

Effects of Selected Aerobic Exercises in Water on Balance Improvement in Patients with MS

Sayyed Mahmood Hejazi (Ph.D.)¹, Mahmood Soltani^{1*}, Asghar Keshavarz Siyahpoush²,
Ehsan Haji Nour Mohamadi², Seyyedeh Asiyeh Ardalan Javan³

¹Department of Physical Education, Mashhad Branch, Islamic Azad University, Mashhad, Iran

²Bachelor of Physical Education, Islamic Azad University, Qazvin, Iran

³MSc of Physical Education and Sport Sciences

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ABSTRACT

Background and Purpose: Multiple Sclerosis (MS) is a chronic, disabling neural system disease in which myelin destructs central neural network. Most common symptoms are fatigue, muscle contraction, tremor, diplopia, ataxia and walking disorders. This study was aimed to investigate the effect of an 8-week exercise program inside water to improve balance in patients with MS.

Methodology: This semi-experimental study includes 25 subjects (samples) with 1-4 disease rate and 20-30y age range and is stochastically is divided into two groups, the experimental (15) and the control (10). Exercise program for experimental group was 8 weeks long with 3 weeks breaks. Balances were measured by balance gauge before and after the exercise and the data was analyzed and synthesized by dependent t test.

Findings: There has been observed a significant difference ($p < 0.012$) with regard to balance improvement of subjects in experimental group. Average balance in experimental group before and after the test was 0.810 ± 0.299 cm and 0.736 ± 0.202 cm, respectively whereas it was 0.710 ± 0.172 cm and 0.734 ± 0.222 cm, respectively, in the control group.

Conclusions: Selected aerobic exercises in the water causes to improve the balance in patients with MS. Considering the results, respective professionals can use the exercises as a complement treatment beside medication treatments for patients with MS.

KEYWORDS: Multiple sclerosis, Aerobic exercises, Exercise in water, Balance

INTRODUCTION

Multiple Sclerosis (MS) is a chronic, disabling neural system disease in which myelin destructs central neural network. Causes of the disease (still unknown) destructs myelin and causes to complications for conducting neural and electric currents followed by disabling gradually some parts of muscles [1 and 2]. This disease has many deep influences on lifestyle of infected patients. In fact, the subject is infected by the disease during best conditions in his/her life requiring activities, household and life and various and unpredictable symptoms can interfere with lifestyle [1]. Fatigue, muscle contraction, tremor, diplopia, ataxia and walking disorders are among most common symptoms [3]. This study was conducted because MS patients take advantage of exercise benefits as a complement treatment to relieve their mental and physical sufferings. The prevalence is more in Indo-Europeans while is rare in yellow and black races. Therefore, considering the fact that Iranians are Indo-European, more evaluations of the disease and finding alternatives to cope with the symptoms are required. Advancement of science and research in physical education, raising this major as a complement treatment (beside medication treatments) in order to advance physical health levels, increasing balances of patients with MS, coping with variant state of the disease and unwanted control, decreasing physical immunity system to destruct myelin and white mass of central neural network before damaging axons for neural cells, answering questions and uncertainties such as whether physical movements interferes with complications or physical exercises and exercising in water have any effect on balance in patients with MS are all requirements for the study. Physicians classify MS symptoms into 3 categories:

1) The primary symptoms: symptoms that are directly resulted from myelin destruction inside specific nerves (visual disorder);

2) The secondary symptoms: side effects that caused by primary symptoms. For example, paralysis as a primary symptom can result in secondary complications such as muscle atrophy and inactivity; and

3) third hand disorders: mental, social and psychological symptoms which are resulted from primary and secondary symptoms [4]. Because of no decisive treatment, the patients should rely on cures that just decline disease symptoms [5]. In order to reduce disease symptoms, exercise therapy can be used as complement treatment beside medications [6]. Hydrotherapy results in raising physical readiness level via 5 methods: 1) giving more energy to the patient or help patients sleep better; 2) controlling patient's weight; 3) empowering heart muscles; 4) depression decline; and 5) improvement of self-esteem and health for the patient [7].

In this study physical disability scale (1 (mild) to 4 (moderate) disabilities) has been considered by the researcher. Based on WHO definitions, Kurtzke Expanded Disability State Scale (EDSS) is any constraint or disability for normal tasks influencing on lifetime tasks [8]. Based on this scale, the patient rated by EDSS and its visit form have 10 points graded from 0 to 10. A grade between 1 and 4 indicates physical disability but personal independence is in daytime movements and activities. 4.5-9.5 range indicates potential complications in daily activities and movements dependent on medical team or the family. Grade 10 is devoted to death [8].

