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ORIGINAL RESEARCH

Swimming Improves Pain and Functional Capacity of Patients With Fibromyalgia: A Randomized Controlled Trial

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Abstract

Objective: To evaluate the effect of swimming on pain, functional capacity, aerobic capacity, and quality of life in patients with fibromyalgia (FM).

Design: Randomized controlled trial.

Setting: Rheumatology outpatient clinics of a university hospital.

Participants: Women with FM (N = 75; age range, 18–60y) randomly assigned to a swimming group (SG) (n = 39) or a walking group (WG) (n = 36).

Intervention: The SG performed 50 minutes of swimming 3 times a week for 12 weeks, with a heart rate at 11 beats under the anaerobic threshold. The WG performed walking with a heart rate at the anaerobic threshold, with the same duration and frequency as the SG.

Main Outcome Measures: Participants were evaluated before the exercise protocols (t0), at 6 weeks (t6), and at 12 weeks (t12) after the onset of the protocols. The primary outcome measure was the visual analog scale for pain. The secondary measurements were the Fibromyalgia Impact Questionnaire and the Medical Outcomes Study 36-Item Short-Form Health Survey for quality of life; a spiroergometric test for cardiorespiratory variables; and the timed Up & Go test for functional performance.

Results: Patients in both groups experienced improvement in pain after the 12-week program, with no difference between groups ($P = .658$). The same results were found regarding functional capacity and quality of life. Moreover, no statistical difference between groups was found regarding aerobic capacity over time.

Conclusions: Swimming, like walking, is an effective method for reducing pain and improving both functional capacity and quality of life in patients with FM.

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Fibromyalgia (FM) is characterized by chronic, diffuse, noninflammatory pain in the musculoskeletal system.[1] Patients with FM also experience fatigue, limited range of joint motion, reduced muscle strength, and below average cardiovascular fitness.[2-7]

Pharmacologic treatment for FM is often insufficient to control persistent symptoms and improve functional limitations.[8,9] Consequently, nonpharmacologic treatment, especially exercise, is recommended.[10-13] Randomized controlled trials have previously demonstrated that aerobic exercises such as walking and aquatic exercise are effective at reducing FM symptoms.[14-18]

In a review article on the effects of physical exercise in patients with FM, Busch et al[19] report an increase in the number of studies with adequate methodological quality involving aquatic, ground-based, muscle-strengthening, aerobic, and flexibility exercises, as well as combinations of these modalities, with positive results on the population with FM. Specifically with regard to aquatic exercises, studies show improvements in pain, functional capacity, muscle strength, emotional aspects, mental health, vitality, and health-related quality of life.

Although the literature reports on the positive effects of swimming, few studies have used this type of exercise in patients with chronic pain, and no studies were found addressing the effects of swimming in patients with FM. As such, the aim of the present study was to evaluate the effects of swimming on pain, functional capacity, aerobic capacity, and quality of life in patients with FM.

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Methods

Population

Participants were recruited using announcements in large newspapers and on radio programs. The inclusion criteria were as follows: (1) classification of FM based on the criteria of the American College of Rheumatology[20]; (2) female sex; (3) age 18 to 60 years; (4) pain intensity between 4 and 8cm on a visual analog scale (VAS) ranging from 0 to 10cm; (5) ability to swim; and (6) no change in medication for FM in the previous 3 months. The exclusion criteria were as follows: (1) uncontrolled cardiorespiratory disease; (2) any health condition for which physical exercise was contraindicated; (3) serious psychiatric disorder; (4) uncontrolled diabetes mellitus; (5) history of regular physical exercise (≥30min 3 times a week) in the previous 3 months; (6) skin condition for which the use of a swimming pool was contraindicated; and (7) inflammatory rheumatic disease. A total of 75 patients meeting these criteria participated in the study. This study received approval from the ethics committee of the Universidade Federal de Sao Paulo.

