ORIGINAL ARTICLE

Effect of Aquatic Exercise Training on Fatigue and Health-Related Quality of Life in Patients With Multiple Sclerosis

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ABSTRACT. Kargarfard M, Etemadifar M, Baker P, Mehrabi M, Hayatbakhsh R. Effect of aquatic exercise training on fatigue and health-related quality of life in patients with multiple sclerosis. Arch Phys Med Rehabil 2012;93:1701-8.

Objective: To examine the effectiveness of aquatic exercise training on fatigue and health-related quality of life (HRQOL) in women with multiple sclerosis (MS).

Design: Randomized controlled trial, 4-week and 8-week follow-up.

Setting: Referral center of a multiple sclerosis society.

Participants: Women (N=32) diagnosed with relapsing-remitting MS (mean age ± SD, 32.6±8.0y) were recruited into this study. After undergoing baseline testing by a neurologist, participants were randomly assigned to either an intervention (aquatic exercise) or a control group.

Interventions: The intervention consisted of 8 weeks supervised aquatic exercise in a swimming pool (3 times a week, each session lasting 60min).

Main Outcome Measures: At baseline, 4 weeks, and 8 weeks, fatigue and HRQOL were assessed by a blind assessor using the Modified Fatigue Impact Scale and the Multiple Sclerosis Quality of Life-54 questionnaire, respectively. A mixed-model approach to repeated-measures analysis of variance was used to detect within- and between-subject effects.

Results: Findings are based on 21 patients (10 from the exercise group and 11 from the control group) who had data available on outcomes. There was no significant difference between the 2 groups at the baseline. Patients in the aquatic exercise group showed significant improvements in fatigue and subscores of HRQOL after 4 and 8 weeks compared with the control group. Results obtained from the intention-to-treat analysis were consistent with those of per-protocol analysis.

Conclusions: The findings suggest that aquatic exercise training can effectively improve fatigue and HRQOL of patients with MS and should be considered in the management of this relatively common public health problem.

Key Words: Fatigue; Multiple sclerosis; Quality of life; Rehabilitation.

MULTIPLE SCLEROSIS (MS) is a relapsing-remitting and chronic progressive disease that affects the brain and spinal cord, resulting in loss of muscle control, vision, balance, and sensation. Usually, a person is diagnosed with MS between 20 and 50 years of age, with women being twice as likely as men to be affected earlier in life.[1] Fatigue is one of the most common disabling complaints in patients with MS.[2,3] It causes people with MS to lose their job,[4] limits their social relationships,[5] affects their mental health,[6] and generally impairs a person's ability to perform routine daily tasks.[7] Further, research has indicated that patients with MS are disproportionally likely to exhibit depressive symptoms[3,8] and manifest low levels of quality of life compared with a healthy population and with those with other chronic illnesses.[9]

MS currently has no cure and available treatments are offered to slow the progression of the disease, reduce relapses, or improve symptoms.[2] Therefore, the symptomatic and supportive interventions that aim to improve daily functioning of patients with MS are important.[10] Exercise training is considered a significant behavioral strategy with implications for slowing disease progression in MS.[11] A review of several studies based on 600 participants has suggested that exercise training programs are associated with small, but clinically meaningful, improvements in walking mobility among MS patients.[12] Despite benefits of physical exercise for patients with MS, recent studies suggest that individuals with MS are physically less active than the average, healthy population.[13]

Randomized controlled trials have indicated that exercise training is associated with increased fitness,[14] reduced motor fatigue,[15] improved quality of life,[16] and psychological conditions[17] in MS patients. The American Physical Therapy Association has established preferred practice patterns that provide a basis for the exercise therapy of patients, including those with MS.[18] One specific type of physical therapy that is recommended by the American Physical Therapy Association is

List of Abbreviations

ANOVA	analysis of variance
BMI	body mass index
EDSS	Expanded Disability Status Scale
HRQOL	health-related quality of life
IMSS	Isfahan Multiple Sclerosis Society
ITT	intention-to-treat
MFIS	Modified Fatigue Impact Scale
MS	multiple sclerosis
MSQOL-54	Multiple Sclerosis Quality of Life-54
RRMS	relapsing-remitting multiple sclerosis

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aquatic exercise. Notwithstanding, there is limited information about the modes of physical activity performed by MS patients.[13,19] A recent study by Weikert et al[19] has found walking to be the most common type of self-reported physical activity among people with MS, followed by gardening and weight training.

The buoyant nature and viscosity of water facilitate physical activities for individuals with a physical weakness. In addition, as patients with MS may experience exacerbating symptoms in exposure to heat, aquatic exercise can help to reduce weakness and other neurologic symptoms.[20] However, there is little known about the effectiveness of aquatic exercises on the level of fatigue and quality of life in patients with MS. Further, there is a lack of knowledge about the impact of duration of aquatic exercise on fatigue and quality of life of MS patients. The available evidence about the impact of aquatic exercise is based on weak study designs. Case reports and case series have suggested benefits of pool exercise in improved fitness and movements of patients with MS.[21,22] Their findings have been supported by quasi-experimental[23-25] and noncontrolled[26] trials.

