



Effect of Educational Intervention Based on Health-Promoting Self-Care Behaviors Model on Quality of Life, Resilience, and Sense of Coherence in Patients with Multiple Sclerosis: A Randomized Controlled Trial

Victoria Momenabadi¹, Mohammad Hossein Kaveh^{1*}, Nouzar Nakhaee², Kambiz Karimzadeh Shirazi³, Maryam Dastoorpoor⁴ and Behnaz Sedighi⁵

¹Department of Health Education and Promotion, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran

²Neuroscience Research Center, Kerman University of Medical Sciences, Kerman, Iran

³Department of Health Education and Promotion, School of Health and Nutrition Sciences, Yasuj University of Medical Sciences, Yasuj, Iran

⁴Department of Epidemiology and Biostatistics, Social Determinants of Health Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

⁵Neurology Research Center, Kerman University of Medical Sciences, Kerman, Iran

*Corresponding author: Department of Health Education and Promotion, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran. Email: m.h.kaveh12@gmail.com

Received 2019 August 16; Revised 2019 December 01; Accepted 2019 December 23.

Abstract

Background: Multiple sclerosis (MS) is a progressive central nervous system disease that has an enormous effect on a patient's quality of life due to physical complications and psychological problems.

Objectives: The purpose of this study is to investigate the effect of self-care education program based on Health-Promoting Self-Care Behaviors System Model on quality of life, resilience, and sense of coherence in patients with MS.

Methods: In this randomized controlled clinical trial, 80 patients with MS referred to hospitals for special diseases in Kerman were enrolled using systematic sampling method and then randomly assigned to the intervention and control groups. The main research instruments, including demographic information checklist, Multiple Sclerosis Quality of Life (MSQOL-54), Connor-Davidson scale, Resilience Scale and Sense of Coherence Scale were completed by subjects in both intervention and control groups. The intervention group participated in 18 training sessions that addressed the needs of patients. The two groups completed the questionnaires one week and two months after intervention again. Generalized Estimating Equations (GEE) (GEE) test was used for data analysis.

Results: Pre-intervention results revealed that intervention and control groups were not significantly different in the mean scores of most dimensions of quality of life and sense of coherence ($P > 0.05$). However, intervention and control groups were significantly different in mean scores of all dimensions of quality of life, resilience and sense of coherence one week and ($P < 0.05$) and two months ($P < 0.05$) after the intervention. The results of GEE test also reflected a meaningful difference in the intervention group in terms of increased mean scores in all dimensions of quality of life ($P < 0.05$), resilience (69.60 ± 6.62) ($P < 0.05$) and sense of coherence (74.50 ± 3.52) ($P < 0.05$) one week and two months after the intervention compared to the baseline. However, this improvement was not observed in the controls ($P > 0.05$).

Conclusions: Teaching health-promoting self-care behaviors system model improves the quality of life, resilience, and sense of coherence in patients with MS. Therefore, it is recommended to plan and implement self-care training interventions in accordance with this model for all patients with MS.

Keywords: Health-Promoting Self Care Behaviors Model, Quality of Life, Resilience, Coherence, Multiple Sclerosis

1. Background

Multiple sclerosis (MS) is one of the most common chronic disorders of the central nervous system that is associated with the demyelination of nerve cells and damage to the central nervous system (1). Its prevalence is estimated at 30 percent worldwide. Iran has the highest prevalence of MS among the Middle East countries. The preva-

lence of this disease in Iran is 5 to 115 per 100,000 populations and is most prevalent in Tehran, Isfahan, and Kerman, respectively. Kerman, with an average prevalence of 90 percent of the population, is among the provinces with relatively high rates of MS (2, 3).

The symptoms of MS include fatigue, stress and pain, spasm, muscle weakness, ataxia, unstable gait, tremor, ten-

sion, anxiety, speech and vision disorders, dizziness, bowel and bladder dysfunction, sexual problems, depression and cognitive changes (4). In fact, MS is one of the most debilitating diseases in adults aged 18 to 40 years and poses numerous challenges to the quality of life in these patients (5), hindering their overall physical, social and cognitive functions (6, 7). As such, it has a harmful effect on the overall quality of life in patients. The bulk of studies on the quality of life of patients with MS have documented the lower quality of life in these patients compared to the general population (8, 9). The rate of mental and psychological problems is higher in patients with MS, and they are more likely to develop depression, stress, and anxiety (10, 11).

Quality of life is a multidimensional construct that embraces physical, mental, and social health, and has received growing attention as a major outcome of studies on health policymaking and the efficacy of therapeutic and educational interventions (12). Quality of life is a dynamic and subjective construct that compares one's past life with the status quo by observing all positive and negative dimensions. The subjective nature of the quality of life is linked to an individual's perception of life rather than the accounts of other people, originating from a sense of satisfaction or dissatisfaction with those spheres of life that are important to a person (13).

The review of literature in this field suggests that drug therapy supplemented by resilience training can be used to improve the quality of life in patients with MS, suggesting that in designing intervention programs for patients with MS, special attention has been paid to factors such as efficient coping strategies, problem-solving, and motivational and cognitive resources reinforcement (14). In this context, resilience training, which is based on positive psychology, is particularly important as one of the most widely used intervention programs to empower individuals in dealing with adverse life experiences (15). Resilience describes one's ability and skill to successfully adapt to challenging and stressful life situations or difficult conditions such as chronic illness (16).

The sense of coherence is a general approach that perceives life as comprehensible, controllable, and meaningful (17), leading to more adaptive behaviors and lower vulnerability. By reinforcing a sense of coherence in chronic patients, especially patients with MS, the life expectancy and hope can be nurtured in these patients so that they can assume a meaningful view of life and the future (17, 18). Therefore, it can be argued that enhancing resilience and sense of coherence in patients with MS can foster a good coping strategy to better adapt to this disease and ultimately improve the quality of life.

There are numerous ways to improve the quality of life, resilience and sense of coherence in patients, including

self-care behaviors training. Self-care is defined as an individual's power to protect or preserve one's well-being or health (19). A prerequisite of promoting self-care behaviors in chronic patients is the empowerment of these patients. Therefore, empowerment is one of the main goals of self-care. The health promotion approach also maintains that people should be empowered to assume responsibility for their health and adopt a healthy lifestyle (20). Self-care activities can encourage people to maintain health and well-being, reinforce their adaptability, alleviate the degree of disability and infirmity, and consequently diminish the costs of treatment (21).

One of the most exhaustive self-care theories is the health-promoting self-care behavior system model. As a pattern commonly used in behavioral change, this model was developed by Simmons in 1990 with the aim of integrating theoretical aspects of self-care in the context of health promotion as a broad scientific framework and holistic to identify and describe factors influencing decision-making, performance, along with the outcomes of pursuing a healthy lifestyle. This model underscores self-care, or an individual's commitment and responsibility for promoting knowledge and skills required to improve health. In fact, the concept of self-care in this model represents an individual approach to self-care that embraces a set of voluntary goal-oriented actions in response to life's interests and realization of one's health and well-being (22). One of the key concepts of this model is the experience of self-care agency. Self-care agency is the result of self-assessment, decision-making, and self-care behavior. Individual criteria of self-care agency entail developing knowledge for promoting self-care and self-esteem. Alongside these issues, the healthcare delivery system calls for a supportive-educational system to foster agency in individuals. This supportive-educational system may include educational programs, access to health services and the implementation of necessary preventive or therapeutic interventions, the supply of behavioral instructions in educational classes, mass media or health reminder materials that can cultivate cognitive-perceptual abilities and skills of individuals in health promotion, and hence foster a sense of self-care agency. The Simmons' health-promoting behaviors system model also specifies cognitive-perceptual factors as key components of behavior. These factors include perceived self-efficacy, perceived benefits, and barriers to behaviors. This model focuses on the implications of self-care as a part of health outcomes, one of which is enhanced quality of life (22).

2. Objectives

The outcomes of a study designed to further the involvement of patients in self-care can have positive effects on patients' quality of life, resilience, and sense of coherence. The review of previous studies in Iran reveals a paucity of studies on the effect of a self-care training program based on health-promoting self-care behaviors system model in patients with MS. In view of this, the researchers decided to determine the effect of a self-care training program based on health-promoting self-care system behaviors model on physical and psychological dimensions of quality of life, resilience, and sense of coherence in patients with MS.