From 1868, researches on MS patients were initiated by Charcot and it was showed that an aerobic exercise training and movement therapy have no significant effect on balances of patients with MS [9]. In another study on 112 patients with MS, relative improvement in balances of patients with low grade MS was no longer observed [10]. It was indicated in another study there was no improvement after 4-week exercise [11].

Considering positive effect of physical activities on patients with MS, researcher's focus was devoted to the subject that besides medication treats, aerobic exercises inside water for 8 weeks helps patients reduce their symptoms and improve their balance. It is expected that in this study, significant results are evaluated for selected aerobic exercise effects inside water on balances of patients with MS. Finally, the question is whether selected exercise inside water has any effect on balances of patients.

MATERIALS AND METHODS

The purpose of this study was to investigate effect of a selected aerobic training in water within 48 sessions on the balance of female patients with MS. The study was applied and semi experimental. Considering study constraints, the plan was including pre and post test subjects in two groups, experimental and control and their data was analyzed.

The population in this study was total 100 subjects with MS which was demonstrated by neurologist and all the subjects were encountered with medications with medical case in one of credible private medical centers. Of the population, 25 persons were selected randomly as research sample and based on input measures were divided into two groups. Experimental group included 5 persons and the control 10 persons with average disease duration 1 ± 4 y and 25-30y age. Input measures based on which statistical sample was selected and they were participated in hydro-training were:

- a) no infection history with cardiovascular disease;
- b) no epilepsy history;
- c) no history of metabolic disease;
- d) no history of mental disease;
- e) no history of orthopedic diseases (such as knee pain);
- f) the subjects should have physical disability scale between 1 and 4; and
- g) minimum 2 months have elapsed from last MS attack.

One day before initiating training and exercising program, the subjects came together in respective place and after some explanations about how to train and exercise, intensity and frequencies in every session, control and experimental groups participated in pre-test. In this stage, balance test was measured by the author using balance gauge and EDSS was measured and recorded by neurologist.

Training program for experimental group was duration of 8-week aerobic activity 3 sessions a week with 40%-50% of maximum heart rate intensity. Heart rate was measured by polar clock within the training. After training stage in every stage of post-test, balance test and EDSS were achieved by both groups and the results were synthesized and analyzed. It should be noted that both groups consumed medications during training.

Measurement tool and methods were:

1) Balance test by balance gauge (Metal Satrap Engineering Design Company). Stability and physical state measurement tool measures and analyzes directly physical oscillations based on static level reaction relative to forces applied from center of gravity changes. Its applications are body balance measurement, analyses for balance-related diseases, sport trainings and exercises and investigations about fall possibilities in elderlies.

2) Kurtzke's EDSS questionnaire. It measures various states and functions of central neural network. Measurements include performance of pyramidal, cerebellar, brainstem, sensational, bowel and bladder, visual

cerebral tract systems. So, it gives grade 0-10 to patients with MS (depending on damages on central neural network). The more the grade, the more is the damages.

Kurtzke EDSS test stability was confirmed [8]. Descriptive statistics has been used to show percentages, averages, SDs and diagrams and t test was used to evaluate intragroup effects. All statistics and calculations were conducted by SPSS software. It should be noted that pretests had no significant difference in both experimental and control groups. Significance level was at 0.05.

At first, the data related to experimental group and control group about disease duration, MS type and the type of medications were investigated. During disease duration analyses it was recognized that average disease duration of research samples was 1±4 years (Table 1).

Also, in this study, most common type of disease was of recurrent-improved type (84%) and the medications most consumed were immunity system retarding medications (Tables 2 and 3).

Findings

Selected aerobic trainings in water have significant effects on improvement of balances of patients with MS. In Tabled 4 and 5, statistical factors for balance variable in experimental and control groups are provided for pre and post trainings.

As seen, average balance in experimental group in pretest is 0.810cm and in posttest 0.736cm while they are 0.710cm and 0.743cm, respectively, for control group. As can be seen, average and generally statistical factors of balance variable are relatively different for (control and experimental) MS patients. Significance of this difference is shown in Table 6.

