Effect of progressive muscle relaxation technique on self-esteem and self-efficacy in multiple sclerosis patients: A clinical trial study

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Abstract:

BACKGROUND: Low self-esteem and inefficiency are major problems in multiple sclerosis (MS) patients. A progressive muscle relaxation technique is one of the complementary therapies. The objective of this study was to investigate the effect of progressive muscle relaxation techniques on self-esteem and self-efficacy in MS patients.

MATERIALS AND METHODS: This clinical trial was conducted on 100 MS patients were randomly divided into two groups of experimental ($n = 50$) and control ($n = 50$). The experimental group received progressive muscle relaxation techniques in eight 60-min sessions twice a week for 4 weeks. Rosenberg's Self-Esteem Scale and Self-Efficacy Scales of MS patients were completed before, immediately, and 4 weeks after the intervention. Data were analyzed using the SPSS software version 16.

RESULTS: The mean score of self-esteem was not significantly different between the control (26.02 ± 5.83) and experimental (26.40 ± 6.06) groups before intervention ($P = 0.247$). The mean score of self-esteem in the control group (27.16 ± 7.45) and the experimental group (29.06 ± 6.61) immediately after the intervention ($P = 0.083$) was not significantly different. 4 weeks after the intervention, the mean scores of self-esteem in the control (26.96 ± 8.33) and the experimental (29.98 ± 7.02) groups were significantly different ($P = 0.012$). The mean score of self-efficacy was significantly different between the control (41.62 ± 4.46) and experimental (39.32 ± 4.31) groups before intervention ($P = 0.010$). The mean scores of self-efficacy in the control group (38.38 ± 5.07) and the experimental group (44 ± 4.46) immediately after the intervention ($P < 0.001$) and 4 weeks after intervention showed a significant difference between the control group (38.04 ± 5.46) and the experimental (46.40 ± 5.04) groups ($P < 0.001$).

CONCLUSION: Due to the effect of progressive muscle relaxation on self-esteem and self-efficacy of MS patients, its safety and simplicity, this technique can be used as a complementary therapy to enhance the level of self-esteem and self-efficacy of MS patients.

Keywords:
Multiple sclerosis, muscle relaxation, self-efficacy, self-esteem

Introduction

Multiple sclerosis (MS) is a progressive and chronic degenerative disease of the central nervous system.[1] It is one of the most common neurological diseases and most debilitating diseases in young people.[2] The mean age of the diagnosis is 32 years. Females are twice as likely to have MS as compared to males. 2.8 million people are estimated to live with MS worldwide (35.9/100,000 populations).[3] In Iran, the average annual incidence is 67.9 and 207.3 per 100,000 people among males and females, respectively.[4]

The manifestations and complications of MS greatly affect one's self-perception

and have a very destructive effect, especially on self-esteem.[5] Patients with MS usually report lower levels of self-esteem resulting from the functional disabilities associated with MS[6,7] Self-esteem is a personal feeling about being worthy, or refers to a level to which people give value, appreciate, or love themselves.[8] Self-esteem or a feeling of self-worth is a valuable asset and it is among the factors involved in the self-actualization of people. In this regard, cognitive processes, emotions, motivation, decision-making, and selection are influenced by the feeling of self-worth.[9] The development of MS affects people's self-esteem by causing cognitive and psychological changes.[5] Positive self-perception and self-esteem are the best predictors of coping with MS,[10] but low self-esteem has been one of the most serious risk factors for depression in MS patients.[11]

Mikula *et al*. showed that if MS patients had higher self-esteem, the physical and psychological quality of these patients would be improved.[12] High self-esteem is followed by self-efficacy.[13] Soheili *et al*. conducted a study aimed to determine the effects of relaxation on the psychological symptoms in women with MS. They showed that relaxation technique as intervention in reducing stress, anxiety, and depression is effective in women with MS.[14] Result of Zende Talab and Norouzi study with aimed to the effect of educational interventions on patients' self-esteem with MS showed that educational interventions are effective on patients' self-esteem with MS.[15]