3. Methods

3.1. Design and Inclusion/Exclusion Criteria

This is a randomized controlled clinical trial conducted on 80 patients with MS in Kerman from September 2018 to March 2019. Of 850 patients with medical records in Kerman Hospital for Special Diseases, $n = 566$ patients were included in the study and $n = 284$ patients were excluded.

Inclusion criteria: Relapsing-remitting multiple sclerosis (as decided by a neurologist, the patient's medical records and an Expanded Disability Status Scale of below 5 age range of 19 to 35 years, willingness to participate in the study, any chronic diseases other than MS such as diabetes, kidney disease, etc., as well as any mental illnesses that impede the comprehension of items in the questionnaire and patient cooperation.

Exclusion criteria: Incomplete questionnaires, unwillingness to participate in the study, abandoning of the trial during intervention, and failure to attend training classes more than session led to excluding the subjects from the study.

3.2. Ethical Consideration

After obtaining necessary permission and making arrangements with relevant authorities, written informed consent was obtained from the patients with MS for voluntary participation in the study. They were assured that their information would be confidential and if they decided to withdraw from the research, no information would be disclosed. The research was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.REC.1396.182) (Project Code: 15554) and registered as a clinical trial (IRCT20180423039393N1).

3.3. Sample Size

Based on previous studies (23) and the following formula, which considered Z_1 and Z_2 , the sample size was estimated at 1.96 and 0.86, $d = 0.1$ and $\sigma = 0.25$ at a confidence interval of 0.95 and a power of 0.8 with a 20% dropout rate. There were 40 subjects in each group and a total of $n = 80$ participants.

$$n = \frac{2(Z_1 - Z_2)^2 \sigma^2}{d^2} \quad (1)$$

3.4. Sampling Strategy and Randomization

From the list of patients admitted to hospitals who met the inclusion criteria, 80 patients were selected through a systematic sampling method ($n = 80$) (according to the Consort chart). Eighty patients selected by systematic random sampling were divided into two groups: control ($n = 40$) and intervention ($n = 40$) based on a simple random allocation method (Figure 1). Our research context was a hospital for special diseases (Samen-Alhojaj Medical Complex). This hospital is a governmental center affiliated to Kerman University of Medical Sciences, Iran, and treats patients with diseases such as Thalassemia, hemophilia, kidney disease, and MS.

3.5. Data Collection Instruments

1) Demographic checklist: Demographic data included age, sex, marital status, education level, number of children, employment status, and monthly income.

2) Quality of life (MSQOL-54) Scale for MS: This scale was developed by Vickrey et al. (12) at the University of California and is currently used in the United States. It is a recognized instrument for assessing the quality of life in patients with MS. This scale covers diverse domains of quality of life in patients with MS, including 14 subscales of "physical function", role limitations-physical, role limitations-emotional, pain, emotional well-being, energy, health perceptions, social function, cognitive function, health distress, overall quality of life, and sexual function, satisfaction with sexual function and health change. In the end, the patient's quality of life score is determined by aggregating two composite summary scores. These two composite summaries include "physical health" and "mental health". The scores for all 14 subscales as well as the two composite summaries are in the range of 0 to 100, with higher scores indicating a greater health status. The scale contains a total of 54 items, 18 of which are specific to MS disease and 36 are global. The instrument consists of items that are evaluated on a 2 to 7-point Likert scale (12). This scale has been validated in Iran (24). They measured face and content validity of the tool and reported validity using Cronbach's alpha of 0.7.

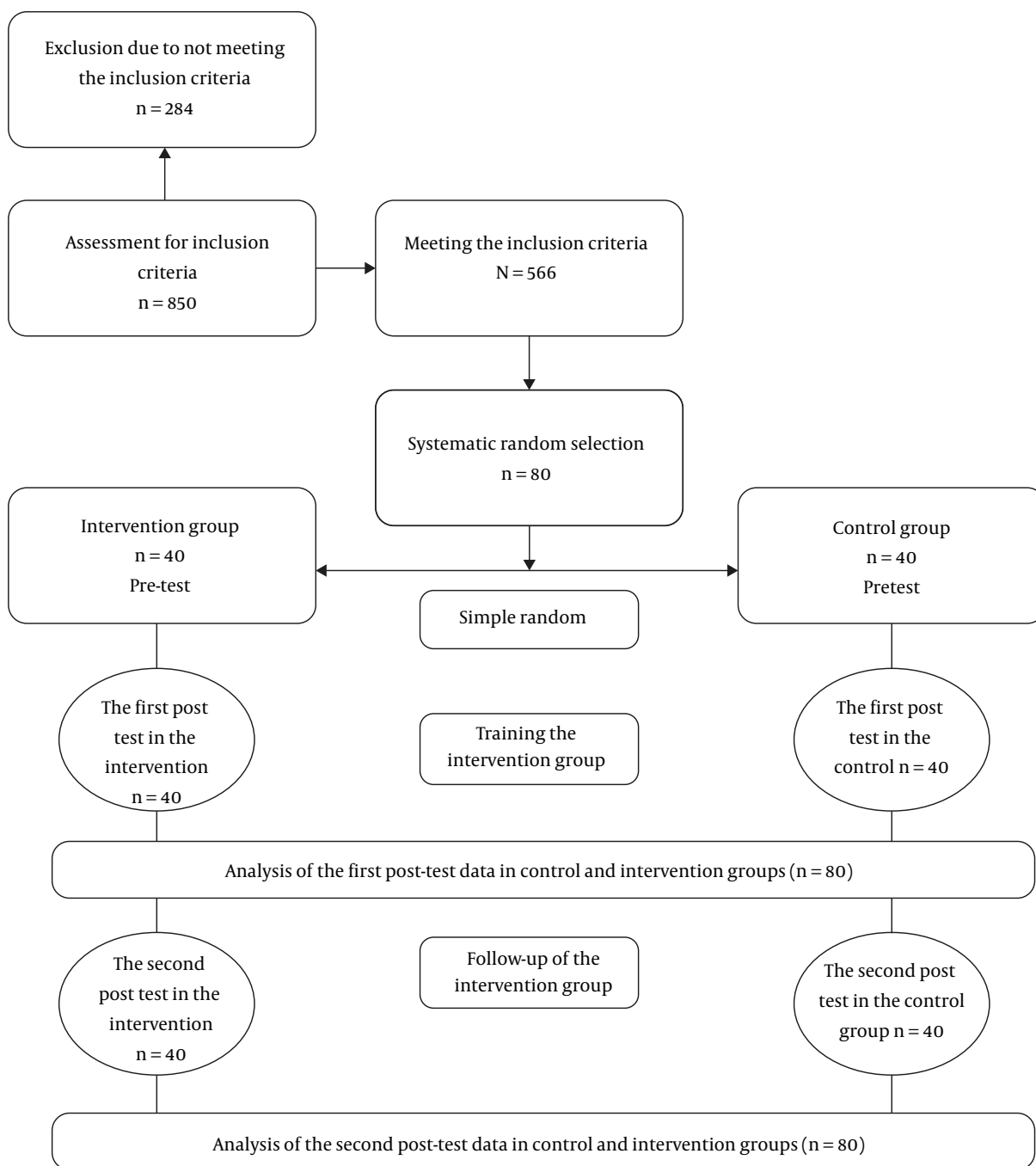


Figure 1. Consort chart to outline the steps involved in selecting and participating in the study is shown.

3) Connor-Davidson Resilience Scale (CD-RISC): Designed by Connor and Davidson in 2003, this scale consists of 25 items that are evaluated on a 5-point Likert scale [not true at all (0), rarely true (1), sometimes true (2), often true (3), and almost always true (4)]. The total score is between

0 and 100 (25). This scale has been validated in Iran (26). They measured face and content validity of the tool and reported validity using Cronbach's alpha of 0.84.

