

Health Benefits of Underwater Treadmill Exercise for Active Adults

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ABSTRACT

Purpose: To assess health benefits of hydrotherapy using an underwater treadmill when added to the exercise of adults who are already participating 3 days per week in a university fitness program. We hypothesized that the underwater treadmill would be beneficial for muscle and joint comfort, energy for activities of daily living (ADL's), sleep quality, and well-being in people for whom additional land based exercise would likely have resulted in overtraining symptoms. **Methods:** 14 subjects (56 ±11 yr) exercised in pairs for 40 minute bouts in a 34°C therapy pool twice weekly for 5 weeks while continuing their usual aerobic, strength, and flexibility sessions 3 days/week. All had histories of physical ailments. The treadmill was submerged to the xiphoid process for 20 min walking or jogging at an intensity to elicit a heart rate of 40-60% of heart rate reserve or RPE of 3-6 on a scale of 1-10. Next, 20 minutes were spent in underwater strength movements using a variety of aquatic resistance devices. Anthropometrics, strength, flexibility, and the SF-36 Health Survey were assessed at the beginning and end of the program. Questionnaires were completed at each session. **Results:** Hamstring flexibility improved approximately 20% after 5 weeks (p<.05). Fatigue post-exercise dropped from 1.8/10 at the start of the program to 0.6/10 at the end (p<.05). Likewise, muscle or joint pain/soresness 2-4 hrs post-exercise dropped as the program progressed (p<.05). **Conclusion:** In this small group over this short period, overtraining was avoided and health benefits were apparent as hydrotherapy was successfully added to current exercise prescriptions. The subjects were also overwhelmingly appreciative of the opportunity to try this innovative mode of exercise.

INTRODUCTION

Hydrotherapy is exercise that encompasses a variety of resistance, aerobic, and stretching activities conducted within a heated pool. Numerous studies have shown that engaging in hydrotherapy can result in multiple health benefits that are similar to land based exercise (3). Even better, water resistance and buoyancy allow for a full range of motion (ROM), which helps to improve balance, stability, strength and flexibility (7). Thus, hydrotherapy may be indicated for individuals who have balance and postural stability impairments when doing land exercise (4). Some health benefits that have been attributed to hydrotherapy include lower heart rate (HR) during exercise, decreased joint pain, and decreased muscle soresness. Several studies have indicated, at a given intensity, that HR is lower during underwater exercise than land exercise. It was suggested that the rating of perceived exertion (RPE) should be the standard for measuring intensity during underwater exercise, instead of HR (1). Hydrotherapy is an innovative way to enjoy exercising with minimal to no pain or injury, especially for people who suffer from arthritis (2,7). Water pressure and temperature play a favorable role in reducing joint pain. Similar to using a hot tub to soothe aching muscles, the warm water temperature can promote relaxation while also decreasing muscle spasm and tightness (7). An Australian study done by Rissel and colleagues found that 66% of participants reported decreased stiffness in their most painful joints (5). Individuals participating in underwater treadmill exercise do not need to have previous swimming skills or good balance and strength. Thus, the underwater treadmill is especially effective for individuals suffering from hip, leg, or back problems as well as shoulder issues (6). **AIM:** To evaluate the impact of adding underwater treadmill exercise (2 days/week) to the routine of active adults already exercising 3 days/week on land. We hypothesized that this will have measurable health benefits (e.g., flexibility, strength, pain, sleep patterns, completion of activities of daily living (ADL's) and energy levels) without overtraining symptoms.

METHODS

Subjects

Fourteen physically active men and women were recruited from the University of Wisconsin – Eau Claire Community Fitness Program. All subjects reported a history of physical ailments. Each participant completed the SF-36 quality of life health survey, a Physical Activity Readiness Questionnaire (PAR-Q), and a health history questionnaire. Written informed consent was also obtained.

Baseline and Final Assessments and Instrumentation

Body mass, height, waist to hip ratio, body fat percent (via skinfold), BMI, blood pressure, resting heart rate, muscular strength, and flexibility were all measured pre and post training.

Exercise Program

Two days per week combined underwater treadmill and resistance exercises for 5 weeks. The exercise sessions lasted approximately 40 min: 20 min of aerobic underwater treadmill exercise followed by 20 minutes of aquatic resistance training. Subjects walked or jogged on the treadmill at 40-60% of their heart rate reserve or an RPE of 3-6 on a 1-10 scale. Subjects then completed one set of 12-15 repetitions for each strength exercise over the course of 20 min. Upper body exercises included elbow flexion and extension, chest and back press, lateral shoulder raises, and chest flies. For the lower body, subjects completed hip abduction, adduction, flexion and extension as well as knee flexion and extension. Heart rate and RPE were recorded every five minutes throughout the entire session.

