

The Impact of Selected Aerobic Aquatic Exercises on the Depression and Happiness Levels of Patients with Multiple Sclerosis (M.S)

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Abstract: Introduction: Multiple sclerosis (M.S) is one of the most common chronic diseases of the central nervous system. The chronic nature of the disease, lack of prognosis, lack of any definitive cure and affecting the individual in the young age will cause several mental disorders in patients, including depression and low rate of happiness. **Objective:** Evaluation the effect of aquatic exercise programs on depression and happiness levels of the patients with multiple sclerosis (M.S). **Methodology:** In this quasi-experimental research, 40 patients with M.S. with grades 1 to 4 were randomly divided into two experimental and control groups. The exercise program was performed for the experimental group for eight weeks, three sessions per week with 50-60 percent of the maximum heart rate. The depression and happiness rates were evaluated using the Beck Depression questionnaire and the Oxford Happiness questionnaire at intervals before and after the exercise. Analysis of the data was performed by independent t test, and the data normalization was evaluated using the Kolmogorov-Smirnov test. **Results:** The test group, regarding the depression level ($p < 0.001$) and happiness level ($p < 0.002$) after exercise had significant changes compared to the pre-exercise time. Thus, the mean differences for depressions and happiness levels of these two groups were obtained respectively as 4.65 and -7.80. **Conclusion:** Regular aquatic exercise provides more productive emotional communications and also causes the improvement of depression and increased happiness in M.S. patients. Hence, doing these exercises is recommended as an effective non-pharmacologic therapy method in addition to drug therapy.

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Introduction

Multiple sclerosis (M.S) is one of the most frequent chronic and progressive diseases of the central nervous system that is considered as the third cause of neurological disabilities. In this disease, the immune system of the patient's body shows inflammatory reaction against his nerve tissue and causes demyelinating of the tissue (1). The prevalence of M.S. disease is geographically different and increases more from the equator towards the hemispheres (North and South). The disease has infected more than 3.5 million people worldwide. In Iran, 57 individuals out of every 100 thousands people are affected by this disease (2).

The most common involving age of this disease is between 20 and 40 years old; right the years in which the individual has the most family and social responsibilities, and actually in the reproductive age. As a result, the productive forces of the society are harmed and the damage is related to all people who live in the community (3).

The disease prognosis is unclear and the patients experience a variety of physical and mental disorders due to disease complications; such

disorders strongly affect the patient's daily functioning, social and family life, functional independence and the individual's program planning for the future and as a whole, will severely impair the person's well-being feeling.

About 80% of patients will develop some degree of disability, and only the condition of 1 out of every 5 patients remains constant and the does not lead towards disability. It can be concluded from the mentioned items that the disease can cause symptoms and mood and mental disorders due to the chronic nature of the disease in the patient (4).

Given the high levels of depression and low rate of happiness in M.S. patients, using the diagnostic tests and treatment methods other than common medicines therapy to reduce these symptoms seems to be necessary (5), since the common drug treatments are not effective in all patients with multiple sclerosis, and on the other hand, the medicines have many side effects such as fatigue and psychological imbalances, for which there is no known cure completely effective to overcome such complications (6).

The findings in conjunction with recovery of the damages show that the observed damages in M.S. patients can be due to reduced physical activity levels in these patients compared to the time they were completely well and healthy. This is not yet clear that how much these damages in M.S. patients can be recovered. The damages resulting from the progress in the disease process will not likely to be reversed by exercising.

Meanwhile, the injuries that have progressed as a result of deactivation are likely to be reversible. According to all the research conducted on highly improving in patients with M.S. after physical exercising, it appears that the major part of damages occur as a result of inactivity rather than the irreversibility of the damaged tissue. Therefore, exercising is a vital tool for recovery of the patients with M. S. (7).

American Physical Therapy Association (APTA) has suggested a foundation of exercising methods for the patients that also include the patients with M.S. One of these proposed strategies is the aquatic therapy program (8).

Given the prevalence of balancing- motor problems in patients with M.S., water will provide the adequate support for performing movements that are difficult to be done on the ground (9). Buoyancy and viscosity features of the water can help in motion and cause increased muscular strength (8).

Increased body temperature is also one of the main problems of M.S. patients during physical activity, and it is believed that water can partly prevent the increase in body temperature, and hence, the patient will exercise and work better (10). Of water activities, aquatic exercise training can be mentioned.