4) Sense of Coherence (SOC) Scale: Designed by Flensburg-Medden et al. in 2006, this scale consists of 35

items that are evaluated by multiple-choice questions (yes, no, I have no idea). The total scale score is between 35 and 105 (27). This scale has been validated in Iran (28). They measured face and content validity of the tool and reported validity using Cronbach's alpha of 0.89.

After explaining the objectives to the participants and them completing informed consent form, the questionnaires were completed in three stages: pre-test, post-test I, and post-test II. The questionnaires were self-reported by the patients and handed over to the researcher. For illiterate or illiterate participants, the questions were read by the researcher and they answered the questions. The average time to complete the questionnaires was about 20 minutes.

3.6. Intervention

For patients in the intervention group, 18 training sessions were held over a period of three months based on the main constructs of the health-promoting self-care behaviors system model to improve the quality of life, resilience, and sense of coherence. Each training class was organized twice a week in 45 - 60 min sessions. In addition to holding in-person training sessions, patients in the intervention group were followed up by phone calls and texts during the training period. Given the global reach of information and communication technology, integrating e-learning with traditional and in-person training provides the best strategy for effective, sustainable and high-quality training. Social networks represent the most common form of e-learning tools. Most internet users in the world and Iran are active in at least one social network (29). Therefore, to review educational materials and create a reinforcing effect, the audio file of each session was uploaded to an online group called "Self-Care Group", which consisted of subjects in the intervention group.

Various educational techniques such as interactive lectures, participatory methods involving questions and answers and brainstorming were utilized in each training session to further influence people's attitudes, group discussion and practical training. In the above study, a variety of educational media, including a self-care guidebook for patients with MS, educational slides and video clips, as well as images, were used for more effective teaching. The educational content of the intervention sessions was inspired by the model constructs. The training sessions were intended to improve the sense of coherence (five sessions), resilience (eight sessions), self-esteem (three sessions) and nutrition knowledge and health (two sessions) in patients with MS (Table 1). The training programs based on other model constructs (self-efficacy, perceived benefits and barriers) are also listed below.

Perceived benefits and barriers represent another construct of health-promoting self-care behaviors system model. In all training sessions, the benefits and efficacy of self-care behaviors in physical, emotional, psychological and spiritual dimensions were discussed and the effect of these behaviors on reducing recurrence and treatment costs, and reinforcing independence of individuals were described. Subjects were also encouraged to discuss barriers to self-care behaviors, so that other participants could share their solutions and strategies to overcome such obstacles (30).

To improve patients' self-efficacy, as another model construct, the following questions were presented to patients in the conclusion of each chapter of the self-care guide book for patients with MS in the training classes, which were in fitting with the subject of the training session: "What do you do to control your anger and stress? What do you do to promote your self-esteem? How do you organize your work during the day? What do you do to improve your social relationships? What do you do to mitigate MS-induced fatigue?" The participants in the class exchanged their answers and views, and those who had a successful and positive experience regarding each of the questions were motivated by the instructor and other participants. Patients with MS (outside the study population), who had succeeded in controlling their illness, were also asked to attend the class and share their positive experiences. Another strategy to improve self-efficacy involved teaching self-relaxation techniques to control stress and providing an opportunity for practicing these techniques. Subjects who were successful in performing self-relaxation and meditation techniques were applauded and encouraged by other participants (23).

3.7. Data Analysis

In this study, mean, standard deviation, frequency and frequency percentages were used as the descriptive statistics. The normality of data was assessed by Shapiro-Wilk test and the results showed the abnormality of all variables. Therefore, the Generalized Estimating Equations (GEE)(GEE) test with an exchangeable structured was used to evaluate the intra- and inter-group effects of repeated variables at three time points (before, one week and two months after the intervention) in the intervention and control groups. Data analysis was performed using SPSS 22 software and a significance level of less than 0.05 was considered.

4. Results

According to Table 1 and the results of the chi-square test, the intervention and control groups were homoge-

Table 1. Outline and and Schedule of Training Sessions

Topic of the Meeting	Main Objective	Educational Content of Sessions	Educational Method	Educational Media
Learning about MS; sense of coherence	Learning more about MS; enhancing the sense of coherence in patients	- General information MS and its types		
		- Types and complications of the disease		
		- Defining the sense of coherence		
		- Teaching problem-solving skills based on coping strategies		
		- Training self-relaxation techniques (Benson and Jacobson)		
		- Promoting internal attribution		
Resilience	Increasing resilience	- Definition of resilience	Lecture; group discussion; Q and A; collaborative learning technique (send-a-problem); talking about positive experiences; practical exercise	Books; slides; videos; photos; telegram groups (virtual)
		- Positive thinking training		
		- Stress management training		
		- Anger management training		
		- Coping strategies and communication skills		
		- Reiterating the importance of recalling positive memories to establish effective interpersonal communications		
Self-esteem	Promoting self-esteem	- The importance of forging a relationship with God and trusting Him at the time of adversities		
		- Definition of self-esteem		
		- The importance of mental health		
		- Symptoms of impaired self-esteem and how to enhance it		
		- Proper pelvic and bladder strengthening exercises		
Nutrition and exercise in MS	Improving knowledge and nutrition health of patients with MS	- Self-relaxation techniques and problem-solving strategies		
		- The importance of a healthy diet in MS disease		
		- The diet-related instructions		
		- The list of alternative and recommended diets and permitted dose of supplements		
		- Exercise appropriate for patients with MS		

neous in terms of demographic variables. The mean age of the patients in the intervention group was 30.43 ± 3.8 (an age range of 22 - 35 years). The mean age of the patients in the control group was 30.18 ± 3.88 (an age range of 20 - 35 years). Other demographic information of the patients with MS in both intervention and control groups are presented in Table 2.

The results of GEE test showed that there was a significant difference between mean scores of some subscales of quality of life in patients with MS before the intervention, including role limitations-physical, role limitation-emotional, emotional well-being, energy, health perception, social function, health distress, sexual function, satisfaction with sexual function, and composite summary of physical health in the intervention and control groups.

The same test, however, demonstrated a significant difference in mean scores of all 14 subscales of quality of life including physical function, role limitation-physical, role limitation-emotional, pain, mental well-being, energy, health perception, social function, cognitive function, health distress, sexual function, change in health, satisfaction with sexual function, overall quality of life and composite summaries of physical and mental health one week and two months after the intervention in both intervention and control groups (Figure 2, Tables 3 and 4).

The results of the GEE test also indicated a significant increase in the mean scores of all 14 subscales of quality of life and two composite summaries of physical and mental health in the intervention group one week and two months after the intervention compared to the baseline. In the control group, nonetheless, no significant increase was observed in mean scores of 14 subscales of quality of life and composite summaries of physical and mental health of patients one week and two months after the intervention compared to the baseline.

The results of GEE test revealed that there was a significant difference between the intervention and control groups with respect to the mean score of resilience at the baseline. In the post-intervention period, the mean score of resilience reflected a significant difference between the intervention and control groups, considering the moderating effect before intervention, one week and two months after the intervention (Table 5).

The mean score of resilience in the intervention group was 47.15 at pre-intervention, 69.60 at one week after the intervention and 69.58 at two months after the intervention. The results of the GEE model in the intervention group suggested that the mean scores of resilience at one week and two months after the intervention were significantly higher than the pre-intervention stage ($P < 0.05$). In the control group, the mean score of resilience was 42.35 at pre-intervention, 42.93 at one week after the intervention

Table 2. Demographic and Social Characteristics of Patients Under Study in both Intervention and Control Groups^a

Variables	Intervention Group (N = 40)	Control Group (N = 40)	P Value
Gender			0.531
Male	5 (12.5)	7 (17.5)	
Female	35 (87.5)	33 (82.5)	
Level of education			0.270
Grade school	5 (12.5)	2 (5.0)	
Diploma	14 (35.0)	8 (20.0)	
University degree	21 (52.5)	30 (75.0)	
Marital status			0.082
Single	10 (25.0)	18 (45.0)	
Married	28 (70.0)	22 (55.0)	
Widow/divorced	2 (5.0)	0 (0)	
Number of children			0.091
NA	4 (10.0)	4 (10.0)	
One	11 (27.5)	13 (32.5)	
Two	13 (32.5)	5 (12.5)	
Three and more	12 (30.0)	18 (45.0)	
Occupation status			0.068
Employed	10 (25.0)	7 (17.5)	
Unemployed	30 (75.0)	33 (82.5)	
Incomes			0.558
< 500,000 T per month	6 (15.0)	3 (7.5)	
500 - 750 thousands T per month	5 (12.5)	7 (17.5)	
750,000 to 1 million T per month	8 (20.0)	13 (32.5)	
One-two million T per month	18 (45.0)	15 (37.5)	
> 2 million T per month	3 (7.5)	2 (5.0)	

^aValues are expressed as No (%).

and 42.85 at two months after the intervention, which did not exhibit a significant increase compared to the baseline ($P > 0.05$) (Table 5).

