

# The Effects of Water Exercises on the Quality of Life in Patients with Multiple Sclerosis

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Article info:

Received: 28 Mar. 2015

Accepted: 19 Jun. 2015

## Key Words:

Water exercises, Quality of life, Multiple sclerosis patients

## ABSTRACT

**Introduction:** The purpose of this study was to examine the effects of water exercises on the quality of life in patients with multiple sclerosis.

**Methods:** 30 multiple sclerosis patients (40-65 years old) were selected by available sample. They were divided into control and experimental groups. The instrument was the Quality of Life Questionnaire (SF-36) in this study. The experimental group participated in 6 weeks of water exercises. The water exercises were held 3 sessions in every week. The every session lasted 60 minutes. The data were analyzed by ANCOVA.

**Results:** The results showed that water exercises had no significant effect on the quality of life in patients with multiple sclerosis. Those only had a significant effect on the pain subscale and reduced it.

**Conclusion:** It seems that water exercises can be used as a complementary therapy alongside drug therapy in patients with multiple sclerosis.

## 1. Introduction

**H**uman is constantly exposed to risks that threaten his/her life. These events have increased along with human evolution. Multiple Sclerosis (MS) is a progressive and degenerative disorder of the myelin sheath of nerve cells in the central nervous system. The cause of this disease is unknown. But it seems

that the activation of the safety mechanism against myelin antigens involved in this disorder [17]. This disease usually occurs between the ages of 20 and 40 and affects on women more than men. The reason is unclear but studies have shown that environmental, immunological, and genetics factors play an important role in the incidence of MS. There is no definitive cure for MS. So, the basis of treatment has been focused on the immune regulation with beta interferon, control symptoms, and

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non-pharmacological interventions [9]. MS Patients' life conditions and their social roles are considerable and very important.

The World Health Organization defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease". So, we should consider not only the traditional health indicators such as morality and the rate of disease in the evaluation of individuals' health, but we should pay attention to the individuals' perception about the quality of life.

The quality of life is a key index of health. The quality of life is very important since it has many dimensions such as physical health, mental health, social relationships, family life, excitements, physical functions, spirituality, and individuals' career life [13]. The concept of the quality of life is used as a personal-social concept now than the mean of a sense of respect for humanity. This concept provides a framework with focus on the individual's condition and his. Her environment to identify and assess a set of factors that make up the difference aspects of life until it improves the qualitative aspects of human's life in addition to his/her quantitative aspects [4]. The quality of life is important for all humans but this issue is more important in conditions that a person

has a chronic disease such as MS because this disease affects on his/her spirit and life conditions. Also, it will create different effects on individuals' social and individual life depending on their personality and psychological and moral characteristics. The measurement of the quality of life is important because we can use the results of its measurement to survey the physical, mental, social, and functional health, the efficiency of treatment methods and care, medicines, and medical equipment's. The different factors such as age, health, education, physical activity, exercise, and economical and social factors can affect on the quality of life, but the most important factors are diseases especially chronic and long-term diseases [20].

Life skills are one of the effective factors on the quality of life in people with chronic diseases. These skills can improve their life. These skills include the abilities that everybody needs them for a stable and rich life. Skills are essential tools for anyone needs them to access the physical and mental health. These skills that are essential for human's social life have been improved with the aim by strengthening and developing of a balanced human and autonomous who be able to solve the daily life problems [3]. MS patients' quality of life is affected by the intensity and duration of disease and their drugs. There is no definitive cure for MS despite advances in medical