Because observed significance level is p=0.302, therefore, difference of balance variable was no longer significant between two groups based on which both experimental and control groups have the same states regard to balance. Effects of selected aerobic trainings in water on balance variable in both control and experimental groups are observed in Table 7.

According to Table 7, p=0.204 in control group and p=0.037 in experimental group. Therefore, there is no significant difference in control group between average balance pre and posttests while this difference is at 0.05% significance in experimental group. Based on these it has been concluded that selected aerobic trainings (hydro-trainings) significantly improve balance variable in experimental group and these trainings and exercises can improve average 0.123 balance in mentioned group.

Table 1: Frequency distribution according to disease duration

Duration	Number	%
1-2	8 exp.	44
	3 cont.	
3-4	1 exp.	20
	4 cont.	
5-6	3 exp.	20
	2 cont.	
7-8	2 exp.	12
	1 cont.	
9-10	1 exp.	4
	0 cont.	

Table 2: Frequency distribution based on medication types

Medication	Number	%
Symptomatic treatment	4 exp.	16
	0 cont.	
Retarding Immunity system	7 exp.	64
	9 cont.	
Suppressor Immunity system	4 exp.	16
	1 cont.	
7-8	2 exp.	12
	1 cont.	
9-10	1 exp.	4
	0 cont.	

Table 3: Frequency distribution of patients based on MS

types		
MS type	Number	%
Recurrent-improved	12 exp. 9 cont.	84
Primary progressive	2 exp. 0 cont.	8
Secondary progressive	1 exp. 1 cont.	8

Table 4: Statistical properties of balance variable in experimental and control groups based on pre-trainings

Group	Number	Min.	Max.	Mean (SD)	First quarter	Second quarter	Third quarter
Control	10	0.540	1.007	0.710 (0.172)	0.577	0.672	0.834
Experimental	15	0.360	1.310	0.810 (0.299)	0.578	0.683	1.127

Table 5: Statistical properties of balance variable in experimental and control groups based on post-trainings

Group	Number	Min.	Max.	Mean (SD)	First quarter	Second quarter	Third quarter
Control	10	0.543	1.160	0.743 (0.222)	0.577	0.643	0.979
Experimental	15	0.432	1.067	0.736 (0.202)	0.577	0.680	0.967

Table 6: Comparison of averages in both experimental and control groups before selected aerobic trainings in water

-	f	p	Differences	t	DoF	p
Before	5.189	0.032	-0.099	-1.056	22.627	0.302

Table 7: Comparison of averages in both experimental and control groups before and after selected aerobic trainings in water

Group	Average of differences	SD of Differences	t	DoF	p
Control	-0.033	0.076	-1.370	9	0.302
Experimental	0.0733	0.123	2.311	14	0.302

DISCUSSIONS

Outside of the country many researches have been conducted on influence of training in the water on MS patients but they have been investigated rarely in Iran. EDSS scale is in 1-4 range and this distribution is accounted as a limitation of the study. Having no male subjects is because they were rare. From 20-50y age range and hidden disease among some patients vie points, research subjects constrained to 25 persons.

a) Controllable limitations: activity level, controlling degree of warmth and cold water and environment using facilities; and

b) Uncontrollable limitations: in spite of required recommendations for the subjects, factors like feed, mental and family problems, medication type, MS type and disease duration were among uncontrollable limitations.

Conclusions

With regard to the results of the study, trainings and exercises cause to relatively improve balance of with MS and it could average improve 0.073cm balance variable such that this change in patients is very This result is confirmed by Rosave (2004) [11] studies and is against With et al. (1994) [12], DeBolt (2004) [9], Wiles (2001) [10] and Lord (1948) [13] studies. The cause of improving balance of patients in this study could be selected aerobic trainings in water and 8-week duration. Therefore, conducting these trainings in water with to overweight and monitoring the trainings seems required for the patients because it is appropriate for physical limitations, having no balance and also walking imbalance among the patients. So, personal weight is decreased in water and this causes to better conduct training and exercise programs. Also, water resistance patient balance from all sides. Whereas one of basic problems of these patients is when body temperature this temperature increase interferes with sending neural messages and it changes patient conditions and disability. Water (as a resistant to increase temperature) can prevent increasing body temperature. This causes

prevent movement poverty and increase physical power of MS patients. For these, water therapy with water trainings is considered among the best aerobic exercises for MS patients. Therefore, it is recommended that respective professionals use these trainings as a complement treatment beside medication treatments to help patients.

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