Table 4. Inter-Group and Intra-Group Comparisons of Mean Scores of Composite Summaries of Physical and Mental Health in the Intervention and Control Groups^a

Variable	Assessment Stage	Group	Values	P Value ^b	P Value ^c
Composite summary of physical health	Pre-intervention	Intervention	51.59 ± 16.31	0.054	-
		Control	45.15 ± 13.86		-
	One-week after intervention	Intervention	72.33 ± 10.60	< 0.001 ^d	< 0.001 ^d
		Control	44.12 ± 13.87		0.014 ^d
	Two months after intervention	Intervention	72.99 ± 10.09	< 0.001 ^d	< 0.001 ^d
		Control	43.38 ± 13.55		< 0.001 ^d
Composite mental health	Pre-intervention	Intervention	48.46 ± 17.44	0.027 ^d	-
		Control	40.26 ± 16.16		-
	One-week after intervention	Intervention	75.39 ± 10.78	< 0.001 ^d	< 0.001 ^d
		Control	39.63 ± 15.62		0.410
	Two months after intervention	Intervention	75.55 ± 10.54	< 0.001 ^d	< 0.001 ^d
		Control	38.30 ± 15.36		0.050

^aValues are expressed as mean ± SD.

^bP value: intra comparison.

^cP value: inter comparison.

^dP value < 0.05.

Table 5. The Intra-Group and Inter-Group Comparison of Resilience and Sense of Coherence Variables in the Intervention and Control Groups^a

Variable	Assessment Level	Group	Values	P Value ^b	P Value ^c
Resilience	Pre-intervention	Intervention	47.15 ± 10.64	0.025 ^d	-
		Control	42.35 ± 8.65		-
	One week after intervention	Intervention	69.60 ± 6.62	< 0.001 ^d	< 0.001 ^d
		Control	42.93 ± 9.19		0.782
	Two month after intervention	Intervention	69.58 ± 6.66	< 0.001 ^d	< 0.001 ^d
		Control	42.85 ± 9.17		0.788
Sense of coherence	Pre-intervention	Intervention	69.15 ± 9.97	0.180	-
		Control	66.63 ± 6.77		-
	One week after intervention	Intervention	74.50 ± 3.52	< 0.001 ^d	0.001 ^d
		Control	67.20 ± 5.53		0.627
	Two month after intervention	Intervention	74.48 ± 3.49	< 0.001 ^d	0.002 ^d
		Control	67.25 ± 5.48		0.597

^aValues are expressed as mean ± SD.

^bP value: intra comparison.

^cP value: inter comparison.

^dP value < 0.05.

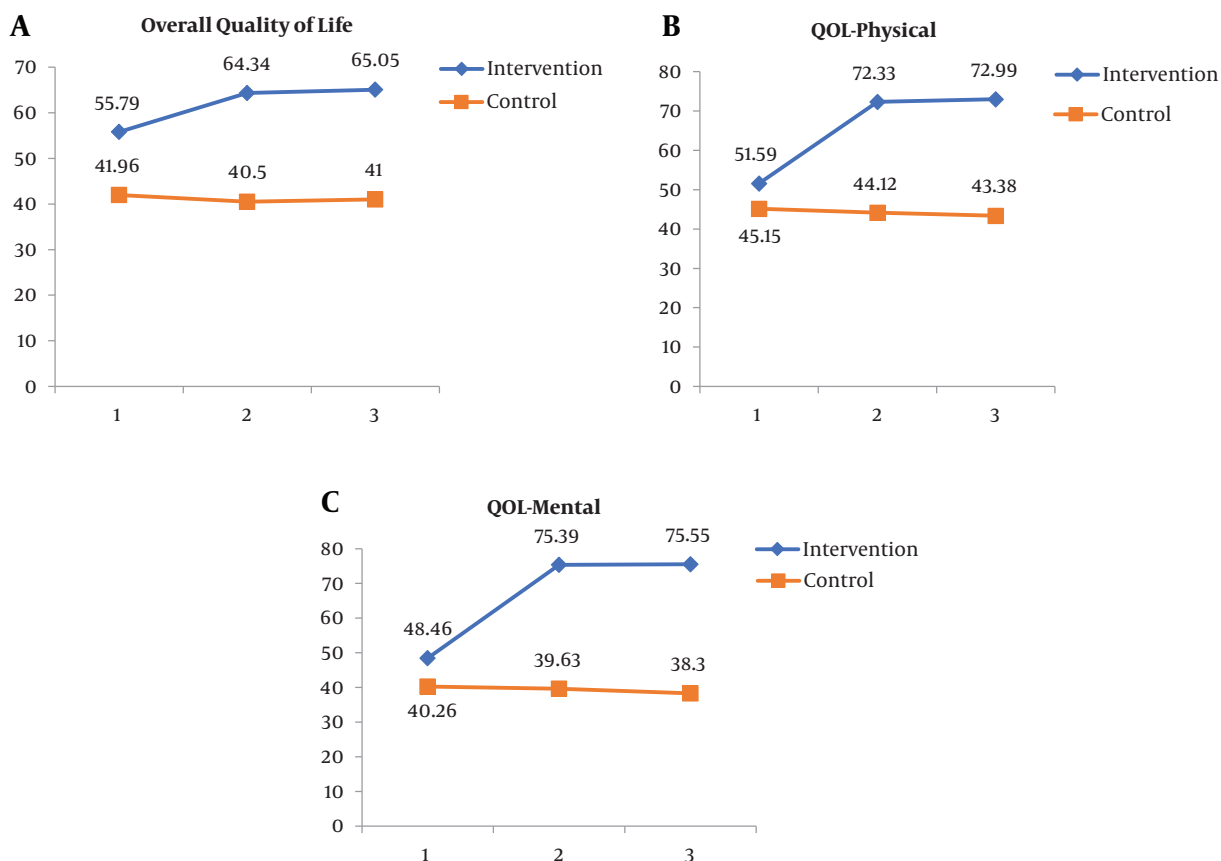


Figure 2. Comparison of A, overall quality of life; B, QOL-Physical; and C, QOL-Mental variables in the intervention and control groups ($P < 0.05$).

With regard to the sense of coherence variable, the results of GEE model for intergroup effects revealed that the mean score of sense of coherence at one week and two months after the intervention revealed a significant difference between the intervention and control groups ($P < 0.05$) (Table 5).

The mean score of sense of coherence in the intervention group was 69.15 at pre-intervention, 74.50 at one week after the intervention, and 74.48 at two months after the intervention. The results of the GEE model for the analysis of intra-group effects in the intervention group suggested that the mean score of sense of coherence at one week and two months after the intervention was significantly higher than the pre-intervention phase ($P < 0.05$). In the control group, however, the mean score of sense of coherence was 66.63 at pre-intervention, 67.20 at one week after the intervention and 67.25 at one month after the intervention, which did not show a significant increase compared to the pre-intervention period ($P > 0.05$) (Figure 3, Table 5).

