention and control groups were requested to complete the questionnaires before and immediately after the intervention. These questionnaires measure variables, including anxiety, depression, stress, quality of life, health physical symptom, and severity of these symptoms.

The questionnaires used in this study are as follow:

Depression Anxiety Stress Scale

Depression Anxiety Stress Scale (DASS) is a 21-item self-reported tool that measures three relative negative emotional states, including depression, anxiety, and stress/tension. Each item score ranges from 0 to 3, and each subscale in this questionnaire has a range score of 0–21. The severity of depression, anxiety, and stress is reported based on each subscale score. This questionnaire has been widely used in previous studies with confirmed validity and reliability.^[24]

36-Item Short-Form Survey

The 36-Item Short-Form Survey (SF-36) is a 36-item patient-reported questionnaire that evaluates the health-related quality of life. This questionnaire consisted of 8 subscales, such as physical function, limitation due to health, limitation due to emotional problems, energy/fatigue, emotional well-being, social functioning, general health, and pain. The validity and reliability of this questionnaire were evaluated in previous studies.^[25]

Patient Health Questionnaire Physical Symptom

Patient Health Questionnaire Physical Symptom (PHQ-15) is a 15-item questionnaire evaluating somatic symptoms during the last 4 weeks. The responses are scored from 0 to 2. This questionnaire categorizes the severity of somatic symptoms as minimal (0–4), low (5–9), medium (10–14), and high (15–30). The validity and reliability of this questionnaire were evaluated in previous studies.^[26] The severity of SSD was evaluated using the DSM IV criteria by a psychiatrist before and after the intervention.

Statistical analysis

The data were analyzed in SPSS Statistics for Windows, version 24 (SPSS Inc., Chicago, Ill., USA). Moreover, the quantitative and qualitative data were reported by mean ± standard deviation, as well as frequency and percentage, respectively. The independent samples *t*-test, paired sample *t*-test, and Chi-square test were utilized to compare variables between the groups. In addition, a two-sided α level of 0.05 was used to assess statistical significance.

Results

In this study, 46 SSD patients were assessed for eligibility, and 6 of them were excluded due to not meeting the inclusion criteria. In total, 40 SSD patients were randomly divided into two groups of 20. It should be mentioned that one and two patients in the intervention and control groups discontinued the treatment, respectively, and were excluded from the study. Finally, the data were collected from 37 patients (19 and 18 cases in the intervention and the control groups, respectively) [Figure 1].

Table 1: The contents of mindfulness-based stress reduction program session

Sessions	Sessions contents
Session 1	Introduction to the body scan, a practice to facilitate nonjudgmental awareness of physical sensations, and an eating meditation that focused on differentiating physical sensation from thoughts
Session 2	Introduction to sitting meditation with awareness of breathing as the primary object of attention
Session 3	Introduction to gentle mindful yoga movements as a way of bringing awareness to subtle movements of the body
Session 4	Introduction of walking meditation, the psychophysiology of the stress response was discussed
Session 5	Sitting meditation was expanded to include awareness of thoughts arising and passing away, and discussion included the role of mindfulness in responding to stress in everyday life
Session 6	Work to strengthen emotions and emotional resilience of expanding internal resources
Session 7	Introduction to choiceless awareness (a practice in which one is fully aware of the moment, yet not focused on any physical or mental image or object), awareness of how we nourish our bodies
Session 8	A review of the course and cultivating resources for continued practice was discussed

Table 1 shows the demographic characteristics of the participants. The mean age of participants in the intervention and control groups was 38.21 ± 8.55 years and 35.89 ± 7.97 years, respectively (P value = 0.39). About 31.6% ($n = 6$) in the MBSR group and 44.4% ($n = 8$) were male (P value = 0.42) [Table 2].

It can be seen that there is no difference between the two groups in terms of age and gender. The severity of SSD was assessed by the DSM V criteria. In the MBSR group, about 15.8% ($n = 3$), 31.6% ($n = 6$) and 52.6% ($n = 10$) had severe, moderate, and mild SSD, respectively, although after intervention, these variables were 0% ($n = 0$), 21.1% ($n = 4$), and 57.9% ($n = 11$), respectively, and 21% ($n = 4$) were normal without diagnosis of SSD. In the control group, the prevalence of severe, moderate, and mild SSD were 22.2% ($n = 4$), 55.6% ($n = 10$), and 22.2% ($n = 4$) before study and 16.7% ($n = 3$), 55.6% ($n = 10$), and 16.7% ($n = 3$) after study and 11.1% ($n = 2$) had not met criteria for diagnosis of SSD [Table 3].