Given the prevalence of this disease in Iran and the positive effect of physical activities on the mood of M.S. patients, in this study, the researchers are to investigate the changes in depression and happiness of patients with M.S during a period of 8 weeks aquatic exercising.

Methodology

This is a quasi-experimental type study. The statistical population consists of a hundred of women with M.S. who have been diagnosed by M.S. by a neurologist physician; they have been all under pharmaceutical treatment and have medical files in a valid specialized clinic.

Among the statistical population, 40 people were randomly selected as the research sample; they were divided into two groups, including the test group (20 subjects) and the control group (20 subjects) based on the selecting inclusion criteria with features such as disease grade based on Expanded Disability Status Scale (EDSS) of 1 to

4, the mean duration of the disease as 6.5 years and the age range between 20 and 50 years old.

Patient inclusion criteria for participation in this study were as:

1. Definite M.S. diagnosis approved by a neurologist physician
2. Having a measure of Expanded Disability Status Scale (EDSS) from 1 to 4
3. Age range from 20 to 50 years old
4. Affected by no other diseases (epilepsy, cardiovascular, respiratory, skin, etc.)
5. Not pregnant
6. The ability to participate in exercise training regularly

Exclusion criteria for project were as the following:

1. Not performing at least two thirds of the number of exercise sessions
2. Relapse of M.S. during intervention
3. Becoming pregnant
4. Changing the patient's medicines during the 8 weeks intervention

Procedure

To perform the study, the patients gathered in the exercise place one day before starting the exercise program, and after the descriptions about the way of training, both test and control groups participated in the pre-test. At this stage, the Expanded Disability Status Scale test was measure and recorded by a specialist neurologist using the Krutz Physical Disability Scale, which determines a score between 0 and 10 for M.S. patients (depending on the amount of damage to the CNS). Also, both experimental and control groups completed the depression and happiness questionnaires.

Depression

Depression levels were measured in this research using the Beck Depression Inventory.

The reliability coefficients test-retest based on intervals between performing times and the population type were in the range of 48/0 to 86/0 (Beck et al., 1988).

This questionnaire includes 21 items. Each item has 4 options that are scored based on 0 to 3. It determines different degrees of depression from mild to severe. The maximum and minimum scores on this test are respectively as 63 and 0.

Happiness

Happiness measurement in this study was performed using the Oxford Happiness questionnaire. Argayel et al. (2002) have reported the reliability of the Oxford questionnaire using the Cronbach's alpha coefficient as 0.90 and the test-retest reliability over a 7-week period as 0.78. The test consists of 29 four-option statements. Thus, the highest score that a subject can get on the

scale is 87, which represents the highest level of happiness and the lowest score on this scale is zero that suggests the subject's dissatisfaction of life and the person's depression. The normal score in this test is between 40 and 42.

The attribute of the selected aquatic training program

A. The kind of exercise trainings and their duration

The patients in the experimental group performed the aquatic exercise training for 8 weeks as 3 sessions per week at 28 ° C, while the control group patients did not participate in any training program during this period, and were only similar to the test group regarding the social and group activities. Meanwhile, these training programs were leading and guiding by aquatic sports and swimming teachers.

B. Aquatic exercise sessions schedule

Warming up

Each session was beginning with warming-up, including walking in the water (the correct way had been instructed to the patient) and performing gentle stretching movements for 10 minutes within the water.

The main activity (each session objective)

The basic trainings related to each session consisted of kinetic and stretching exercises and movement within the water in the first eight sessions for 40 minutes, in the second 8 sessions for 50 minutes and in the third 8 sessions for 60 minutes were provided to the patients. During the training period, with making the movements more difficult and using the combined movements and shortening the resting time interval between periods, the exercise pressure was applied (the over-load principle).

Cooling

At the end of each training session, for 5 to 10 minutes, the subjects were performing the stretching movements to return to the initial state by slow walking and doing simple movements with low intensity.

C. The exercise intensity

The subjects were performing the aquatic selected aerobic training program with the intensity of 50 to 60% of maximum heart rate, which had been obtained in the preliminary test. The exercise intensity was measured during each session by Polar heart rate monitor.

Statistical methods

After completion of the exercise period, the subjects completed the depression and happiness questionnaires as the post-test.