**Table1.** The frequency distribution and the percentage of age group in the control and experimental groups.

Age group		Study groups		
		Experimental	Control	Total
40-50 years old	Frequency	3	7	10
	Percent of the age group	30%	70%	100%
	Percent in the study group	20%	7.46%	7.6%
	Total frequency	10%	3.23%	3.33%
51-60 years old	Frequency	12	6	18
	Percent of the age group	7.66%	3.33%	100%
	Percent in the study group	80%	40%	60%
	Total frequency	40%	20%	60%
61 years old and over	Frequency	0	2	2
	Percent of the age group	0%	100%	100%
	Percent in the study group	0%	3.13%	7.6%
	Total frequency	0%	7.6%	7.6%
Total	Frequency	15	15	30
	Percent of the age group	50%	50%	100%
	Percent in the study group	100%	100%	100%
	Total frequency	50%	50%	100%

science in recent years. Most available treatments lead to reduce symptoms or slow the progression of the disease. Therefore, the early disease detection can prevent the incidence of its severe complications and uncontrolled development. Thus, patients must rely on therapies that reduce symptoms [1]. Exercise and physical activities have the considerable importance among the different sciences and it is an undeniable and essential science [18]. Also, it is used as a complementary therapy in diabetes, cardiovascular, multiple sclerosis, and arthritis diseases, etc. [18].

MS patients have many problems. These problems limit patients' participation in activities that improve health. So, this increases secondary complications and restrictions on independent life that this will lead to negative effects on their quality of life as well [10].

Water exercises help to create the proper coordination between nerve and muscle system that this affects on the person's brain in addition to the positive physical effects. The performance of organs improves during exercises specially the performance of muscles and joints. The patient's daily movements such as sitting, standing, bending, and walking will practice in the water. Also,

treatments such as occupational therapy, physiotherapy, muscle relaxation, and yoga may be effective as a form of physical activity [2]. Water exercises are as a type of effective physical activities Due to the nature of their treatment. It seems that we can use this program to improve MS patients' life conditions due to the increasing of this disease and the effects of water exercises that can improve the MS patients' quality of life. The mean of water exercises is the execution of movements such as walking, aerobic, and flexibility exercise in the water that can reduce pain and increase joints and muscles flexibility and bone movement. This can reduce muscle spasms and increase the individual's power and ability as a result. Water exercises create hydrostatic pressure and lead to physiological responses that are focused on the circulatory system so that the blood moves from the lower extremities to the abdomen and trunk. It increases blood supply to organs with the increasing of venous return to the heart, stroke volume, and cardiac output. So, it reduces psychological and mental problems [6].

The first study about the MS patients' quality of life published in 1990. Since then many studies had been done about these patients' quality of life [12]. The results of these studies have showed that these patients have

**Table 2.** The frequency distribution and the percentage of education level in the control and experimental groups.

Education level		Study groups		
		Experimental	Control	Total
Cycle degree	Frequency	3	2	5
	Percent of education	60%	40%	100%
	Percent in the study group	20%	3.13%	7.16%
	Total frequency	10%	7.6%	7.16%
Diploma	Frequency	8	11	19
	Percent of education	1.42%	9.57%	100%
	Percent in the study group	3.53%	3.73%	3.63%
	Total frequency	7.26%	7.36%	3.63%
Bachelor	Frequency	4	2	6
	Percent of education	7.66%	3.33%	100%
	Percent in the study group	7.26%	3.13%	20%
	Total frequency	3.13%	7.6%	20%
Total	Frequency	15	15	30
	Percent of education	50%	50%	100%
	Percent in the study group	100%	100%	100%
	Total frequency	50%	50%	100%

**Table 3.** The statistics of variables in the control and experimental groups before and after the intervention.

Variable	Group	N	Pre-test		Post-test	
			Mean	SD	Mean	SD
Resiliency	Experimental	15	14.54	60.5	42.67	81.16
	Control	15	90.54	99.5	97.64	60.12

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lower quality of life than healthy People. Also, other studies that those compared the MS patients' quality of life with other chronic diseases such as epilepsy, diabetes, rheumatoid arthritis, and inflammatory bowel diseases showed that MS patients had significantly a lower quality of life [5].