Moreover, Table 4 indicates the mean scores of the MBSR and control groups obtained from DASS, SF-36, and PHQ 15 questionnaires in pre- and posttest. These two tables show the significantly reduced levels of SSD severity, depression, anxiety, and stress in the MBSR group, compared to the control group. Moreover, there was a decrease in the physical symptoms of the patients and their severity assessed by PHQ-15. According to the results obtained from the SF-36 subscales, there were no significant differences between the two groups in this regard. However, there was just a significant difference between the MBSR and the control groups regarding the scores obtained from the general health of the SF-36 subscale.

Table 2: Demographic data of participants in intervention and control groups

Demographic variables	Intervention group	Control group	P
Age	38.21 ± 8.55	35.89 ± 7.97	0.39†
Gender (%)			
Male	6 (31.6)	8 (44.4)	0.42††
Female	13 (68.4)	10 (55.6)	

Data shown mean±SD or n (%). †Used of independent samples t -test, ††Used of Chi-square test. SD: Standard deviation

Discussion

This study evaluated the effect of the MBSR program in addition to venlafaxine on SSD patients, compared to venlafaxine alone. The results showed that MBSR along with venlafaxine can significantly reduce the levels of depression, anxiety, and stress in patients with SSD. This finding is consistent with the results of other studies in which they revealed that mindfulness approaches had effects on psychological symptoms and complaints (e.g., anxiety, depression, well-being, quality of life, and interpersonal problems), the symptoms of medical diseases,^[16-20,27] as well as medically unexplained symptoms.^[22] However, the results of one study are inconsistent with those in this study. The aforementioned study evaluated the effects of MBSR on chronic pain management and revealed that this method had no effects on mood symptoms and quality of life. This discrepancy can be attributed to the fewer number of participants that continued their treatment.^[28]

Our finding indicated that MBSR significantly reduced the number and severity of physical symptoms of SSD based on PHQ-15 in the MBSR group, compared to the venlafaxine alone group. Several mechanisms have been identified for the impact of mindfulness. The main mechanism includes the effects on one's attention style. The MBSR is focusing on the present moment considering nonjudgmental behavior. In addition, the neurological, structural, and functional effects of this treatment have been well known to some extent. Brain regions consistently altered the meditators, including key areas to attention regulation, exteroceptive and interoceptive body awareness that is disturbed in SSD, emotion and stress regulation, memory consolidation and reconsolidation, as well as self-perception.^[29-31] Furthermore, mindfulness training can cause changes in brain areas that are responsible for affecting regulation and reacting to stress impulses by influencing on body functions, such as breathing, heart rate, and immune function.^[32-34] On the molecular level, dopamine and melatonin are found to be increased, followed by modulating serotonin activity and decreases in cortisol as well as norepinephrine.^[30]

Accordingly, the MBSR is influenced by structural changes in the brain responsible for controlling thoughts, emotions, physical complaints, and neurotransmitter changes affecting mood, anxiety, and stress. According to this fact, psychological symptoms, such as depression, anxiety, and

Table 3: The severity of somatic symptom disorder based on the Diagnostic and Statistical Manual of Mental Disorders criteria in intervention and control groups before and after study

Variable	Group	Before				$P^†$	After				$P^†$
		Severe	Moderate	Mild	Normal		Severe	Moderate	Mild	Normal	
Severity of SSD	Intervention	3 (15.8)	6 (31.6)	10 (52.6)	0 (0)	0.158	0 (0)	4 (21.1)	11 (57.9)	4 (21)	0.013*
	Control	4 (22.2)	10 (55.6)	4 (22.2)	0 (0)		3 (16.7)	10 (55.6)	3 (16.7)	2 (11.1)	

*The SSD severity distribution was significantly different between intervention and control groups after study, †Used of Chi-square test. SSD: Somatic Symptom Disorder, DSM: Diagnostic and Statistical Manual of Mental Disorders