In a noncontrolled trial, Salem et al[26] found improved motor function after a 5-week aquatic exercise program among 11 patients with MS. Salem's study[26] did not examine the effect of aquatic exercise on patients' quality of life. To date, there is a lack of evidence based on randomized controlled trials examining the effect of an aquatic exercise program on fatigue and quality of life of MS patients. The present study aims to examine changes in fatigue and health-related quality of life (HRQOL) in patients with relapsing-remitting multiple sclerosis (RRMS) after 4 and 8 weeks of aquatic exercise training. The following is hypothesized: (1) MS patients who undergo aquatic exercise achieve significant improvement in fatigue and HRQOL; and (2) the impact of 8 weeks of aquatic exercise is greater than that of 4 weeks of aquatic exercise.

METHODS

Participants

The present study was approved by the Ethics Committee of the University of Isfahan and the Isfahan Multiple Sclerosis Society (IMSS). One hundred seventy-eight patients diagnosed with MS were referred to the IMSS by public and private neurology clinics (fig 1). Participants included in this study were all women diagnosed with RRMS referred to the IMSS by public and private neurologists in 2009. In order to prevent extreme fatigue in patients with more severe disability, the referring neurologists requested to include patients with the Expanded Disability Status Scale (EDSS) scores[27] of $\leq$3.5. The inclusion criteria were as follows: diagnosis of clinically or laboratory-supported MS, a minimum time of 2 years since the diagnosis was made, no relapse within the 4 weeks preceding baseline, and ability to participate in regular exercise sessions. Patients were excluded from the study if they had a relapse during the intervention period and/or had a disease preventing their participation (eg, cardiovascular, respiratory, or skeletal diseases). After explaining the purpose of the study to the patients and obtaining informed consent, 32 patients were recognized eligible and recruited into the study. They were randomly allocated into 2 groups: exercise and control. Randomization was completed by someone who had no other study responsibilities using shuffled, sealed envelopes with group allocations inside.

All patients in both the exercise and control groups were instructed to refrain from use of medication (except their routine treatment), use of supplementary nutrition, consumption of tea and coffee, smoking cigarettes, and any rigorous physical activity within 48 hours before the baseline tests. During the 8-week program, 6 patients from the exercise group and 5 patients from the controls were excluded from continuing the study. The reasons for exclusion were experience of relapse, personal circumstances, being unable to regularly participate in exercise training, and refusing to participate in measurement of outcomes at both 4-week and 8-week measurements. As a result, 21 patients (10 in the exercise and 11 in the control groups) remained in the study.

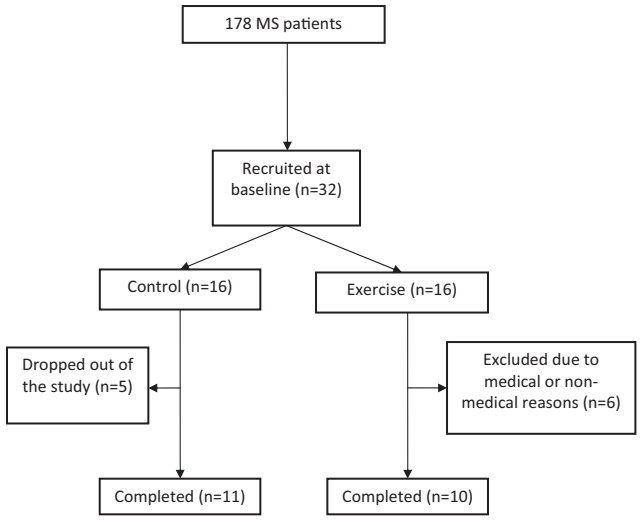

Fig 1. Sampling frame of the study.

Design

One week before the start of the intervention period, all patients in the exercise and control groups were asked to fill out a questionnaire comprising information about sociodemographic, clinical, and anthropometric characteristics. The intervention group was administered an 8-week aquatic exercise training, while the participants in the control group were asked to maintain their current treatment and behavior throughout the 8-week study period. The patients in the 2 groups were treated similarly except for the exercise training. Outcome measures were assessed by research assistants who were blind to the patients' groups.

Aquatic Exercise Training

All participants in the exercise group took part in an aquatic exercise program for a period of 8 weeks. It consisted of 3 sessions per week, each session lasting 60 minutes (including 10 minutes of warm-up, 40 minutes of exercise, and 10 minutes of cool-down). The aquatic exercise training was led and supervised by a certified aquatic instructor who had experience in conducting aquatic exercise programs for persons with physical disabilities. Lifeguards and pool safety equipment were available during the training sessions. Intensity was prescribed at 50% to 75% maximal heart rate reserve. The aquatic exercise was undertaken in Isfahan University's swimming pool, with water temperature maintained between 28°C and 30°C. The patients were advised to report to the trainer or the research supervisor if they encountered any difficulty, extreme fatigue, or disability during and between exercise sessions.

During the first training session, participants were familiarized with the exercise training in water. They were instructed