Quality of Life Surveys

At each exercise session participants completed surveys; documenting muscle and joint pain, changes in flexibility, the ability to perform activities of daily living, energy levels, and overall sleep patterns.

Statistical Analysis

Differences in subject characteristics in response to the exercise program were determined by a paired T-test. Non-parametric tests were used to assess changes in the quality of life survey over the course of the exercise program. Data are presented as mean ± SD. Statistical significance was set at P<0.05. Statistical analyses were performed using SPSS software version 17.0 (SPSS Inc).

Table 1. Subject Characteristics

Variable	Total Group Pre-Training	Male	Female	Total Group Post-Training
Number	n=12	n=6	n=6	--
Age, years	56±5	58.5±9.1	56.6±2.8	--
Weight, kg	108.1±21.8	112.1±8.2	96.4±37.5	108.1±21.8
BMI, kg/m ²	36.5±7.4	35.0±2.6	35.4±13.8	36.7±8.1
SBP, mmHg	127±9	125±4	128±12	124±14
DBP, mmHg	77±5	76±5	76±6	75±12
Grip Strength, kg	70.7±18.2			71.4±19.7

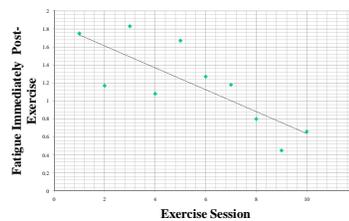


Fig. 1 Fatigue Post-Exercise. Symbols are group means.

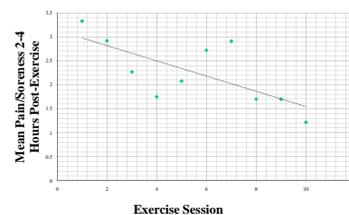


Fig. 2 Muscle Pain and Soresness 2-4 hours Post-Exercise. Symbols are group means.

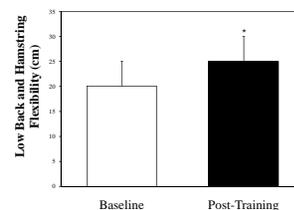


Fig. 3 Pre- and Post-Training Hamstring Flexibility

RESULTS

All 14 subjects expressed enthusiastic appreciation/enjoyment without experiencing adverse effects from the additional 2 days/week of exercise. Survey responses showed that they enjoyed the aerobic and resistance exercise routine and felt better both physically and psychologically. Eleven of 14 subjects reported decreased joint discomfort, and seven (50%) reported better quality of sleep. In Table 1 data are shown for the twelve participants (6 male, 6 female) who completed all ten sessions of the hydrotherapy exercise program over the five week period. As shown in Figure 1, there was a decrease in reported fatigue levels immediately post-exercise, from 1.8/10 at the beginning to 0.6/10 at the end of training (p<.05). Similarly, we found a decrease in muscle and joint pain/soresness 2 – 4 hours post exercise (p <.05; Figure 2). The group average for flexibility improved about 20% after 5 weeks of hydrotherapy (p < 0.05; Figure 3). Body weight, BMI, grip strength, and resting blood pressure did not change from pre- to post training.

Sample Quotes from Subjects

"I sleep more soundly, feel stronger, and have more energy throughout the day." "I am excited to be able to jog for the first time since my heart attack." "My favorite time of day." "It didn't feel like exercise!" "I think the study should go longer."

SUMMARY & CONCLUSIONS

The main finding of the present study was that a program of hydrotherapy exercise was well tolerated, improved flexibility, and tended to reduce muscle and joint pain in a cohort of middle-aged to older adults who had reported a history of orthopedic limitations and musculoskeletal discomfort. Surveys showed substantial decreases in joint pain, muscle soresness, and fatigue following exercise as the training progressed. Limitations may include small sample size, short duration, and having two participants in the pool simultaneously, which limited our ability to individualize the exercise intensity.

The present study demonstrated that a 5-week hydrotherapy program with an underwater treadmill was successful to increase exercise volume without overtraining problems. This innovative form of exercise appears to be a positive way to improve flexibility, muscle and joint pain, sleep patterns, and overall quality of life. Hydrotherapy is an enjoyable and sociable mode of exercise which promotes exercise adherence.

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