The quality of life is an important issue that scholars considered it with the improvement of technology and process of industrialization in western countries. In this regards, Senders, et al. (2014) studied the perceived stress in multiple sclerosis: The potential role of mindfulness in health and well-being. They examined the quality of life as a secondary outcome in this study. The results of this study showed that greater trait mindfulness was significantly associated with the decreasing of psychological stress, better coping skills, increasing of resiliency, and higher quality of life [21]. Examined the prediction of the quality of life in patients with Multiple Sclerosis on the basis of the illness perception (N=100).

The instruments of this study were e Moss-Morris's Illness Perception Questionnaire Revised and Multiple Sclerosis Quality of Life questionnaire with 54 items [19]. The results of this study showed that the patient's perception and physical and mental dimensions predict MS patients' quality of life. Also, the patient's perception had a significant effect on MS patients' quality of life. McCullagh, et al [11]. Studied Long-term benefits of exercising on quality of life and fatigue in multiple sclerosis patients with mild disability (N=30). Classes were held twice-weekly for three months, and participants exercised independently once-weekly. The control group

was monitored monthly and management remained unchanged. The results showed that a three-month exercise program improved participants' exercise capacity, quality of life and fatigue with the improvements in the quality of life and fatigue lasting beyond the program.

Very few studies have examined the effects of the exercises especially water exercises on MS patients. Also, different reports express that water exercises can have positive effects on mental disturbances and physical diseases. Therefore, the conducting this study was essential to examine the effects of water exercises on MS patients. This study can present more complete and accurate information. Thus, the purpose of this study was to examine the effects of water exercises on the quality of life in patients with multiple sclerosis.

## 2. Materials and Methods

The method of research was semi empirical and design of it included pre-test, post-test with control group. The statistical population was 90 multiple sclerosis patients in Tehran city (40-65 years old). These patients were diagnosed at least a year. 30 multiple sclerosis patients who were eligible for this study were selected from available sample. They had a mild MS according to them medical records. The instruments of this study were a demographic questionnaire to collect individual data, medical records, and the Quality of Life Questionnaire (SF-36) [20]. Its reliability was 0.77 and validity was 0.92. The subscales of this questionnaire was included the physical functioning, role-limitations due to physical health, role limitations due to emotional problems, en-

**Table 4.** The Shapiro-Wilk test for the determining of the normal description of quality of life scores.

Group		Amount	df	Sig.
Pre-test	Experimental	982.0	15	980.0
	Control	905.0	15	112.0
Post-test	Experimental	909.0	15	129.0
	Control	976.0	15	930.0

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**Table 5.** The Leven's test for evaluation of the homogeneity of variances.

F	df <sub>1</sub>	df <sub>2</sub>	Sig.
0.142	1	28	0.709

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ergy, vitality, mental health, social functioning, pain, and general health. The purpose and the process of study were explained to subjects. The participants were assured that their data will be kept confidential and those will not be available to anyone. Then all subjects completed a consent form to participate in this study and they attended with the complete satisfaction in this study. The researchers provided the best conditions as much as possible for the experimental group to observe all moral and valuable aspects of study. The subjects were randomly divided control and experimental groups ( $N_{\text{every group}}=15$ ). The subjects participated in the pre-test. Then, experimental group participated in a training program that it was included water exercises for 6 weeks. 3 sessions was held in every week that every session was lasted 60 minutes.

Water exercises were included warm-up exercises, stretching exercises, short-term endurance exercises, and cooling exercises. Exercises were executed accordance with the valid protocols and doctors' confirmation. The control group did only their daily activities during this time and they did not participate in water exercises. The control and experimental groups participated in the post-test at the end. Researchers could not control confounding factors and variables such as genetics, marital status, sleep, nutrition, and regular exercise that those probably could be effective on the results in this study. The collected data were classified by descriptive statistical methods and were analyzed by ANCOVA. The SPSS software (version 20) was used for data analysis ( $\alpha \leq 0.05$ ).