Self-efficacy has been proven to be a key determinant related to adoption and maintenance of physical activity in people with chronic diseases, such as MS.[16] Self-efficacy refers to one's confidence and belief in the ability to perform self-care behaviors in specific situations.[17,18] People with higher levels of self-efficacy actively participate in self-care programs and are more successful in controlling their disease.[17,19] Bandura *et al*. believe that feelings of self-efficacy are developed by tolerating the challenges and by performing sequential and systematic behavior in people.[20] Daniali *et al*.) have emphasized the importance of self-efficacy and the impact on physical activity and adherence to medication in chronic patients.[21] Janalipour *et al*. conducted a study aimed to the effectiveness of yoga therapy in increasing the self-efficacy of women with MS. The result of this study showed that yoga therapy is effective in increasing the self-efficacy of MS patients.[22]

In recent years, nonpharmacological methods have attracted the attention of patients, including MS patients. These methods are known as complementary therapies and patients seek ways to reduce symptoms.[23,24] Complementary therapies include exercise, meditation,

relaxation techniques, acupuncture, behavioral therapy, and herbal diets.[25] A progressive muscle relaxation technique is an important part of caring for patients with chronic diseases[26] that reduces stress, anxiety, divergent thinking, muscle contraction, improves sleep, and lowers pain sensitivity and fatigue.[27] A progressive muscle relaxation technique is one of the complementary therapies introduced and applied by Jacobson (1938). He found that when the skeletal muscles were relaxed, both the body and the mind were relaxed and the emotion that led to disease and slow downed the recovery period was weakened or possibly stopped. He developed the progressive relaxation system, in which the muscles are relaxed throughout the body and are helpful in recovery from a variety of physical and mental diseases.[28]

The basic principle of progressive muscle relaxation training is to contract a set of muscles and then release it to relieve stress. Then, a set of muscles in your body is contracted and the focus is on the emotions you find in that state and in that part of the body. This state of contraction is maintained for 5–6 s and then is released to relieve stress while focusing on the feeling of muscle relaxation. This easy-to-learn technique is one of the nursing interventions with a positive effect on MS patients. It can be considered as a complementary therapy.[29,30]

Several studies have assessed the effect of relaxation technique on other diseases;[31,32] however, to our knowledge, no research has been carried out using this technique in MS patients. Most studies on patients with MS have used postmastectomy radiation therapy technique, i.e. more difficult to learn by the patient than Jacobson technique and requires advanced training. Moreover, studies on using relaxation on self-esteem and self-efficacy in patients with MS in Iran are scarce. Therefore, the current study aimed to determine the effect of progressive muscle relaxation techniques on self-esteem and self-efficacy in MS patients.

Materials and Methods

Study design and setting
This clinical trial was conducted on MS patients referred to the MS Patient Support Association and the Neurology Clinic of Farshchian (Sina) Hospital in Hamadan (west of Iran) in 2019.

Sample
The sample size was estimated to be 50 patients at each group by considering the confidence level of 95% ($1-\alpha$ =0.95), test power of 90% based on the formula of

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)^2 \left(\sigma_1^2 + \sigma_2^2\right)}{\left(\mu_1 - \mu_2\right)^2}$$, and based on the results of a similar study.[33]

The CONSORT diagram is provided in Figure 1. We recruited participants by meeting them in the research environment. We explained the objectives of the research to them. This resulted in 100 participants to the study. We conducted a screening for eligibility based on the inclusion criteria among 100 persons.

Inclusion and exclusion criteria

The inclusion criteria were as follows: (a) age between 18 and 65 years, (b) having the reading and writing skills, (c) living in Hamadan, (d) willingness to participate in study, (e) not having other acute and chronic diseases according to the medical record, (f) passing of 6 months after definitive diagnosis of MS based on neurological examinations and magnetic resonance imaging by a neurologist, (g) not being in the acute phase of the disease, (h) having no history or simultaneous use of common complementary therapies such as yoga, psychotherapy, pilates, meditation, the ability to do exercises for 20 min per day based on patient statements, (i) no history of taking stimulant or psychotropic drugs according to the medical record, and expanded disability status scale score ≤4.5 determined by a neurologist.