Immediately after the preparation of the questionnaires results, the obtained and required data was extracted form the related sheets and was entered

into the SPSS, v.16 software table for statistical analysis.

The percentages, means, standard deviation and the graphs drawing were used to show the results. The normalizing of data was performed by Kolmogorov-Smirnov test.

The independent t test at alpha level of 5% was used to compare the difference between the pre-tests and the post-tests of the two groups.

Results

The descriptive results of the subjects are presented described in Table 1. The findings obtained from both groups in pre-test and post-test in conjunction with depression and happiness are provided respectively in Tables and Figures 1 and 2 is:

Table 1: Descriptive results

Variable	Group	
	Control	Test
The individuals mean age	30.4	35.45
The mean age of disease onset	35.80	30.05
The mean duration of M.S.	5.45	7

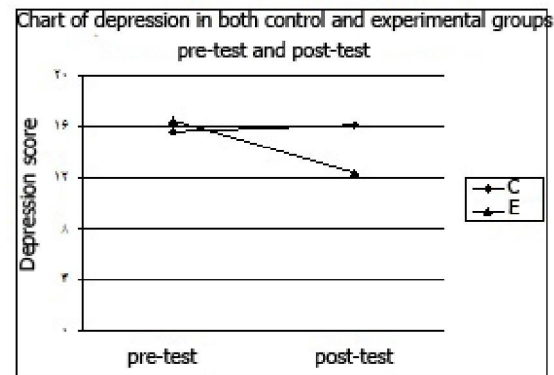


Figure 1: The comparative depression test of the two groups of subjects

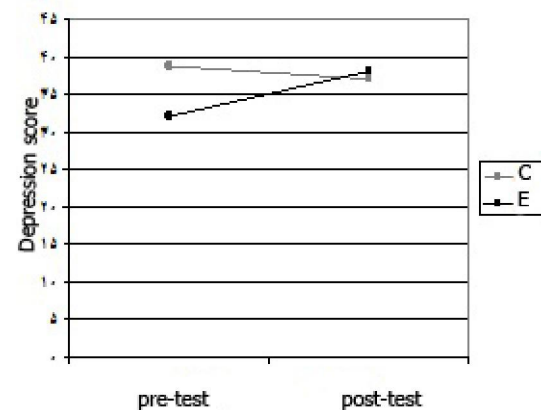


Figure 2: The comparative happiness test of the two groups of subjects

Table 2: The comparative depression test of the two groups of subjects

Variable	Group	Stage	Mean and standard deviation	Means difference	T value	P value
Depression	Control	Pre-test	15.55 ± 2.394	4.65	1.597	0.08
		Post-test	16.1 ± 2.552			
	Test	Pre-test	16.45 ± 2.327			
		Post-test	12.35 ± 2.183			

Table 3: The comparative happiness test of the two groups of subjects

Variable	Group	Stage	Mean and standard deviation	Means difference	T value	P value
Happiness	Control	Pre-test	38.90 ± 11.07	7.80	1.671	0.111
		Post-test	37.10 ± 12.94			
	Test	Pre-test	32.15 ± 15.73			
		Post-test	38.15 ± 17.63			

In general, the most common symptoms and problems caused by M.S. are mental psychological and social complications, which are created due to the primary or secondary symptoms and problems, meaning the symptoms that are caused directly due to the loss of myelin sheath in special nerves such as visual disturbances as well as complications caused by early symptoms such as paralysis, inactivity, etc. (2). On the other hand, the disease is a mental - physical experience and can be a stress- causing event in patients' lives. The chronic disease implies on the separation between past and present and changes the image of the person from himself and creates an unfamiliar situation. The women with a chronic illness may face with some problems in combining and matching with the new identity (due to the illness) (11).

Since the disease has no definitive cure, the patients should rely on methods that only reduce the disease symptoms. Exercise meanwhile increasing the behavioral reinforcement through participation the individual in group activities will strengthen the individual's positive behaviors and prevents him from disappointment, frustration and depression and help him to be a healthy and self- thriving person regarding the psychological aspects.

In conducted research on patients with M.S. that have been fully described by Charcot since 1877, the mood (mental) disorders have been always described associated with the disease (12).

In 1996, Petajan et al. performed a study entitled as "Effects of Aerobic Exercise on the Health of Patients with M.S" (with EDSS score from 1 to 6).