Table 4: The mean score of Depression Anxiety Stress Scale, 36-Item Short-Form Survey, and Patient Health Questionnaire Physical Symptom-15 questionnaires in intervention and control groups before and after study

Variables	Group	Mean±SD		P*	
		Before	After		
DASS questionnaire	Depression	Intervention	8.15±2.33	5.26±2.90	<0.001*
		Control	9.00±2.49	8.77±2.23	0.104
		P††	0.297	<0.001**	
	Anxiety	Intervention	8.52±1.89	5.63±2.13	<0.001*
		Control	8.72±2.42	8.05±2.38	0.149
		P††	0.785	0.003**	
Stress	Intervention	9.94±2.09	7.73±2.23	<0.001*	
	Control	10.77±2.12	10.38±2.30	0.163	
	P††	0.240	0.001**		
SF-36 questionnaire	Physical functioning	Intervention	73.42±24.94	76.84±16.93	0.663
		Control	69.44±24.72	72.22±23.46	0.730
		P††	0.630	0.495	
	Limitation due to physical health	Intervention	51.31±27.40	52.63±41.57	0.515
		Control	59.72±42.99	63.88±40.42	0.703
		P††	0.531	0.410	
	Limitation due to emotional problem	Intervention	54.27±27.40	59.86±26.04	0.412
		Control	57.29±35.82	73.95±31.74	0.091
		P††	0.775	0.148	
	Energy-fatigue	Intervention	49.47±12.01	52.36±11.34	0.324
		Control	50.55±19.47	54.72±19.51	0.570
		P††	0.839	0.654	
	Emotional well-being	Intervention	58.10±9.46	61.68±15.56	0.829
		Control	57.55±18.41	56.22±24.25	0.855
		P††	0.839	0.418	
	Social functioning	Intervention	61.84±23.01	59.86±27.18	0.059
		Control	65.27±24.08	70.13±23.53	0.502
		P††	0.660	0.229	
General health	Intervention	52.63±24.11	68.42±23.69	<0.001*	
	Control	54.44±9.05	61.66±25.78	0.240	
	P††	0.766	0.412		
Pain	Intervention	57.36±15.55	58.55±17.14	0.834	
	Control	56.94±15.91	61.11±12.43	0.253	
	P††	0.935	0.608		
PHQ-15 questionnaire	PHQ score	Intervention	11.05±1.95	1.954±2.01	<0.001*
		Control	10.94±1.9)	10.27±2.16	0.181
	P††	0.867	<0.001**		

*The mean score of depression, anxiety, and stress in DASS questionnaire, general health in SF-36 questionnaire, and PHQ-15 score was significantly decreased in intervention group after study, **The mean score of depression, anxiety, and stress and PHQ-15 score was significantly different between intervention and control groups after study, †Used of paired sample *t*-test, ††Used of independent samples *t*-test. DASS: Depression Anxiety Stress Scale, PHQ-15: Patient Health Questionnaire Physical Symptom, SD: Standard deviation

stress can affect symptoms, such as pain. In addition, the MBSR has an impact on physical symptoms due to its effects on the psychological aspect of disorders.^[35] The results of evaluating patients based on the DSM-5 criteria revealed that MBSR + venlafaxine can reduce the severity of SSD, compared to venlafaxine alone. To the best of our knowledge, there have been no studies evaluating the effects of psychotherapy, such as MBSR on the severity of SSD. The remarkable effects of the MBSR program on variables in this study may be explained by the number of physical symptoms, depression, anxiety, and stress.

Although this study has its own strengths, it suffers from some limitations. One of the strengths of this study is evaluating SSD patients since there are few studies in this regard. The other advantage is the utilization of standard tools for measuring variables that were mostly used in population-based studies. Moreover, the severity of disorder and symptoms was assessed in addition to the quantitative evaluation of these variables. On the other hand, the patients had no follow-ups after finishing the treatments, and variables were just measured before and immediately after the intervention. Another limitation of this study is

the lack of any gold standard psychotherapy method to compare MBSR. Therefore, future studies are recommended to compare this method to other psychotherapy programs.