5. Discussion

The findings of this study reveal that the mean score of 14 subscales of quality of life and the composite summaries of physical and mental health in the intervention group increased significantly in the first and second post-test in comparison to the pre-test. However, this surge was not observed in the control group in three different test phases. In this regard, Hamidzadeh et al. (31) conducted a study to evaluate the effectiveness of self-care program on physical subscales of quality of life in patients with MS based on Orem’s model. The results illustrated an improvement in physical subscales of quality of life in the intervention group after four months of intervention, which was significantly different from the control group (31). Al-mohamadi et al. (32) undertook a study to evaluate the impact of self-care training on quality of life in patients with MS. The results of their study documented a significant growth in the mean score of quality of life in physical, psychological and social function and the general health domains as a result of educational interventions and self-

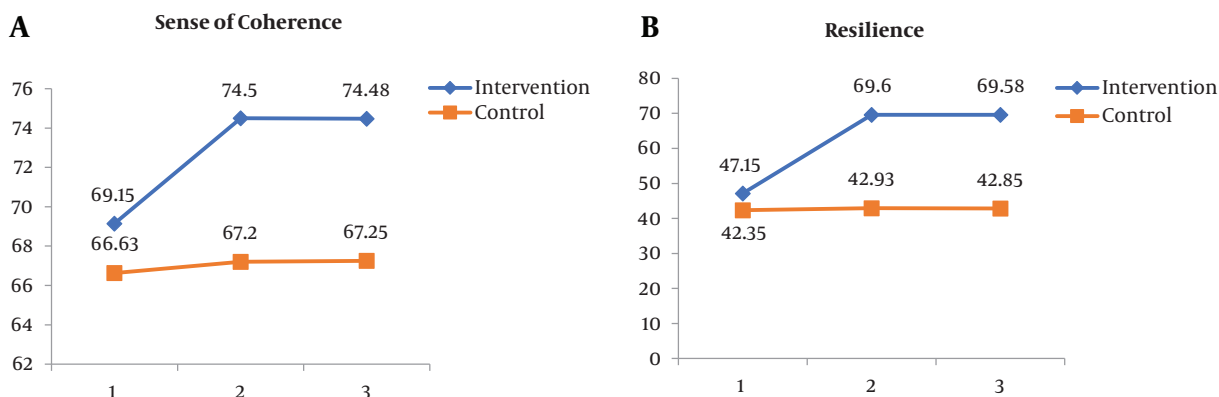


Figure 3. A, Comparison of sense of coherence; and B, Resilience variables in the intervention and control groups ($P < 0.05$).

care interventions (32). Another study by Fayand et al. (33) on the effect of resilience model on improving the quality of life of patients with MS demonstrated a substantial difference between the mean scores of quality of life in intervention and control groups at the post-intervention phase. Resilience intervention led to the improvement of quality of life parameters in the intervention group. Also, the results of follow-up after 3 months suggested that the resilience model had a lasting effect on patients' quality of life (33). In the study of Sahebalzamani et al. (34) on the impact of self-care training program on the quality of life in patients with MS, the results suggested that the mean scores of patients' quality of life in physical health, mental health, pain, fatigue, health perception, sexual activity and overall quality of life had improved significantly after the educational intervention compared to the baseline. Khodaveisi et al. (35) in their study, on the impact of using Orem's self-care model on physical dimensions of quality of life in patients with MS, found that the mean quality of life in subscales of role limitation, physical health, energy, health perception sexual function, social function, sexual satisfaction, pain, health distress and quality of life in physical subscales had significantly improved in the intervention group compared to the control group. However, no substantial enhancement was observed in the control group (35). In keeping with our results, the study of Petajan et al. (36) on the impact of aerobic exercise on patients' fitness and quality of life patients with MS exhibited the effectiveness of this intervention on improving the role of patients. O'Hara et al. (37) also evaluated the efficacy of a professional self-care program in patients with MS. Their results, in agreement with our findings, depicted a significant improvement in quality of life scores in the mental health dimension and the independence of patients in the intervention group.

Findings of the present study demonstrate that self-care activities could be performed by patients with MS so that proper training and execution of these self-care programs could significantly improve the mean score of quality of life in patients with MS. If the self-care program is sustained in keeping with patients' self-care demands and level of understanding, it can generate promising outcomes that help promote their health status. Thus, self-care educational interventions that motivate patients and consider their role in self-care can improve all subscales of quality of life in these patients.

The findings also reveal substantial growth in the mean score of resilience in the intervention group after the first and second post-tests. However, the mean score of resilience in the control group did not change dramatically in three test stages. Therefore, it can be concluded that educational intervention based on health-promoting self-care behaviors model has been effective in reinforcing the resilience of patients with MS. In this regard, Rahimi et al.'s (38) study on the efficacy of positive psychology interventions on the resilience of female patients with MS showed that educational interventions considerably increased the mean score of resilience in subjects. In research on the efficacy of social support and self-regulation on resilience of patients with breast cancer, Wills et al. (39) reported that social support and self-regulation fostered resilience in patients with Cancer. Taghizadeh and Miralahi (40) studied the usefulness of group spirituality therapy on resilience in women with MS, revealing that this type of therapy was highly effective in nurturing resilience of women with MS. In another study by Kaboudi et al. (41) on the effect of stress management skills training on the resilience and perceived stress of MS women, the results showed the effectiveness of educational intervention on improving resilience and decreasing stress score in the intervention

group. Also, Norte et al. (42) reported that educational interventions of cognitive-behavioral therapy cultivated resilience in patients with MS.

Improved resilience in patients with MS as a source of intrinsic resistance mitigates the adverse effects of emotion and improves quality of life. In fact, people with high levels of resilience exhibit more flexible behaviors in stressful situations. These flexible behaviors enhance problem-solving skills and provide greater insights into situations.

In summary, the findings of this study revealed a significant increase in the mean score of sense of coherence in the intervention group in the first and second post-test compared to the pre-test. However, the mean score of sense of coherence in the control group did not change significantly in the three phases of the test. In this context, the study of Mirhashemi and Najafi (43) on the effect of solution-based therapy on resilience and sense of coherence in patients with MS demonstrated substantial growth in the mean score of resilience and sense of coherence in post-test compared to the pre-test. In another study by Rezapour and Nasouhi (44) on the effect of a combined hope therapy and Adler's lifestyle therapy on the sense of coherence and self-efficacy in physically disabled women, the results of the first post-test indicated an improved sense of coherence and self-efficacy in patients after the treatment. Improvements made during the treatment period were observed at one-month follow-up, indicating the sustained effect of the intervention. In a study by Salmabadi et al. (45), on the impact of life review training on life satisfaction and sense of coherence in middle-aged and elderly women, the results showed that training sessions raised the mean score of life satisfaction and sense of coherence in the elderly group. Research has documented the crucial role of the sense of coherence in adopting a healthy lifestyle and self-promoting health behaviors in chronic patients. Thus, by enhancing the sense of coherence in patients with MS, they can be encouraged to adopt a meaningful view of life and remain hopeful about the future (18).

The strongest and most important novelties of the present research are as follows: this study is the first trial to improve the quality of life, resilience, and sense of coherence of patients with MS using a holistic model called: health-promoting self-care behaviors system model. This model addresses all aspects of self-care (physical, mental and social). In this study, we used several educational media as well as a participatory learning technique called Send-a-problem in behavior change intervention.

One of the limitations of this study is individual differences among subjects, which is beyond the control of the researchers. The lack of long-term follow-ups to assess the effect of long-term educational interventions, as well

as intensive training sessions due to time constraints, are other limitations of this study. Other weak points of the study include the possibility of receiving additional information from patients from other sources such as mass media, the internet, books, their physician, family, and friends that were beyond the control of the researchers.

5.1. Conclusions

The results of this study revealed that self-care training (physical, mental, social, and spiritual training) based on the health-promoting self-care behaviors model improves the quality of life, resilience, and sense of coherence in patients with MS. Therefore, it is recommended to design and implement more extensive and long-term educational interventions based on the above model in all patients with MS.

Acknowledgments

This article is extracted from a PhD thesis written by Victoria Momenabadi, a PhD student in Health Education and Health Promotion, and was financially supported by Shiraz University of Medical Sciences, Shiraz, Iran grant No: 15554.