The exclusion criteria included (a) relapse of disease (acute phase experience), severe physical and mental problems, motor or cognitive impairment, (b) being absent in training sessions (at least two sessions), (c) withdrawal from study for any reason, patient death, migration to another city, and (d) a new debilitating disease [Figure 1].

A total of 100 patients were divided into experimental and control groups using permuted block randomization in the R software (A = intervention; B = control). After determining the random sequence, each of these sequences was recorded on a card and kept in sealed envelopes. Finally, 100 envelops were given for the principal researcher. This study had no sample loss.

Data collection tools

Three tools were used for the data collection in this study: (1) Demographic and clinical questionnaire (i.e. age, gender, marital status, education, job, type of health insurance (special diseases, family, master, and with without insurance), and family history of MS; (2) Rosenberg self-esteem scale; and (3) self-efficacy scale for MS patients. The Rosenberg Self-Esteem Scale was developed in 1965 by Rosenberg. This scale is a standard criterion containing 10 items, in which the real feeling of the person on each item is determined in one of four options of strongly agree = 1 agree = 2, disagree = 3, and strongly disagree = 4. The total score is obtained from the sum of the scores given for the 10 items. Accordingly, the scores of 10 and 40 represent the minimum and maximum self-esteem, respectively. In this scale, 5 items (1–5) are scored positively and the other 5 items (6–10) are scored negatively.[34] In a study conducted by Sharifi Neyestanak *et al*. on self-esteem and related factors in MS patients, the Cronbach's alpha coefficient of this tool was reported at 0.91.[35] Moreover, Akhlaghi *et al*. (2011) reported the satisfactory internal validity of this scale. According to their results, the reliability of this scale by the test-retest
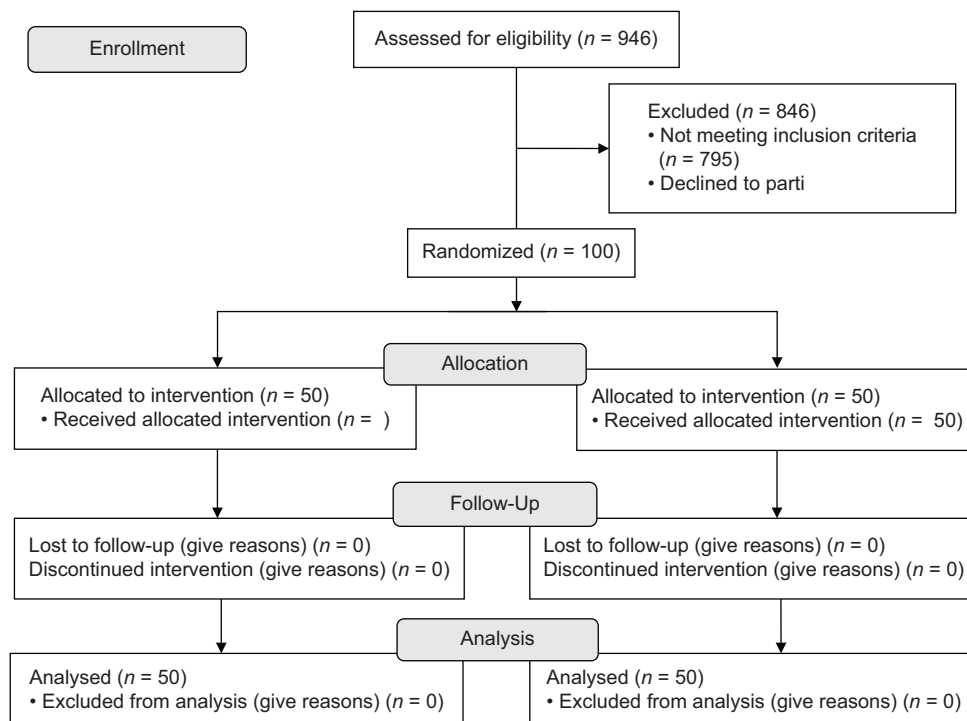

Figure 1: Consort flowchart

method ranged from 0.77 to 0.88.[36] In the present study, the Cronbach's alpha coefficient was calculated at 0.915.