They reported the significant improvement of mental health aspects in their own results.

The scores of depression, anger and fatigue of the participants in the exercise have significantly reduced (13).

Sutherland et al. (2001) by conducting a 10-week (30 sessions) of aquatic exercise on patients with M.S. evaluated the effect of this exercise

training course on the life quality of these patients. The results indicated increase energy and reduced fatigue and pain (14). The results of these studies are consistent with the present research.

Oken et al. (2004) conducted a research in the United States to investigate the influence of Yoga and aerobic exercise on the mood of patients with M. S.

In this study, the subjects have been definitely diagnosed with M.S. (EDSS ≤ 6/0) and have been randomly divided into three groups until the end of 6 months.

1. Weekly yoga and exercise at home group
2. Weekly training by use of fixed bicycle associated with exercise at home group
3. Control group

No significant change was seen in mood related to the yoga exercise (15).

Freeman et al. (2004) in their research entitled as "group exercise classed in patients with M.S." performed a guiding study on 10 volunteers covered by M.S. Society in London. Holding group exercise training classes in a short term had the greatest impact on the health outcomes. Although the psychological aspects had been also improved, but they were in lower range (P = 0.48) (16).

Reiberg et al. (2005) reviewed the impact of exercise therapy in patients with M.S. on daily activities and health-related quality of life in a case study. The results showed that exercise therapy had a significant impact on the power of the muscles functioning, exercise tolerance functions and activities related to mobility and as well as a partially effect on mood. No harmful effects due to exercise have been reported in the conducted studies (17).

The results of these three studies are in disagreement with this research. One of the reasons may be the different types of exercise training. Thus, in this study, the aquatic exercise followed by the soothing advantage of the water has been used.

Tedman (2005) performed a research in the UK entitled as "study the depression in patients with motor neurological diseases and other diseases due to neurological disabilities on 40 patients with motor neurological diseases and 92 patients with multiple sclerosis. He found that the depression was associated more significantly with multiple sclerosis than other motor neurological diseases ($P = 0.001$) (2).

Researchers at the University of Utah (2006) studied on patients with M.S. in a different way. Having knowledge on the physical and mental benefits of exercise, they decided to find out how the patients with M.S. respond to exercise. After 15 weeks of aerobic training, their study showed that some changes have occurred in some of the factors in M.S. patients, including more positive attitudes and less depression (18).

In their study, Rampello et al. (2007) reviewed and compared the effects of two kinds of aerobic exercise training and neurological rehabilitation programs for 8 weeks on the life quality of people with M.S. They used the 54-question specific life quality questionnaire to measure the quality of life in patients before and after the training period.

The results of this study showed that both training programs have caused improved quality of life in patients, although the improved aspects of the life quality were different in both groups. The aerobic training showed a significant increase in understanding of public health, energy and vitality. The training program of neurological rehabilitation had a contradictory impact and had reduced the vitality due to its threatening for mental health (19).

Macually et al. (2007) conducted a research on effects of persistent physical activities and their relationship with health and happiness on patients with M. S. The results indicated that the individuals participating in persistent exercises were working harder and doing the practices made them feel better compared to the people who had no exercise training and increased their happiness rate (20).

Since doing physical activity has increased the patients' happiness rate in this study, their results are consistent with each other.

Ghaffari et al. (2008) conducted a quasi-experimental study aiming to determine the effects of muscular progressive relaxation technique on depression, anxiety and stress in patients with M.S. in Tehran.

The method in this study included a session for making the samples familiar with the objectives and method of intervention and 63 sessions of performing the technique by the test group during two months, while no intervention was done for the control group.

Data collection tools included the demographic data questionnaire, depression-anxiety-stress-21 (DAS -21) questionnaire and self-reporting checklists.

66 subjects participated (33 subjects in the control group and 33 subjects in the test group) in this study. The mean scores of depression, anxiety and stress showed no significant differences before the intervention; however, one month and two months after the intervention, the difference between the experimental and control groups in the anxiety and stress scores became statistically significant ($P < 0.05$). Also, no significant differences were found in the depression and anxiety scores in three times of measurements between the two groups, but this difference was significant in mean scores of stress in three times of measurements between the two groups ($P < 0.008$). Consequently, implementation of this technique could lead to decreased depression, anxiety and stress in patients with M.S. (21).