Footnotes

Authors' Contribution: Study concept and design: Mohammad Hossein Kaveh and Victoria Momenabadi. Analysis and interpretation of data: Victoria Momenabadi, Maryam Dastoorpoor, and Mohammad Hossein Kaveh. Drafting of the manuscript: Victoria Momenabadi and Mohammad Hossein Kaveh. Critical revision of the manuscript for important intellectual content: Mohammad Hossein Kaveh, Victoria Momenabadi, Nouzar Nakhaee, Kambiz Karimzadeh Shirazi, Maryam Dastoorpoor, and Behnaz Sedighi.

Clinical Trial Registration Code: The clinical trial registration code is IRCT20180423039393N1

Conflict of Interests: The authors declare no conflict of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval: The ethical code is IR.SUMS.REC.1396.182.

Funding/Support: The research project was funded by Shiraz University of Medical Sciences, Shiraz, Iran (grant number: 15554).

References

- Sangelaji B, Nabavi SM, Estebsari F, Banshi MR, Rashidian H, Jamshidi E, et al. Effect of combination exercise therapy on walking distance, postural balance, fatigue and quality of life in multiple sclerosis patients: A clinical trial study. *Iran Red Crescent Med J*. 2014;**16**(6). e17173. doi: [10.5812/ircmj.17173](https://doi.org/10.5812/ircmj.17173). [PubMed: [25068045](https://pubmed.ncbi.nlm.nih.gov/25068045/)]. [PubMed Central: [PMC4102978](https://pubmed.ncbi.nlm.nih.gov/PMC4102978/)].
- Azami M, YektaKooshali MH, Shohani M, Khorshidi A, Mahmudi L. Epidemiology of multiple sclerosis in Iran: A systematic review and meta-analysis. *PLoS One*. 2019;**14**(4). e0214738. doi: [10.1371/journal.pone.0214738](https://doi.org/10.1371/journal.pone.0214738). [PubMed: [30964886](https://pubmed.ncbi.nlm.nih.gov/30964886/)]. [PubMed Central: [PMC6456231](https://pubmed.ncbi.nlm.nih.gov/PMC6456231/)].
- Raeisi R, Mohammadi N, Reza M, Almodaresi SA. The geographical distribution of multiple sclerosis patients in Kerman City by using Geographic Information system. *Health Based Res*. 2017;**3**(3):217-26.
- While A, Ullman R, Forbes A. Development and validation of a learning needs assessment scale: A continuing professional education tool for multiple sclerosis specialist nurses. *J Clin Nurs*. 2007;**16**(6):1099-108. doi: [10.1111/j.1365-2702.2007.01693.x](https://doi.org/10.1111/j.1365-2702.2007.01693.x). [PubMed: [17518884](https://pubmed.ncbi.nlm.nih.gov/17518884/)].
- Sangelaji B, Kordi M, Banihashemi F, Nabavi SM, Khodadadeh S, Dastoorpoor M. A combined exercise model for improving muscle strength, balance, walking distance, and motor agility in multiple sclerosis patients: A randomized clinical trial. *Iran J Neurol*. 2016;**15**(3):11-20. [PubMed: [27648171](https://pubmed.ncbi.nlm.nih.gov/27648171/)]. [PubMed Central: [PMC5027145](https://pubmed.ncbi.nlm.nih.gov/PMC5027145/)].
- Kanter JW, Baruch DE, Gaynor ST. Acceptance and commitment therapy and behavioral activation for the treatment of depression: Description and comparison. *Behav Anal*. 2006;**29**(2):161-85. doi: [10.1007/bf03392129](https://doi.org/10.1007/bf03392129). [PubMed: [22478462](https://pubmed.ncbi.nlm.nih.gov/22478462/)]. [PubMed Central: [PMC2223147](https://pubmed.ncbi.nlm.nih.gov/PMC2223147/)].
- Rimaz S, Mohammad K, Dastoorpoor M, Jamshidi E, Majdzadeh R. Investigation of relationship between social capital and quality of life in multiple sclerosis patients. *Glob J Health Sci*. 2014;**6**(6):261-72. doi: [10.5539/gjhs.v6n6p261](https://doi.org/10.5539/gjhs.v6n6p261). [PubMed: [25363095](https://pubmed.ncbi.nlm.nih.gov/25363095/)]. [PubMed Central: [PMC4825513](https://pubmed.ncbi.nlm.nih.gov/PMC4825513/)].
- 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). [PubMed: [15148144](https://pubmed.ncbi.nlm.nih.gov/15148144/)].
- Tepavcevic DK, Kostic J, Basuroski ID, Stojisavljevic N, Pekmezovic T, Drulovic J. The impact of sexual dysfunction on the quality of life measured by MSQOL-54 in patients with multiple sclerosis. *Mult Scler*. 2008;**14**(8):1131-6. doi: [10.1177/13524585080893619](https://doi.org/10.1177/13524585080893619). [PubMed: [18632783](https://pubmed.ncbi.nlm.nih.gov/18632783/)].
- Dennison L, Moss-Morris R, Chalder T. A review of psychological correlates of adjustment in patients with multiple sclerosis. *Clin Psychol Rev*. 2009;**29**(2):141-53. doi: [10.1016/j.cpr.2008.12.001](https://doi.org/10.1016/j.cpr.2008.12.001). [PubMed: [19167801](https://pubmed.ncbi.nlm.nih.gov/19167801/)].
- Siegert RJ, Abernethy DA. Depression in multiple sclerosis: A review. *J Neurol Neurosurg Psychiatry*. 2005;**76**(4):469-75. doi: [10.1136/jnnp.2004.054635](https://doi.org/10.1136/jnnp.2004.054635). [PubMed: [15774430](https://pubmed.ncbi.nlm.nih.gov/15774430/)]. [PubMed Central: [PMC1739575](https://pubmed.ncbi.nlm.nih.gov/PMC1739575/)].
- Vickrey BG, Hays RD, Harooni R, Myers LW, Ellison GW. A health-related quality of life measure for multiple sclerosis. *Qual Life Res*. 1995;**4**(3):187-206. doi: [10.1007/bf02260859](https://doi.org/10.1007/bf02260859). [PubMed: [7613530](https://pubmed.ncbi.nlm.nih.gov/7613530/)].
- Taormina RJ. Adult personal resilience: A new theory, new measure, and practical implications. *Psychol Thought*. 2015;**8**(1):35-46. doi: [10.5964/psyct.v8i1.126](https://doi.org/10.5964/psyct.v8i1.126).
- Johns MM, Zimmerman M, Harper GW, Bauermeister JA. Resilient minds and bodies: Size discrimination, body image, and mental health among sexual minority women. *Psychol Sex Orientat Gen Divers*. 2017;**4**(1):34-42. doi: [10.1037/sgd0000207](https://doi.org/10.1037/sgd0000207).
- Forgeard MJC, Seligman MEP. Seeing the glass half full: A review of the causes and consequences of optimism. *Pratiques Psycholog*. 2012;**18**(2):107-20. doi: [10.1016/j.prps.2012.02.002](https://doi.org/10.1016/j.prps.2012.02.002).
- Beasley M, Thompson T, Davidson JR. Resilience in response to life stress: The effects of coping style and cognitive hardiness. *Pers Individ Differ*. 2003;**34**(1):77-95. doi: [10.1016/s0191-8869\(02\)00027-2](https://doi.org/10.1016/s0191-8869(02)00027-2).
- Lutha SS, Cicchetti D. The construct of resilience: Implications for interventions and social policies. *Dev Psychopathol*. 2000;**12**(4):857-85. doi: [10.1017/s0954579400004156](https://doi.org/10.1017/s0954579400004156). [PubMed: [11202047](https://pubmed.ncbi.nlm.nih.gov/11202047/)]. [PubMed Central: [PMC1903337](https://pubmed.ncbi.nlm.nih.gov/PMC1903337/)].
- Wainwright NW, Surtees PG, Welch AA, Luben RN, Khaw KT,ingham SA. Healthy lifestyle choices: Could sense of coherence aid health promotion? *J Epidemiol Community Health*. 2007;**61**(10):871-6. doi: [10.1136/jech.2006.056275](https://doi.org/10.1136/jech.2006.056275). [PubMed: [17873222](https://pubmed.ncbi.nlm.nih.gov/17873222/)]. [PubMed Central: [PMC2652963](https://pubmed.ncbi.nlm.nih.gov/PMC2652963/)].
- Mohammad Hassani M, Farahani B, Zohour A, Panahi A. Self-care ability based on Orem's theory in coronary artery disease patients. *Iran J Crit Care Nurs*. 2010;**3**(2):87-91.
- Ghasemi A, Rahimi Foroshani A, Kheibar N, Latifi M, Khanjani N, Eshagh Afkari M, et al. Effects of family-centered empowerment model based education program on quality of life in methamphetamine users and their families. *Iran Red Crescent Med J*. 2014;**16**(3). e13375. doi: [10.5812/ircmj.13375](https://doi.org/10.5812/ircmj.13375). [PubMed: [24829765](https://pubmed.ncbi.nlm.nih.gov/24829765/)]. [PubMed Central: [PMC4005427](https://pubmed.ncbi.nlm.nih.gov/PMC4005427/)].
- Hashemi F, Rahimi Dolatabad F, Yektatabab S, Ayaz M, Zare N, Mansouri P. Effect of Orem self-care program on the life quality of burn patients referred to Ghotb-al-Din-e-Shirazi Burn Center, Shiraz, Iran: A randomized controlled trial. *Int J Community Based Nurs Midwifery*. 2014;**2**(1):40-50. [PubMed: [25349844](https://pubmed.ncbi.nlm.nih.gov/25349844/)]. [PubMed Central: [PMC4201185](https://pubmed.ncbi.nlm.nih.gov/PMC4201185/)].
- Simmons SJ. The health-promoting self-care system model: Directions for nursing research and practice. *J Adv Nurs*. 1990;**15**(10):1162-6. doi: [10.1111/j.1365-2648.1990.tb01708.x](https://doi.org/10.1111/j.1365-2648.1990.tb01708.x). [PubMed: [2258523](https://pubmed.ncbi.nlm.nih.gov/2258523/)].
- Daniali SS, Shahnazi H, Kazemi S, Marzbani E. The effect of educational intervention on knowledge and self-efficacy for pain control in patients with multiple sclerosis. *Mater Sociomed*. 2016;**28**(4):283-7. doi: [10.5455/msm.2016.28.283-287](https://doi.org/10.5455/msm.2016.28.283-287). [PubMed: [27698603](https://pubmed.ncbi.nlm.nih.gov/27698603/)]. [PubMed Central: [PMC5034965](https://pubmed.ncbi.nlm.nih.gov/PMC5034965/)].
- Borhani Haghghi A, Ghaem H. Quality of life in multiple sclerosis: Translation and cultural adaptation in persian version of the MSQOL-54. *Iran J Neurol*. 2005;**4**(10-11):40-56. doi: [10.4103/0028-3886.33316](https://doi.org/10.4103/0028-3886.33316).
- Connor KM, Davidson JR. Development of a new resilience scale: The Connor-Davidson Resilience scale (CD-RISC). *Depress Anxiety*. 2003;**18**(2):76-82. doi: [10.1002/da.10113](https://doi.org/10.1002/da.10113). [PubMed: [12964174](https://pubmed.ncbi.nlm.nih.gov/12964174/)].
- Ghasemi M, Gholami A, Mehdizadeghan I. The effect of training forgiveness on resilience and perceived stress in wives of veteran. *Iran J War Publ Health*. 2017;**9**(4):177-83. doi: [10.29252/acadpub.ijwph.9.4.177](https://doi.org/10.29252/acadpub.ijwph.9.4.177).
- Flensburg-Madsen T, Ventegodt S, Merrick J. Sense of coherence and physical health. Testing Antonovsky's theory. *Sci World J*. 2006;**6**:2212-9. doi: [10.1100/tsw.2006.351](https://doi.org/10.1100/tsw.2006.351). [PubMed: [17370017](https://pubmed.ncbi.nlm.nih.gov/17370017/)]. [PubMed Central: [PMC5917116](https://pubmed.ncbi.nlm.nih.gov/PMC5917116/)].
- Ehteshamzadeh P, Sabri Nazarzadeh R, Memarbashi Aval M. The relationship between sense of coherence and job performance with intermediation strategies of coping with stress and mental health. *Psychological Methods Models J*. 2013;**3**(13):85-97.
- Movahedi M, Esmaelifar MSNG. The effect of social-based compilation learning on the efficiency of secondary students in math. *Teach Learn Technol J*. 2015;**1**(3):7-22.
- Suleiman Ismail O, Abdullahi M, Babangida Dangani U, Yusuf Sherif K. Using health beliefs model as an intervention to non compliance with hypertension information among hypertensive patient. *IOSR J Humanities Social Sci*. 2015;**20**(9):11-6.
- Hamidzadeh S, Masoudi R, Ahmadi F, Mohammadi E. [Evaluation of the effect of self-care program based on the Orem framework on the physical quality of life in multiple sclerosis patients]. *SSUJ*. 2009;**17**(2). Persian.
- Alimohamadi N, Pahlevanzadeh S, Soltani MH. Effect of self-care on quality of life of multiple sclerosis patients. *J Shahrekord Univ Med Sci*. 2001;**3**(2):79-86.

