

## The effect of aquatic aerobic training on endurance walking in Multiple Sclerosis patients

<sup>1</sup>Seyed Mahmoud Hejazi, <sup>1</sup>Mahmoud Soltani\*, <sup>1</sup>Salehe Nornematolahi, <sup>2</sup>Masoud Zare, <sup>3</sup>Saman nejatpour

1- Department of Physical Education, Mashhad branch, Islamic Azad University, Mashhad, Iran

2- Instructor of community health nursing, Mashhad university of medical sciences, Mashhad, Iran

1- Department of Physical Education, shirvan branch, Islamic Azad University, shirvan, Iran

[Soltani.mahmood@gmail.com](mailto:Soltani.mahmood@gmail.com)

**Abstract: Background and objectives:** Multiple Sclerosis is a chronic and debilitating disease of the nervous system that destroys the central nervous system myelin. The experimental evidence demonstrated the positive effects of physical activity on reducing the symptoms of MS patients. The purpose of this study was to assess the effect of aquatic aerobic exercise for two months of endurance training on the water walking in female multiple sclerosis patients. **Methodology:** This study was a quasi-experimental research that the subjects were 40 female multiple sclerosis patients in Mashhad. Sampling method was simple randomized. They were randomly assigned into two groups; one control group with 20 subjects and one experimental group with 20 subjects. The training program was implemented on the experimental group for 8 weeks, 3 sessions per week at the intensity of 50-60% maximum heart rate. Walking endurance was measured with a 6 minutes' walk test in pre-test and post-test. Data were analyzed by independent t-tests with using SPSS 16. **Results:** No significant difference in walking endurance between the two groups were observed in pre-test step; but there was significant difference in mean of walking endurance between the two groups in post-test step ( $p < 0.001$ ). **Conclusion:** Aquatic aerobic training increases walking endurance in multiple sclerosis patients. Based on the present finding, the therapists may use aquatic aerobic training as a supplementary treatment beside medications for the multiple sclerosis patients.

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### Introduction

Multiple sclerosis (or M.S) is a chronic progressive autoimmune disease of the central nervous system that affects the brain and spinal cord and characterized by destruction of myelin in nerve cells and scar formation (1) and causes dysfunction in conduction neurological and electrical flows (2). After the trauma disease, it is the second cause of neurological disability in young and middle-aged people. The main cause of this disease is unknown (3, 4). MS disease mainly is common among young adults between 40-20 years old and is common among women almost twice men (5). About 3 million people in the world and almost 40 thousand people in Iran are infected to this disease (5).

Variety of MS symptoms is depend on an area of the central nervous system that is affected and it's different in patients including loss of function or sensation of limbs, general fatigue, muscle weakness, numbness, movement disharmonic and loss of balance, stiffness, pain, depression, autonomic dysfunction, cognitive dysfunction, mood swings, problems with vision, slurred speech and tremor. Fatigue is the most common and most debilitating symptoms of M.S (8 and 9). Melagelu and his colleagues have stated that all MS patients have complained of fatigue (10). According to the

National MS Society of America Strods suggests that fatigue in MS, is because of the lack of physical and mental ability (9). Fatigue has negative effects on performance, attention and concentration, playing role and quality of life (10) and decreases life satisfaction (11). In addition, increased depression and limited physical abilities lead to or worsen other symptoms of MS (12). Several studies are done on the effect of endurance exercise on gait in patients are infected by MS. Woods done a long-term exercise training program on water on two MS patients and improvement in muscle endurance and gait was observed (13). Also, Cliff and Eshberon have done aquatic aerobic training during 12 weeks on eight patients who are infected by MS that its results showed significant improvement in walking endurance time (14).

Danny and Speldiany et al have studied on effects of an aquatic aerobic training during 8 weeks on 12 MS patients and significant difference in 6-minute walk test was observed (15). Currently, MS is not a eradicate cure and most available treatments, decrease symptoms or slow the progression of disease. Thus, timely detection and diagnosis of this disease and controlling severe effects and uncontrolled development largely prevent it (16). According to positive effect of physical activity on

MS patients, researchers have been attracted to this subject that exercise executive selected in water for 8 weeks to help reduce the symptoms and effects of endurance training on walking in MS patients should be tested and amount of selected exercises in water, walking endurance in MS patients should be specified.

### Materials and Methods:

Current study is a quasi-experimental study. The statistical sample included 100 MS patients that neurologists diagnosed MS in them and all of them are under medical treatment and have medical records in one of the private treatment centers in Mashhad. The sample size for each group was done based on studies results and using comparison average formulas, 40 people were calculated. Subjects have been chosen using available non probability sampling and based on purpose and then divided into two control (n=20) and experimental (n=20).

For implementing study, patients came together in the desired location 2 days before starting a training program and after description on how to exercise, exercise intensity and number of repetitions per session have discussed and then experimental and control groups participated in pretest. At this stage, testing physical disability scale developed by expert neurologists using krotzkeh questionnaire for physical disability scale was recorded and measured and to measure walking endurance, 6-minute walk test was used. The result data was recorded in pretest table. Experimental group exercise program for a period of aquatic aerobic training was done 3 times a week for 8 weeks and 50 to 60 percent of maximum heart rate was applied. Exercise intensity was controlled using heart rate meter during the exercise. After completion of the training period (8 weeks or 24 sessions) at post-test, walking endurance was retested and the results were analyzed. It should be noted that both groups during exercise, consumed drugs. Krotzkeh developed questionnaire for physical disability specifies degree of disease. The questionnaire measures scenarios and various functions of the central nervous system include pyramidal tract function, cerebellar tract function, the function of the brain stem pathways, the function of sensory pathways, intestinal tract and bladder function, performance of visual way and brain function. The comparison will give a score between the 10-0 for the disease MS (depending on the amount of damage to the central nervous system). The more damage, the more score. Physical disability test developed by Krotzkeh has been normalized in Iran (17). To analyze data, for comparison of the original variables (amount of walking endurance)

Mann-Whitney test and independent t test were used. Level chosen to indicate a significant difference is 5%. For data analysis software SPSS version 16 was used.