The MS Self-Efficacy Scale was first introduced in 2003 by Rigby in the United Kingdom. The Rigby Self-Efficacy Scale was designed for adults. It consisted of 14 items on four dimensions of independence and activity (5 items), worry (4 items), personal control (3 items), and social productivity (2 items).[36] Reshvanlo *et al.* (2012) studied the "psychometric properties of MS patients' self-efficacy scale" to assess the construct validity of the mentioned scale. In this study, they used exploratory factor analysis with principal components and Promax rotation with considering factor load of more than 0.35. After several rotations, three questions were excluded due to the common load in more than one factor and the number of questions in the Iranian questionnaire was reduced to 11 questions. The questions are answered on a 6-point Likert scale, ranging from strongly disagree (1), almost disagree (2), disagree (3), agree (4), almost agree (5), and strongly agree (6). The total score is between 11 and 66, where a high score indicates high self-efficacy. Reshvanlo *et al.* assessed the divergent validity of this scale by calculating the correlation between the dimensions of the scale and the depression and anxiety scores among MS people. They indicated appropriate divergence in these patients. Furthermore, the factors extracted from the self-efficacy scale in MS patients and the total score of the scale were examined using the Cronbach's alpha and Guttman coefficient of coefficient, which were obtained to be 0.9 and 0.78, respectively, for independence and activity, 0.78 and 0.72, for worries and interest, and 0.9 and 0.87, for total scale.[37] In the present study, reliability was calculated through test re-test and intra-class correlation equal to 0.728 was obtained.

After selecting the participants, the demographic and clinical questionnaire and self-esteem scale and self-efficacy scale were completed in a self-reporting manner. Then was contacted to the intervention group and invited to attend the relaxation. The intervention was done by one of the researchers in the intervention group. The self-esteem and self-efficacy scales were re-completed by both groups immediately after the intervention and 4 weeks after the intervention. The control group received routine care (Prescribing drugs that modulate the immune system, immunosuppressive drugs, prescribing some drugs to control symptoms, blood and urine tests, magnetic resonance imaging, and periodic clinical examinations) based on the orders of the physician. Participants in the control condition received a training session on progressive muscle relaxation techniques after the follow-up assessment.

Intervention
Progressive muscle relaxation and deep breathing by the Jacobson method were performed in the experimental

group (4 groups) in four sessions and each session lasted 60 min (2 sessions per week). Progressive muscle relaxation technique was performed by a trained researcher in the gym of Farshchian Hospital (Sina) which has suitable equipment (such as mattress, chair, projector, and favorable space) for training. Then, progressive muscle relaxation techniques were performed at home for at least 20 min daily and followed up by a researcher. Follow-up was done by phone once a day. The training program for each session is as follows: Session 1: Familiarizing with patients, Session 2: Introducing the MS disease, Session 3: Introducing muscles and muscle groups involved in progressive muscle relaxation technique, Session 4: Training of progressive muscle relaxation techniques, Session 5: Progressive muscle relaxation technique under the guidance of researcher and providing feedback, Session 6: Deep breathing training, Session 7: performing deep breathing under the guidance of the researcher and providing feedback, and Session 8: performing practical exercises and deep breathing combined with progressive muscle relaxation techniques under the guidance of the researcher.