33. Fayand J, Akbari M, Moradi O, Karimi K. Investigating the effectiveness of resiliency pattern on improving the quality of life of multiple sclerosis patients: A follow-up study. *Iran J Rehabil Res Nurs*. 2018;**5**(3):31-8. doi: [10.21859/ijrn-05035](https://doi.org/10.21859/ijrn-05035).
34. Sahebalzamani M, Zamiri M, Rashvand F. The effects of self-care training on quality of life in patients with multiple sclerosis. *Iran J Nurs Midwifery Res*. 2012;**17**(1):7-11. [PubMed: [23493483](https://pubmed.ncbi.nlm.nih.gov/23493483/)]. [PubMed Central: [PMC3590698](https://pubmed.ncbi.nlm.nih.gov/PMC3590698/)].
35. Khodaveisi M, Rahmati M, Falahinia G, Karami M, Molavi Vardanjani M. The effect of Orem's self care model on physical quality of life in patients with multiple sclerosis. *Sci J Nurs Midwifery Paramed Fac*. 2018;**3**(4):24-35. doi: [10.29252/sjnmf.3.4.24](https://doi.org/10.29252/sjnmf.3.4.24).
36. Petajan JH, Gappmaier E, White AT, Spencer MK, Mino L, Hicks RW. Impact of aerobic training on fitness and quality of life in multiple sclerosis. *Ann Neurol*. 1996;**39**(4):432-41. doi: [10.1002/ana.410390405](https://doi.org/10.1002/ana.410390405). [PubMed: [8619521](https://pubmed.ncbi.nlm.nih.gov/8619521/)].
37. O'Hara L, Cadbury H, De SL, Ide L. Evaluation of the effectiveness of professionally guided self-care for people with multiple sclerosis living in the community: A randomized controlled trial. *Clin Rehabil*. 2002;**16**(2):119-28. doi: [10.1191/0269215502cr478oa](https://doi.org/10.1191/0269215502cr478oa). [PubMed: [11911510](https://pubmed.ncbi.nlm.nih.gov/11911510/)].
38. Rahimi S, Borjali A, Sohrabi F. Effectiveness of positive psychology interventions on resiliency of female patients with multiple sclerosis. *Positive Psychology J*. 2015;**1**(3):1-10.
39. Wills TA, Bantum EOC. Social support, self-regulation, and resilience in two populations: General-population adolescents and adult cancer survivors. *J Soci Clin Psychol*. 2012;**31**(6):568-92. doi: [10.1521/jscp.2012.31.6.568](https://doi.org/10.1521/jscp.2012.31.6.568).
40. Taghizadeh M, Miralahi M. Study of spiritual group therapy on increase of resiliency in female multiple sclerosis patients in Esfahan. *Q J Health Psychol*. 2013;**82**(7):102-82.
41. Kaboudi K, Dehghan F, Alikhani Darabi F, Farnia V, Alikhani M. The effectiveness of stress management skills on perceived stress and resiliency of women with multiple sclerosis (MS). *Res J Med Sci*. 2016;**10**(7):759-63.
42. Norte CE, Souza GGL, Pedrozo AL, Mendonça-de-Souza ACF, Figueira I, Volchan E, et al. Impacto da terapia cognitivo-comportamental nos fatores neurobiológicos relacionados a resiliência. *Arch Clin Psychiatr*. 2011;**38**(1):43-5. doi: [10.1590/s0101-60832011000100009](https://doi.org/10.1590/s0101-60832011000100009).
43. Mirhashemi M, Najafi F. [Effectiveness of solution therapy on resilience and sense of coherence of multiple patients sclerosis (MS)]. *Med Sci J Islam Azad Univ*. 2014;**24**(3):175-81. Persian.
44. Rezapour Y, Nasouhi M. Investigate the effectiveness of the combined intervention based on hope and Adler's lifestyle therapy on self-efficacy, sense of coherence and self-compassion in individuals with physical handicapped. *Q Counsel Cult Psychother*. 2018;**9**(33):163-85. doi: [10.22054/QCCPC.2018.27226.1669](https://doi.org/10.22054/QCCPC.2018.27226.1669).
45. Salmabadi M, Rajabi MJ, Safara M. Effectiveness of training the review of life on life satisfaction and sense of coherence middle-aged women and elderly nursing home residents in Qazvin. *Salmand*. 2018:198-209. doi: [10.32598/sija.13.2.198](https://doi.org/10.32598/sija.13.2.198).