The patients were randomly assigned using a computer program to 2 groups: a swimming group (SG) and a walking group (WG). Opaque envelopes were used to conceal the assignment, and were safeguarded by a researcher who did not participate in any other aspects of the study.

Protocol

The SG participated in sessions of freestyle swimming without the use of floatation devices. Heart rate was monitored using a waterproof Polar heart rate monitor,[a] and heart rate was calculated at 11 beats below the anaerobic threshold, which was previously determined using a spiroergometric test. The WG participated in sessions of open-air walking, and heart rate was monitored using a heart rate monitor and maintained at the anaerobic threshold previously determined on the spiroergometric test. Both groups began with 5 minutes of warmup, followed by 40 minutes of exercise and 5 minutes of cooldown. The 50-minute sessions were held 3 times a week for 12 weeks.

The participants performed the exercises in groups of 4 to 8 and were supervised by 2 trainers specialized in rheumatology. The trainers had a diary card to report patient adherence to the program.

Evaluations

Participants were evaluated before the exercise protocols (t0), and at 6 weeks (t6) and 12 weeks (t12) after the onset of the protocols. The evaluations were done by blinded assessors to the patient allocations. The following assessment tools were used:

List of abbreviations:

FIQ	**Fibromyalgia Impact Questionnaire**
FM	**fibromyalgia**
SF-36	**Medical Outcomes Study 36-Item Short-Form Health Survey**
SG	**swimming group**
VAS	**visual analog scale**
Vo_2peak	**peak oxygen consumption**
WG	**walking group**

Primary outcome measure

VAS for pain

Participants were instructed to place a mark on a line measuring from 0 (absence of pain) to 10cm (unbearable pain) denoting their pain intensity at the time of the evaluation.[21]

Secondary outcome measures

Fibromyalgia Impact Questionnaire (FIQ)

This health-related quality-of-life questionnaire has been validated in Portuguese and has 19 items addressing physical functioning, work status, psychological aspects, and physical symptoms.[22] The scores range from 0 to 10 points, with higher scores denoting greater impact of the disease.

Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)

This generic quality-of-life questionnaire is made up of 8 subscales. The scores ranges from 0 to 100 points, with higher scores denoting a better quality of life.[23]

Timed Up & Go test

This test measures functional performance and consists of standing up from a chair, walking 3m, turning around, walking back to the chair, and sitting down again. Participants were instructed to perform the task as quickly as possible while maintaining adequate safety. Performance was scored based on the time required to perform the task.[24]

Spiroergometric test

Aerobic capacity was evaluated using a treadmill (LifeFitness 9700HR[b]). This noninvasive exam was used for the measurement of gas exchange, using a ramp protocol.[25,26]

Analgesic log

The number of analgesics taken during the experimental period was determined individually using a standardized daily log. Paracetamol (acetaminophen) 500mg up to 4 times a day (based on need) was prescribed as the rescue drug.

Statistical analysis

All statistical analyses were conducted using version 17 of SPSS.[c]

Sample size was calculated for repeated-measure analysis of variance using the VAS for pain as the main parameter.[27] For the determination of a minimal effect of 2cm, a 5% alpha error, a 20% beta error, and an SD of 2cm were established using the formula described by Filho.[28] The minimum sample for each group was determined to be 34 individuals. Ten percent was added to compensate for possible dropouts, leading to a total of 75 patients.

To determine the homogeneity of the sample at the initial evaluation, the following tests were used: chi-square test and Fisher exact test for categorical variables, Student *t* test for continuous variables with normal distribution, and Mann-Whitney *U* test for variables with nonnormal distribution.

Repeated-measures analysis of variance with Bonferroni adjustments was used to determine differences in the outcomes within groups over time.

With the use of intention-to-treat analysis, the data from all patients initially enrolled were analyzed. For cases in which there was interruption of treatment, the patients were first asked to come in and only perform the evaluations. For patients who refused to return for the evaluations, the last data collected were repeated in the subsequent evaluations.