Training the steps of performing the progressive relaxation technique was in the form of providing practical explanation and presentation, answering patients' questions about the relaxation technique, and the way of applying the technique correctly. Complete training was provided to the patients in a booklet and a recorded training video. In these sessions, the relaxation technique was performed by the patients at the presence of the researcher and the necessary explanations and corrections were provided. Then, the relaxation was performed by the patients under the guidance of the researcher.

In this experiment, patients seated in comfortable chairs or inclined in comfortable clothes. Then, their accessories such as watches and bracelets were removed. In the next step, under the guidance of the researcher, they contracted and extended different muscle groups with effective and deep breathing. The client had to do this exercise until he or she recognized the difference between contracting and extending his muscles and expressed it. In this method, the client learned the technique and was able to do it alone using the training video. In this technique, the large muscle groups are initially contracted and extended because the contractions and relaxation of these muscles and the perception of the difference between the two feelings are more tangible to the client at the beginning of the work. When the patient contracted or extended each muscle, he or she was able to easily and spontaneously relax his whole body. In this way, the patient will be free from any unpleasant physical, mental, and emotional feelings.

The time proposed by Jacobson in 1938 for progressive muscle relaxation exercises consists of several sessions of 30–60 min per week for 1 year.

Ethical approval and consent to participate

This study was registered at the Iranian Registry of Clinical Trials with the code of IRCT20170411033378N6, and approved by the Ethics Committee of the Hamadan University of Medical sciences, approval no. IR. UMSHA. REC.1397.520. This study was conducted in accordance with the 1964 declaration of Helsinki and its later amendments or comparable ethical standards. The ethical considerations of the present study included the completion of the informed consent form by the research participants, the confidentiality of the recorded information, giving the right for participants to participate or withdraw the study.

Data analysis

Data were analyzed through the SPSS (ver. 16) software. To describe the data, frequency, percentage, mean, and standard deviation were used. Furthermore, to analyze the data, Chi-square and Fisher exact tests were used to compare the categorical variables between two groups, independent samples *t*-test (if necessary, regression analysis to control the effect of confounding variables) was used to compare mean self-esteem and self-efficacy between two groups in each time point, covariance analysis was used to control the effect of confounders in comparisons of mean scores between two groups, Bonferroni *post hoc* test, and repeated measures analysis of variance (ANOVA) were used to analyze repeated measurements data.

Results

The mean age of the samples was 35.40 ± 9.60 in the experimental group and 35.86 ± 9.13 in the control group. The Independent *t*-test showed that the mean age was similar in both groups ($P = 0.807$). Furthermore, the two groups were homogeneous in terms of gender ($P = 1.000$), marital status ($P = 0.496$), education level ($P = 0.539$), employment status ($P = 0.709$), type of health insurance ($P = 0.495$), and belief in complementary therapies ($P = 0.213$). However, they were not homogeneous in terms of frequency of hospitalizations in 1 year ($P = 0.001$), history of MS in the family ($P = 0.019$), and degree of disability ($P = 0.014$) [Table 1].

Before the intervention, the mean score of self-esteem was 26.40 ± 6.06 in the experimental group and 26.02 ± 5.83 in the control group. The results of the statistical analysis showed no significant difference between the two groups before intervention ($P = 0.247$). Immediately after the intervention, the mean score of self-esteem was 29.06 ± 6.61 in the experimental group and 27.16 ± 7.45 in the control group. There was no significant difference between the mean scores of self-esteem in the experimental and control groups immediately after the intervention ($P = 0.083$). 4 weeks after intervention, the mean score of self-esteem was 29.98 ± 7.02 in the experimental group and 26.96 ± 8.33 in the control group and the test showed a statistically significant difference between them ($P = 0.012$) [Table 2].

Before the intervention, the mean score of self-efficacy was 39.32 ± 4.31 in the experimental group and 41.62 ± 4.46 in the control group. The statistical test showed a significant difference between the two groups before the intervention ($P = 0.010$). Immediately after the intervention, the mean score of self-efficacy was 44.00 ± 4.64 in the experimental group and 38.38 ± 5.07 in the control group. There was a significant difference between the mean scores of self-efficacy in the experimental and control groups immediately after the intervention ($P < 0.001$). Four weeks after the intervention, the mean score of self-efficacy in the experimental group was 46.40 ± 5.04 and 38.04 ± 5.46 in the control group, indicating a statistically significant difference ($P < 0.001$) [Table 2].