Table 3. Inter-Group and Intra-Group Comparisons of the Mean Scores of 14 Subscales of Quality of Life in the Intervention and Control Groups^a

Variable	Assessment Stage	Group	Variable	P Value ^b	P Value ^c
Physical function	Pre-intervention	Intervention	53.63 ± 20.16	0.032 ^d	-
		Control	44.63 ± 17.74		-
	One week after intervention	Intervention	69.88 ± 13.80	< 0.001 ^d	< 0.001 ^d
		Control	42.38 ± 17.61		0.003 ^d
	Two months after intervention	Intervention	69.75 ± 13.77	< 0.001 ^d	< 0.001 ^d
		Control	41.62 ± 17.30		0.001 ^d
Role limitation-physical	Pre-intervention	Intervention	25.63 ± 32.27	0.700	-
		Control	23.13 ± 26.18		-
	One week after intervention	Intervention	80.00 ± 17.17	< 0.001 ^d	< 0.001 ^d
		Control	23.12 ± 27.96		> 0.999 ^d
	Two months after intervention	Intervention	80.21 ± 17.14	< 0.001 ^d	< 0.001 ^d
		Control	22.50 ± 27.03		0.781
Role limitation-emotional	Pre-intervention	Intervention	34.17 ± 37.35	0.535	-
		Control	29.17 ± 35.56		-
	One week after intervention	Intervention	85.00 ± 19.90	< 0.001 ^d	< 0.001 ^d
		Control	27.50 ± 33.66		0.525
	Two months after intervention	Intervention	85.61 ± 19.74	< 0.001 ^d	< 0.001 ^d
		Control	22.50 ± 32.37		0.062
Pain	Pre-intervention	Intervention	63.92 ± 17.86	0.019	-
		Control	55.04 ± 16.42		-
	One week after intervention	Intervention	76.79 ± 15.56	< 0.001	< 0.001
		Control	54.21 ± 16.13		0.070
	Two months after intervention	Intervention	80.00 ± 13.40	< 0.001	< 0.001
		Control	53.42 ± 15.85		0.117
Mental well-being	Pre-intervention	Intervention	44.90 ± 18.58	0.112	-
		Control	39.00 ± 14.85		-
	One week after intervention	Intervention	67.60 ± 13.67	< 0.001 ^d	< 0.001 ^d
		Control	38.90 ± 14.38		0.827
	Two months after intervention	Intervention	67.51 ± 13.63	< 0.001 ^d	< 0.001 ^d
		Control	38.50 ± 14.20		0.311
Energy	Pre-intervention	Intervention	43.40 ± 17.88	0.158	-
		Control	38.40 ± 14.00		-
	One week after intervention	Intervention	63.20 ± 12.88	< 0.001 ^d	< 0.001 ^d
		Control	38.10 ± 14.35		0.547
	Two months after intervention	Intervention	63.90 ± 12.14	< 0.001 ^d	< 0.001 ^d
		Control	37.20 ± 13.83		0.022
Health perception	Pre-intervention	Intervention	44.63 ± 15.00	0.074	-
		Control	38.88 ± 14.12		-
	One week after intervention	Intervention	59.62 ± 12.27	< 0.001 ^d	< 0.001 ^d
		Control	37.12 ± 11.87		0.041 ^d
	Two months after intervention	Intervention	59.71 ± 12.32	< 0.001 ^d	< 0.001 ^d
		Control	35.88 ± 11.32		0.001 ^d
Social function	Pre-intervention	Intervention	61.25 ± 16.18	0.050	-
		Control	54.79 ± 13.06		-
	One week after intervention	Intervention	72.08 ± 14.19	< 0.001 ^d	< 0.001 ^d
		Control	53.12 ± 15.52		0.035 ^d
	Two months after intervention	Intervention	74.17 ± 13.45	< 0.001 ^d	< 0.001 ^d
		Control			

		Control	52.71 ± 14.79		0.011 ^d
Cognitive function	Pre-intervention	Intervention	60.88 ± 20.69	0.08/0 ^d	-
		Control	50.50 ± 14.40		-
	One week after intervention	Intervention	82.50 ± 12.14	< 0.001 ^d	< 0.001 ^d
		Control	51.12 ± 14.07		0.364
	Two months after intervention	Intervention	82.75 ± 12.11	< 0.001 ^d	< 0.001 ^d
		Control	51.05 ± 14.09		0.367
Health distress	Pre-intervention	Intervention	57.63 ± 22.76	0.063	-
		Control	48.75 ± 20.50		-
	One week after intervention	Intervention	81.62 ± 12.06	< 0.001 ^d	< 0.001 ^d
		Control	48.50 ± 20.73		0.694
	Two months after intervention	Intervention	81.67 ± 12.01	< 0.001 ^d	< 0.001 ^d
		Control	47.75 ± 20.60		0.133
Sexual function	Pre-intervention	Intervention	75.44 ± 20.59	0.334	-
		Control	71.60 ± 19.10		-
	One week after intervention	Intervention	88.13 ± 13.59	< 0.001 ^d	< 0.001 ^d
		Control	69.81 ± 20.99		0.872
	Two months after intervention	Intervention	88.10 ± 13.61	< 0.001 ^d	< 0.001 ^d
		Control	69.20 ± 21.01		0.881
Changes in health	Pre-intervention	Intervention	56.25 ± 19.41	0.029 ^d	-
		Control	47.50 ± 16.79		-
	One week after intervention	Intervention	68.75 ± 13.58	< 0.001 ^d	< 0.001 ^d
		Control	47.10 ± 16.90		> 0.999
	Two months after intervention	Intervention	67.50 ± 14.10	< 0.001 ^d	< 0.001 ^d
		Control	46.88 ± 17.16		0.654
Satisfaction with sexual function	Pre-intervention	Intervention	50.63 ± 29.68	0.654	-
		Control	48.13 ± 19.93		-
	One week after intervention	Intervention	73.12 ± 19.10	< 0.001 ^d	< 0.001 ^d
		Control	45.00 ± 22.07		0.050
	Two months after intervention	Intervention	72.09 ± 19.60	< 0.001 ^d	< 0.001 ^d
		Control	45.62 ± 21.84		0.147
Overall quality of life	Pre-intervention	Intervention	55.79 ± 14.27	< 0.001 ^d	-
		Control	41.96 ± 13.40		-
	One week after intervention	Intervention	64.34 ± 12.70	< 0.001 ^d	< 0.001 ^d
		Control	40.50 ± 14.31		0.004 ^d
	Two months after intervention	Intervention	65.05 ± 11.74	< 0.001 ^d	< 0.001 ^d
		Control	41.00 ± 14.16		0.228

^aValues are expressed as mean ± SD.

^bP value: intra comparison.

^cP value: inter comparison.

^dP value < 0.05.