### 3. Results

The results of Table 1 show the frequency distribution and the percentage of age group in the control and experimental groups. The results of Table 2 show the frequency distribu-

tion and the percentage of education level in the control and experimental groups.

The results of Table 3 show the mean of the quality of life of the experimental group has increased in the post-test but the increasing of it is very little in the control group that this increasing is lower than the experimental group. The Shapiro-Wilk test was used to determine the normal description of data.

The results of Table 4 show that the quality of life scores are greater than 0.05 scores in the pre and post-test that it shows the quality of life scores are normal in the pre and post-test. The Leven's test was used to evaluate the homogeneity of variances (Table 5).

The results of Table 6 show that there is no significant difference between control and experimental groups in the quality of life. Also, water exercises improve MS patients' quality of life ( $F=88.42$ ,  $\text{Sig}=0.000$ ) and effect size is 0.766. But water exercises do not lead a significant difference between control and experimental groups in the quality of life. So those do not have MS patients' effects on the quality of life ( $F=0.206$ ,  $\text{Sig}=0.654$ ).

The results of Table 7 show that mean and standard deviation of the quality of life subscales in the control and experimental groups before and after the intervention.

The results of Table 8 show that water exercises had no significant effect on the physical functioning, role-limitations due to physical health, role limitations due to emotional problems, energy.vitality, mental health, social functioning, and general health in patients with multiple sclerosis ( $P>0.05$ ). But water exercises had a significant effect on the pain ( $F=13.081$ ,  $P=0.001$ ).

**Table 6.** The results of ANCOVA for the surveying of the quality of life in groups.

	Total squares	df	Mean square	F	Sig.	Effect size
Pre-test	9802.240		9802.240	88.24	0.000	0.667
Group	4.468	1	4.468	0.602	0.456	0.800
Error	736.598	27	32.626	---	---	---
Total	65770.00	30	---			

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**Table 7.** The statistics of variables in the control and experimental groups before and after the intervention.

Variable	Group	N	Pre-test		Post-test	
			Mean	SD	Mean	SD
Physical functioning	Control	15	62	12.51	88.67	15.41
	Experimental	15	74	13.26	70.33	19.22
Physical health limitations	Control	15	43.33	27.49	58.33	32.28
	Experimental	15	31.67	27.49	65	24.46
Emotional limitations	Control	15	9.64	21.69	68.89	29.46
	Experimental	15	51.11	15.87	80	324.55
Energy vitality	Control	15	66.40	20.63	67.33	21.29
	Experimental	15	48.75	10.98	58	13.47
Mental health	Control	15	52	12	57.93	18.28
	Experimental	15	62.20	15.85	52.27	14.14
Social functioning	Control	15	54.23	9.11	17.69	21.06
	Experimental	15	71.03	11.25	66.67	17.47
Pain	Control	15	52.50	13.56	72.33	16.70
	Experimental	15	42.57	14.82	70.50	16.75
General health	Control	15	38.33	9.40	56.67	13.32
	Experimental	15	58.67	8.96	57	10.66

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The results of table (9) show that:

- The groups have a significant difference in the physical functioning subscale (Sig=0.01).
- The groups have a significant difference in the role-limitations due to physical health subscale (Sig=0.001).
- The groups have a significant difference in the role-limitations due to emotional problems subscale (Sig=0.000).

• The groups have a significant difference in the energy vitality subscale (Sig=0.013).

• The groups have a significant difference in the mental health subscale (Sig=0.000).

The groups have a significant difference in the social functioning subscale (Sig=0.005).

The groups have a significant difference in the pain subscale (Sig=0.013).