Table 3 shows the results of repeated measurements ANOVA to compare mean self-esteem and self-efficacy in MS patients in the control and experimental groups and determining the time effect. The mean score of self-esteem did not show a significant difference between the two groups ($P = 0.105$). However, the interaction between time and group was significant ($P < 0.001$), suggesting that the mean self-esteem score varied over time in two groups differently. Furthermore, the mean score of self-efficacy was significantly different between the control and experimental groups ($P < 0.001$). The results showed that the interaction effect of time and group was statistically significant ($P = 0.001$), meaning that the mean score of self-efficacy varied in two groups over time [Table 3] and the intervention group had significantly higher scores of self-efficacy.

Table 4 shows the pairwise comparisons of the mean scores of self-esteem and self-efficacy in the MS patients using Bonferroni *post hoc* tests based on measurement time in the control and experimental groups. According to these results, in the experimental group, the mean score of self-esteem immediately after the intervention was significantly different from that before the intervention ($P < 0.001$) such that the self-esteem score increased after the intervention. In the experimental group, the mean score of self-efficacy was significantly different immediately after the intervention ($P < 0.001$) such that the score of self-efficacy increased immediately after the intervention [Table 4].

Table 1: Demographic and clinical characteristics of participants

Variable	Control	Test	Test statistics	P
Age	35.86±9.13	35.40±9.60	0.245*	0.807
EDSS	3.62±0.585	3.30±0.692	2.49*	0.014
Hospitalizations in 1 year	1.02±0.795	1.88±1.13	−4.38*	<0.001
Gender			0.00[#]	1.000
Male	15 (30)	15 (30)		
Female	35 (70)	35 (70)		
Marital status			2.57[†]	0.496
Single	15 (30)	22 (44)		
Married	32 (64)	26 (52)		
divorced	2 (4)	1 (2)		
Widow	1 (2)	1 (2)		
Education level			1.24[#]	0.539
High school	16 (32)	20 (40)		
Diploma	19 (38)	14 (28)		
Above the diploma	15 (30)	16 (32)		
Employment status			3.30[†]	0.709
Homemaker	28 (56)	28 (56)		
Employee	11 (22)	10 (20)		
University student	3 (6)	5 (10)		
Unemployed	6 (12)	3 (6)		
Retired	2 (4)	2 (4)		
Freelance job	0	2 (4)		
Type of health insurance			2.57[†]	0.495
Special diseases	48 (99)	49 (98)		
Family	2 (4)	0		
Master	0	1 (2)		
No	5 (10)	11 (22)		
History of MS in the family			5.48[#]	0.019
Yes	7 (14)	17 (34)		
No	43 (86)	33 (66)		

*Independent *t*-test, [#]Chi-square test, [†]Fisher's exact test. EDSS=Expanded disability status scale, MS=Multiple sclerosis

Table 2: Comparison of mean self-esteem and self-efficacy in patients with multiple sclerosis between two groups of experimental and control before, immediately and 1 month after intervention

Variable	Self-esteem				Self-efficacy			
	Control (mean[c]±SD)	Experimental (mean±SD)	Wald test	P	Control (mean±SD)	Experimental (mean±SD)	T[b]	P[a]
1	26.02±5.83	26.40±6.06	−1.340	0.243	41.62±4.46	39.32±4.31	2.62	<0.01*
2	27.16±7.45	29.06±6.61	2.99	0.083	38.38±5.07	44.00±4.64	−5.77	<0.001
3	26.96±8.33	29.98±7.02	−6.38	0.012	38.04±5.46	46.40±5.04	−7.94	<0.001