In addition, the exact efficacy of MBSR should be assessed in order to evaluate the short-and long-term effects of this method on SSD patients. It is suggested that further studies consider confounding variables, including patient's personality, occupational status, and patients' follow-up in proper time duration after study. In conclusion, MBSR + venlafaxine can significantly reduce the severity of SSD, number, and severity of physical symptoms. Moreover, it reduces the levels of depression, anxiety, stress, and their severity.

Conclusion

A significant reduction of SSD as well as the severity and number of physical symptoms can be obtained as a result of MBSR accompanied by the prescription of venlafaxine. In addition, stress, depression, anxiety and their severity can also be reduced. Hence, patients with SSD can receive the MBSR as complementary medicine.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Katz J, Rosenbloom BN, Fashler S. Chronic pain, psychopathology, and DSM-5 somatic symptom disorder. *Can J Psychiatry* 2015;60:160-7.
2. Kurlansik SL, Maffei MS. Somatic symptom disorder. *Am Fam Physician* 2016;93:49-54.
3. Fjorback LO, Carstensen T, Arendt M, Ornbøl E, Walach H, Rehfeld E, *et al.* Mindfulness therapy for somatization disorder and functional somatic syndromes: Analysis of economic consequences alongside a randomized trial. *J Psychosom Res* 2013;74:41-8.
4. Burton C, McGorm K, Weller D, Sharpe M. Depression and anxiety in patients repeatedly referred to secondary care with medically unexplained symptoms: A case-control study. *Psychol Med* 2011;41:555-63.
5. van Westrienen PE, Pisters MF, Veenhof C, de Wit NJ. Identification of patients with moderate medically unexplained physical symptoms in primary care with a five years follow-up. *BMC Fam Pract* 2019;20:66.
6. van der Feltz-Cornelis CM, Hoedeman R, Keuter EJ, Swinkels JA. Presentation of the Multidisciplinary Guideline Medically Unexplained Physical Symptoms (MUPS) and somatoform disorder in the Netherlands: Disease management according to risk profiles. *J Psychosom Res* 2012;72:168-9.
7. Campo JV. Annual research review: Functional somatic symptoms and associated anxiety and depression-developmental psychopathology in pediatric practice. *J Child Psychol Psychiatry* 2012;53:575-92.
8. Romera I, Fernández-Pérez S, Montejo AL, Caballero F, Caballero L, Arbesú JA, *et al.* Generalized anxiety disorder, with or without co-morbid major depressive disorder, in primary care: Prevalence of painful somatic symptoms, functioning and health status. *J Affect Disord* 2010;127:160-8.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. *BMC Med* 2013;17:133-7.
10. Norton PJ, Paulus DJ. Toward a unified treatment for emotional disorders: Update on the science and practice. *Behav Ther* 2016;47:854-68.
11. Bekhuis E, Boschloo L, Rosmalen JG, Schoevers RA. Differential associations of specific depressive and anxiety disorders with somatic symptoms. *J Psychosom Res* 2015;78:116-22.
12. McDougall W. *An Outline of Abnormal Psychology*, 1st Edition. Philadelphia: Routledge; 2015.
13. Koelen JA, Houtveen JH, Abbass A, Luyten P, Eurelings-Bontekoe EH, Van Broeckhuysen-Kloth SA, *et al.* Effectiveness of psychotherapy for severe somatoform disorder: Meta-analysis. *Br J Psychiatry* 2014;204:12-9.
14. Nyklicek I, Kuijpers KF. Effects of mindfulness-based stress reduction intervention on psychological well-being and quality of life: Is increased mindfulness indeed the mechanism? *Ann Behav Med* 2008;35:331-40.
15. De Vibe MF, Bjørndal A, Fattah S, Dyrdal GM, Halland E, Tanner-Smith EE. Mindfulness-based stress reduction (MBSR) for improving health, quality of life and social functioning in adults: A systematic review and meta-analysis. *Campbell systematic reviews*. 2017;13 (1):1-264.
16. Dalili Z, Bayazi MH. The effectiveness of mindfulness-based cognitive therapy on the illness perception and psychological symptoms in patients with rheumatoid arthritis. *Complement Ther Clin Pract* 2019;34:139-44.
17. Pleman B, Park M, Han X, Price LL, Bannuru RR, Harvey WF, *et al.* Mindfulness is associated with psychological health and moderates the impact of fibromyalgia. *Clin Rheumatol* 2019;38:1737-45.
18. Lengacher CA, Reich RR, Post-White J, Moscoso M, Shelton MM, Barta M, *et al.* Mindfulness based stress reduction in post-treatment breast cancer patients: An examination of symptoms and symptom clusters. *J Behav Med* 2012;35:86-94.
19. Veehof MM, Trompetter HR, Bohlmeijer ET, Schreurs KM. Acceptance-and mindfulness-based interventions for the treatment of chronic pain: A meta-analytic review. *Cogn Behav Ther* 2016;45:5-31.
20. Kolahkaj B, Zargar F, Majdinasab N. The effect of mindfulness-based stress reduction (MBSR) Therapy on quality of life in women with multiple sclerosis, Ahvaz, Iran. *J Caring Sci* 2019;8:213-7.
21. Grossman P, Kappos L, Gensicke H, D'Souza M, Mohr DC, Penner IK, *et al.* MS quality of life, depression, and fatigue improve after mindfulness training: A randomized trial. *Neurology* 2010;75:1141-9.
22. van Ravesteijn HJ, Suijkerbuijk YB, Langbroek JA, Muskens E, Lucassen PL, van Weel C, *et al.* Mindfulness-based cognitive therapy (MBCT) for patients with medically unexplained symptoms: Process of change. *J Psychosom Res* 2014;77:27-33.
23. van Ravesteijn H, Grutters J, olde Hartman T, Lucassen P, Bor H, van Weel C, *et al.* Mindfulness-based cognitive therapy for patients with medically unexplained symptoms: A cost-effectiveness study. *J Psychosom Res* 2013;74:197-205.
24. Asghari A, Saed F, Dibajnia P. Psychometric properties of the Depression Anxiety Stress Scales-21 (DASS-21) in a non-clinical Iranian sample. *Int J Psychol* 2008;2:82-102.
25. Motamed N, Ayatollahi AR, Zare N, Sadeghi-Hassanabadi A. Validity and reliability of the Persian translation of the SF-36 version 2 questionnaire. *East Mediterr Health J* 2005;11:349-57.