### Results

According to Table 1, the mean age of subjects was 80/33 years in the control group, compared to 40/30 years for control group and 20/37 years for group. The mean duration of the disease in both groups was 7 years and the mean age at onset in subjects was 30/27 years. 7/36% of participants were single, 3/53% married and 10% divorced. 37.5% of the subjects used AVonex, 7.5% Rebif and 55% Betaferon. Selected aquatic aerobic training on the water has water has a significant effect on endurance walking of MS patients. Table 2 shows statistical parameters of endurance walking variables in two groups according to the pre-test and post-test.

As can be seen, the overall mean and statistical variables into two groups (control and experimental), walking endurance in pre-test is a little different. According to P value of the ANOVA test, the result is that the variance in the experimental and control groups before the training is different. Thus, the independent t-test was also used with unknown and different variance. The results of these tests are presented in Table 3.

Since the significant level of test or P value is equal to 0.958, the difference between walking endurance in these two groups is not significant and experimental and control groups in terms of endurance are walking in the same situation. In the control group,  $P=0.268$  and the experimental group,  $P=0.001$ . Therefore, the control group has been not showed a significant difference between pretest and posttest in walking endurance, while in experimental group the difference in error of 0.05 is significant. Accordingly, it can be concluded that endurance training significantly increased endurance walking in the experimental group and these trainings have increased average of endurance walking in this group to 53.867 m and have improved walking endurance in MS patients. Another limitation of this study was the distribution of the age range between 20 to 40 years. Factors such as nutrition, mental problems and family problems, drug type, type of MS, disease duration, and lack of cooperation in some cases are the constraints that are considered. Most studies, including the results of this study suggest that exercise is essential for maintaining the strength and tone muscles and joint movements.

## Discussion

Due to sedentary in MS patients, this study has done with the aim of study on overall effect of aquatic aerobic training in water on endurance walking in MS patients. Physical disability scale developed in the range of 1 to 6 (EDSS). This distribution is the limitations of this study. Another limitation of this study was the distribution of the age range between 20 to 40 years. Factors such as nutrition, mental problems and family problems, drug type, type of MS, disease duration, and lack of cooperation in some cases are constraints that are considered. Most studies, including the results of this study suggest that exercise is essential for maintaining the strength and tone muscles and joint movements. In addition, for the patient's physical health, functional status, quality of life and feelings can be helpful. The benefits of regular aquatic aerobic training in MS patients include increased ability, improved mood, increased endurance and muscle strength and ability to perform tasks of daily living (18). Exercising in water has tremendous value because it increases level of physical fitness. Since the weight of these patients is substantially reduced in the water, water resistance can balance patient body. One of the basic problems in these patients during exercise is to increase body temperature and by increasing temperature, disturbance causes on neural signals and it changes patient's condition and increase their inability. Water has the property that prevents an increase in body temperature. It also increases the supply of oxygen to the brain to

increase and maintain strong muscles, increase and maintain range of motion, muscle control development, reduce muscle tightness and stiffness, increased quality of life and well being, enhance balance and more energy and vitality (13).

Selected aquatic aerobic trainings in the water have a significant effect on endurance in MS patients. This result is consistent with the results of Woods' study that was training in the water as a long- time training and its results was to improve muscle strength and endurance (13) and results of Diblots' study that was a resistance training and aquatic aerobic training program continuative 3 times per week for 8 weeks on 37 MS patients and had significant effect on leg strength (19) and results of Sozan Sütöli et al study that was a training program for 6 weeks on MS patients and improved walking in patients relatively (20). It can be noted that the reason was that the duration of the selected training program so that activities can substantially increase their walking endurance levels and is consistent with the results of Marie Roger studies (21). The reason could be that exercise intensity varied with each other.

## Conclusion

Aquatic aerobic training in the water can help MS patients to strength their muscles and increase their walking endurance. Therefore, according to the positive effect of these trainings, the experts can use these trainings as a complementary treatment for MS patients

Table 1- Frequency in patients with Multiple Sclerosis according to age, disease duration and age of onset

Groups	Age (years) Standard deviation $\pm$ Average	Disease duration (years) Standard deviation $\pm$ Average	Age of onset (years) Standard deviation $\pm$ Average
Experimental	37.20 $\pm$ 9.41	7.00 $\pm$ 5.31	30.45 $\pm$ 1.61
Control	30.40 $\pm$ 6.51	7.00 $\pm$ 4.97	23.80 $\pm$ 4.97

Table 2- comparison of the walking endurance in pre-test of two groups of Multiple Sclerosis patients

Groups	Standard deviation $\pm$ Average	F	P variance	The mean difference	Independent T test
Experimental pretest	483/133 $\pm$ 75/448	0.605	0.444	1.867	T=0.053 P=0.958
Experimental posttest	537/006 $\pm$ 94/338				
Control pretest	485/000 $\pm$ 99/900				
Control posttest	462/100 $\pm$ 117/235				

Table 3- The average change in walking endurance in pre- and post-test groups

Groups	The mean difference	Standard deviation of the differences	Paired t-test
Experimental	22.90	61.394	T=1.180 P=0.268
Control	-53.867	40.082	T=5.205 P<0.001

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