Mccullagh et al. (2008) evaluated the effect of aerobic exercise on depression in M.S. patients with mild disabilities in a study.

Thirty patients diagnosed with M.S. with the ability to move without help were studied. The patients were influenced by the exercise trainings for 3 months twice in a week. The control group was reviewed monthly and their program was unchanged. 24 subjects completed the program, and according to the three-month changes, the test group had more improvement in decreased depression rate. Then, a three-month training program improved the quality of life and depression in participants (22).

George Jeling et al. (2009) concluded that the exercise had a positive effect on the M.S. patients' immune system, maintaining their strength, balance and functioning as well as maintaining their readiness in mental health and social work. They also showed that exercise affected on reduced depression due to its contravention with immune system cytokine in M.S. (23).

Strod et al. (2009) conducted a research about the effect of regular exercise programs on depression in patients with M.S.

The purpose of this study was to compare depression in the patients having regular exercise trainings with those did not participate in such activities.

121 patients with M.S. participated in this study with the age range of 25-65 years old that lived in Australia. The depression levels were measured using the Beck Depression Inventory.

52 participants 2 times a week and at least for 30 minutes per session and 69 subjects participated in normal physical activities.

People who were exercising, reported less depression, which was compared with the people

having no activity; the results showed that physical activity had benefits for patients while the people without exercise were excluded such advantages (24). George Jeling (2010) wrote in a book entitled as "Overcoming M.S.: The aerobic exercises are very useful in breaking the cycle of fatigue and depression in M.S. patients, but they require a discipline. It has been observed recently that these people used to exercise less than other individuals. Other research suggests that exercising regularly will reduce the prolonged incapability by increasing the neuronal shielding through production of neuronal growth factor by fluctuation in cytokines and stress hormones changes (25).

Soltani et al. (2010) performed a study entitled as "Reviewing the impact of a course of aerobic activity in water on the quality of life in patients with M.S. In this research, some exercises as three times a week for 8 weeks were performed, while the control group had no exercise. It was concluded that doing aerobic exercises in the water significantly improved the quality of life in M.S. patients (2).

Kargarfard et al. (2010) reviewed the changes in quality of life and fatigue in patients with M.S. after 8 weeks of aquatic exercises in their study. The findings showed the statistically significant effect of exercise in water (aquatic exercises) in improving the mental status ($P = 0.01$), vitality ($P = 0.000$) and energy ($P = 0.03$). Since this research includes aquatic aerobic exercises for 8 weeks and studies the happiness rate, which changes will cause improved mental state and increased patients' vitality, it seems that its results are consistent with their research results (26).

Motl Robert et al. (2010) conducted a research on clinical, psychological, and physical activity manifestations among adults with recurrent reducing M.S. (RRMS).

In this study, the relationship between clinical and mental manifestations such as depression and pain rate and exercise training was studied. There were 269 participants in this project. The research instruments consisted of a questionnaire and an accelerometer.

It was concluded that there is an indirect relationship between exercise training and clinical and psychological manifestations such as depression in RRMS patients that means increased physical activity reduces depression in these patients (27). Although in most conducted studies the training program has been other than the aquatic exercises, but in many studies, the effects of aquatic exercises on patents' mood and enhanced happiness levels in people in different age ranges of other patients (other than M.S.) have been studied that all have supported

the ability of aquatic exercises in increasing the life satisfaction.

Based on the results of this study, it appears that aquatic exercises have the ability to reduce the depression level and increase the happiness rate in patients with M.S. They also demonstrated more ductility level than other exercises.

It seems that improvement in patients' mental- psychological status is affected by the followings during aquatic exercises program:

1. Getting out of the uniform environment at home and engaging in a happy environment that makes the subjects to forget the feeling of being sick for a while.
2. Communicating more with others and performing group exercise, which improves their social functioning.
3. The effect of water relaxation factor
4. Learning aquatic exercises and the ability to float in water that makes the participants experiencing the power sense.
5. Increased endurance, improved functionality and ability to perform more activities will increase their self-confidence.

Conclusion

In general, this study will reveal that the depression levels of patients with M.S. have decreased at the end of aquatic exercises program and their happiness rate has increased. Thus, it is recommended to the relevant experts to use such exercises as a complementary method besides the drug therapies to improve the M.S. patients' situation.

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