*Modified for before intervention differences, [a]P≤0.05 are considered significant, [b]T: *t*-test, [c]Mean±SD. (1) Before intervention, (2) Immediately after the intervention, (3) 4 weeks after intervention. SD: Standard deviation

Discussion

The results of the present study showed that after progressive muscle relaxation intervention, the mean score of self-esteem increased immediately after the intervention in the experimental group, there was no significant difference between the two groups. However, 4 weeks after the intervention, an increase in self-esteem score in the experimental group was observed, but it showed a decrease in the control group, where the difference was statistically significant. Harorani *et al.* investigated Jacobson's relaxation on self-esteem in

cancer patients and showed that relaxation increased self-esteem in cancer patients.[31] Their results are also in line with those of our study. The similarity of our study with Harorani *et al.* in group and face-to-face training, as well as the high time and number of more sessions of progressive muscle relaxation for patients; which causes patients to use each other's experiences, creating an intimate and friendly atmosphere and possibly a more relaxing effect. Progressive muscle relaxation is considered a skill that becomes more effective with more time, more sessions and exercises. Because self-esteem is a personal judgment about one's worth that exists

as a mental experience, it takes more time to relax to change it.

The effects of progressive muscle relaxation on various aspects of health in patients with chronic diseases have been investigated in several studies. Some of these studies show the effect of this technique on the recovery of patients from the symptoms.[29,38]

The reasons for this consistency in results can be attributed to the fact that progressive muscle relaxation increases the self-esteem of patients with chronic diseases and enhances the patients' internal control power and increases their cognitive abilities.[39] Complementary therapies, such as progressive muscle relaxation techniques, have many physical and psychological effects and promote the care of the body, emotion, and spirituality, resulting in the promotion of self-esteem in chronic patients.[40] Complementary therapies, such as progressive muscle relaxation, are thought to affect the pituitary-adrenal axis of the hypothalamus, preventing overproduction of cortisol and improving mood, resulting in a relaxing response, as well as complementary therapies. It acts as a neuroendocrine mediator in neural circuits, which are responsible for regulating mood and emotion.[41]

Bouvet and Coulet examined the impact of progressive muscle relaxation (10 face-to-face sessions) on self-esteem in adults with mental disabilities and reported that progressive muscle relaxation increases the self-esteem

of people with mental disabilities. Furthermore, they showed that the use of complementary therapies was useful in these patients.[42] Chronic diseases can have negative consequences on psychological balance. Progressive muscle relaxation replaces positive thoughts with negative ones and creates self-attention mechanisms.[40] Avazeh *et al.* investigated the effect of progressive muscle relaxation for 8 weeks and twice per day for 20–30 min on increasing self-esteem in patients with myocardial infarction was reported.[43] The results of Soheili *et al.* study showed that relaxation in relieving anxiety, stress, and depression are effective in women with MS.[44]

In our study, in addition to face-to-face meetings, daily follow-up from the beginning to the end of the intervention was done by the researcher in relation to reassurance and encouragement to practice at home and answer patients' questions; telephone follow-up seems to be effective on the continuity and effectiveness of relaxation techniques. In the present study, the reason for the delay in increasing self-esteem may have been due to the fact that improving participants' self-efficacy and gaining physical independence could affect the increase in self-esteem, a process that took time.

The present study also showed that after progressive muscle relaxation intervention, the mean scores of self-efficacy in the experimental and control groups were significantly different. The results showed that self-efficacy decreased in the control group over time, but the self-efficacy score increased in the experimental group. Although there was a significant difference in self-efficacy before the intervention, after the intervention, this difference remained significant and the self-efficacy score increased with time. The results of Rigby *et al.* study indicated that the brief group interventions improved self-efficacy in people with MS, over a 12-month follow-up period. The results from research findings in the pretest, posttest, and follow-up stages demonstrate that progressive muscle relaxation therapy is effective in increasing the self-efficacy of MS patients.[45] Janalipour *et al.* showed that yoga therapy is effective in increasing the self-efficacy of patients with