26. Rezayat F, Dehgannayeri N. Relationship between depression and self-efficacy in nursing students. *Iran J Nurs* 2013;26:54-63.
27. Norouzi M, Zargar F, Norouzi F. Effectiveness of acceptance and commitment therapy on interpersonal problems and difficulties in emotion regulation among university students. *Iran J Psychiatry Behav Sci* 2017;11:e8005.
28. Wong SY. Effect of mindfulness-based stress reduction programme on pain and quality of life in chronic pain patients: A randomised controlled clinical trial. *Hong Kong Med J* 2009;15 Suppl 6:13-4.
29. Lazar S. Change in brainstem gray matter concentration following a mindfulness-based intervention is correlated with improvement in psychological well-being. *Front Hum Neurosci* 2014;8:33.
30. Esch T. The neurobiology of meditation and mindfulness. *Meditation-Neuroscientific Approaches and Philosophical Implications*. New York: Springer; 2014. p. 153-73.
31. Fox KC, Nijeboer S, Dixon ML, Floman JL, Ellamil M, Rumak SP, *et al.* Is meditation associated with altered brain structure? A systematic review and meta-analysis of morphometric neuroimaging in meditation practitioners. *Neurosci Biobehav Rev* 2014;43:48-73.
32. Tang YY, Hölzel BK, Posner MI. The neuroscience of mindfulness meditation. *Nat Rev Neurosci* 2015;16:213-25.
33. Cahn BR, Goodman MS, Peterson CT, Maturi R, Mills PJ. Yoga, Meditation and Mind-Body Health: Increased BDNF, Cortisol Awakening Response, and Altered Inflammatory Marker Expression after a 3-Month Yoga and Meditation Retreat. *Front Hum Neurosci* 2017;11:315.
34. Pascoe MC, Thompson DR, Jenkins ZM, Ski CF. Mindfulness mediates the physiological markers of stress: Systematic review and meta-analysis. *J Psychiatr Res* 2017;95:156-78.
35. Brown LF, Kroenke K, Theobald DE, Wu J, Tu W. The association of depression and anxiety with health-related quality of life in cancer patients with depression and/or pain. *Psycho-Oncology* 2010;19:734-41.