**Table 8.** The Leven's test for evaluation of the homogeneity of variances.

Variable	F	df <sub>1</sub>	df <sub>2</sub>	P
Physical functioning	1.149	1	28	0.293
Role-limitations due to physical health	0.970	1	28	0.333
Role-limitations due to emotional problems	0.124	1	28	0.727
Energy vitality	0.481	1	28	0.494
Mental health	18.874	1	28	0.002
Social functioning	0.183	1	28	0.672
Pain	13.081	1	28	0.001
General health	1.647	1	28	0.210

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Table 9. The results of ANCOVA for subscales of the quality of life.

Groups	df	F	Sig.	Square
Physical functioning	1	26.75	0.01	0.43
Role-limitations due to physical health	1	14.25	0.001	0.345
Role-limitations due to emotional problems	1	17.01	00.00	0.387
Energy vitality	1	7.096	0.013	0.208
Mental health	1	22.81	00.00	0.705
Social functioning	1	9.36	0.005	0.257
Pain	1	7.061	0.013	0.207
General health	1	8.337	0.08	0.236

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The groups have no significant difference in the general health subscale (Sig=0.08).

#### 4. Discussion

The purpose of this study was to examine the effects of water exercises on the quality of life in patients with multiple sclerosis. The results of this study showed that 6-week of water exercises had no significant difference between the mean difference of quality of life in the control and experimental groups. This result of study is conflict with the results of [11, 7, 16] study. The lack of this consistent may be due to subjects' gender, the type of exercises, patients' numbers, and the type and duration of interventions. Also, the results of this study showed that water exercises had no significant effect on the physical functioning, role-limitations due to physical health, role limitations due to emotional problems, energy vitality, mental health, social functioning, and general health subscales. But those had a significant effect on the Pain subscale.

One of the important possible reasons of pain reducing can be endorphins hormone secretion in the body that the euphoria after physical activity is associated with the high secretion of this hormone. This feeling is related to endorphins that endogenous elements are like morphine and they have the interaction with opiate receptors (soothing) of brain areas that are involved in pain transmission. Beta-endorphin in the anterior portion of the pituitary is made from Beta-Lipotrin that Beta-Lipotrin also is produced during the adrenocorticotrophic hormone formation. The Physical activity leads to the intensification of pressure on the body. This factor increases the endorphins hormone secretion that it is secreted when there is a pressure on the body. Endorphin is a hormone that creates the euphoria for the person that it is a mental structure. The sense of pain reduces dramatically by

this beautiful feeling. So, an athlete feels the happiness after the exercises especially aerobic exercises. Endorphin affects on nerve receptors and prevents the release of neurotransmitter molecules from the nerve terminals. So, the transmission of pain messages to the brain is disrupted and the pain reduces. Endorphin is a natural narcotic substance in the human body. Physical activity enhances the secretion of this substance so the person feels happiness and hope by this hormone. The stopping pain is through the affection on the opioid receptors in the brain. This study showed the reduction of pain. So, it seems that the active coping is a key variable that play a prominent role in the relationship between resiliency and pain. The active coping refers to the efforts that the patient does to control the pain. Thus, this leads to the high levels of physical activity and social interactions and lower levels of depression in the patient.

Karoly and Ruhlman (2006) stated that people who have lower levels of cortisol have a high tolerance in the face of pain. So, it seems that the effect of water exercises on the reduction of pain is completely logical and basis on mechanisms of hormonal changes. The purpose of this study was to examine the effects of water exercises on the quality of life in patients with multiple sclerosis. The results showed that water exercises had no significant effect on the quality of life in patients with multiple sclerosis due to the physiological and hormonal changes, subjects' gender and MS disease duration, possible circumstances outside researcher's the control such as genetics, nutrition, sleep, and communication, etc. Water exercises only had a significant effect on the pain subscale and reduced it. It seems that water exercises can be used as a complementary therapy alongside drug therapy and a method for the releasing of the life pressures in patients with multiple sclerosis.

## Conflicts of Interest

None.

## Acknowledgements

The authors acknowledge the support from funding agencies in particular the population multiple sclerosis patients in Tehran city.

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