Table 3: Analysis of variance of repeated measures to compare mean self-esteem and self-efficacy of patients with multiple sclerosis in two groups of control and test and time effect determination

Source of changes	Self-esteem		Self-efficacy	
	Test statistics *F*	*P*	Test statistics *F*	*P*
Group	2.68	0.105	107.04	<0.001
Time	2.79	0.064	0.265	0.608
Time and group interaction	9.87	<0.001	11.88	<0.001

F, ANOVA. ANOVA=Analysis of variance

Table 4: The results of bonferroni posthoc test (after repeated measurements analysis of variance) for comparisons of self-esteem and self-efficacy at different time points in the control and intervention groups

Time point (I)	Time point (J)	Self-esteem						Self-efficacy					
		Control			Test			Control			Test		
		MD	SE	*P*	MD	SE	*P*	MD	SE	*P*	MD	SE	*P*
Immediately after the intervention	Before intervention	−1.142	0.379	0.04	−2.66	0.306	<0.001	3.24	0.503	<0.001	−4.68	0.485	<0.001
4 weeks after intervention	Before intervention	−0.94	0.536	0.086	−3.58	0.346	<0.001	3.58	0.598	<0.001	7.08	0.621	<0.001
4 weeks after intervention	Immediately after the intervention	0.200	0.303	0.513	0.920	0.202	<0.001	0.340	0.337	0.319	−2.40	0.365	<0.001

MD=Mean difference, SE=Standard error

MS.[22] The results of the study by Flesedt and Pardo show that physical activity is effective on self-efficacy of MS patients.[46] Other study results show that changing the activities of people at the physical and psychological level is related to the improvement of their self-efficacy of individuals has led to an increase in the sense of independence and self-management in daily activities of patients with MS.[47,48] Their results are consistent with those of our study. In a study conducted to evaluate the effect of progressive muscle relaxation on self-efficacy in cancer patients, results showed that training of progressive muscle relaxation techniques during 2 months increased self-efficacy in these patients.[29]

Lim *et al*. examined the effect of progressive muscle relaxation on pain and self-efficacy and stress-related variables in patients undergoing knee replacement surgery. They showed that after three sessions of relaxation interventions, a significant increase in self-efficacy was observed in the experimental group.[49] Physical and respiratory exercises of progressive muscle relaxation increase muscle flexibility and strength. Contraction and release in progressive muscle relaxation techniques stabilize the autonomic nervous system, control emotions, and improve a sense of health in the person.[50] Progressive muscle relaxation technique has important physiological and psychological benefits in patients. This technique cures the stress caused by chronic diseases or treatments that are followed by side effects. Progressive muscle relaxation technique increases satisfaction, reduces anxiety, increases participation in health care, and increases independence.[29] In our study, progressive muscle relaxation as a behavioral method helps to activate the patients. The relaxation response through muscle contraction and extension increases the general performance of the body. It also improves nutrition system performance and reduces stress and negative emotions in patients, leading to increased self-efficacy.

The research limitations include

individual differences and psychological state of participants in response to the intervention and their effects, the effect of environmental factors and individuals' cultures on their understanding about the impact of relaxation technique on improving the self-esteem and self-efficacy, the influence of learning and lack of mental concentration on progressive muscle relaxation and also the disabling nature of the disease.

Conclusion

Based on the results of this study and analysis of the results, it can be concluded that progressive muscle relaxation program has increased the self-esteem and self-efficacy of MS patients. It seems that following the improvement of self-efficacy and management of behaviors in participants, a valuable feeling is created in the individual, which leads to increased self-esteem.

Progressive muscle relaxation technique is a noninvasive and low-cost approach in managing symptoms of MS patients in which they can easily be trained by medical personnel including nurses. It is recommended that this method be applied in the care of these patients. We suggest further study of this technique and also to investigate its effects on other MS symptoms and also in other

Conflicts of interest
There are no conflicts of interest.

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