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**Aquatic Physical Therapy
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The Effects of Aquatic Physical Therapy on Balance Deficits in a Patient With Subacute Stroke

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Background and Purpose: Cerebrovascular accident (CVA) is the leading cause of disability and the third leading cause of death in the United States. Stroke is also a risk factor for falls due to resulting impairments and activity limitations. Falls can lead to functional decline, serious injury, and even death. Aquatic physical therapy allows patients to take greater risks while training balance than they would normally take on land. The purpose of this case report is to describe the effects of a 6-week aquatic physical therapy program in combination with conventional physical therapy for a patient with chronic stroke, hemiparesis, and an increased risk for falls due to impaired balance, coordination, and gait.

Case Description: The patient was a 65-year-old male, 7 months post left (L) CVA referred for balance and gait deficits. He participated in 10 treatments of aquatic physical therapy, and 8 treatments of conventional physical therapy for a total of 6 weeks. All treatment sessions were 30 minutes in duration. Aquatic physical therapy included Ai Chi postures, ascending and descending steps, gait training and strengthening exercises, and high-level balance activities that the patient would otherwise not be able to perform on land. Conventional physical therapy included balance, endurance, and gait training on even/uneven surfaces. The physical therapy evaluation revealed limited ankle dorsiflexion (L: 0°, R: -6°), limited R shoulder flexion (135°), decreased strength in R lower extremity (hip 3-/5, knee 3+/5, ankle 2+/5), and a Berg Balance Scale (BBS) score of 44/56. The patient ambulated with standard cane. Gait analysis revealed R knee hyperextension during stance phase, mild R foot drop, and increased trunk extension during swing phase. Baseline 6-Minute Walk Test (6MWT) was 271 m, and gait speed was 0.77 m/s (using the 10-Meter Walk Test [10MWT]) at a self-selected pace using a standard cane.

Outcomes: After the intervention, the 6MWT improved from 271 m to 303 m, a clinically meaningful gain of 32 m. Additionally, the patient no longer required an assistive device for safe ambulation. The 10MWT did not show a clinically important change even though it was 0.78 m/s without the use of a standard cane. The BBS improved to 54/56, which demonstrated a clinically meaningful change.

Discussion: Aquatic physical therapy is often used in rehabilitating patients with stroke to facilitate single-leg stance

on the hemiparetic limb. In a gravity-dependent situation, poor posture, balance, and cardiovascular demands may limit the patient. Buoyancy allows the patient to safely perform balance activities normally done on land. Ai Chi was incorporated because it integrates thermal aquatics, deep breathing, and total body movement. This case report describes an improvement in the 6MWT and BBS, which indicate a decrease in fall risk with progressive ambulation. The findings indicate that aquatic physical therapy, when used as an early intervention in this patient with chronic hemiparesis due to CVA, was an effective strategy for treating gait and balance abnormalities and decreasing fall risk.

Use of Aquatic Therapy for Adults With Chronic Heart Failure: An Evidence-Based Review

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Purpose/Hypothesis: Exercise for chronic heart failure improves physical capacity and quality of life. Safety and efficacy of aquatic exercise for this population is not well determined, due to potentially altered heart function caused by water immersion. However, the aquatic environment may further the benefit of exercise compared to land-based exercise. Therefore, the primary purpose is to search the existing literature to determine if aquatic exercise is safe and effective for improving heart function and quality of life for adults with heart failure. The secondary purpose is to determine if aquatic therapy is more effective than land exercise.

Materials/Methods: An electronic search for articles was conducted through February 10, 2013. Search terms included aquatic exercise, aquatic therapy, aqua therapy, water-based exercise, water exercise, hydrotherapy, cardiac, heart failure, chronic heart failure. Inclusion criteria: participants with chronic heart failure who had more than 1 session of water-based exercise intervention, and spoke the English language. Data from studies meeting preset criteria were combined to calculate grand effect sizes and 95% confidence intervals.

Results: Six articles with level of evidence 1B-2B met the criteria to be included in this review. Analysis of the within-group changes for aquatic exercise showed statistically significant improvements. The grand effect size (95% CI) for the 6-Minute Walk Test (6MWT) was 1.33 (0.07, 2.60), oxygen consumption (VO₂) 0.5 (0.15, 0.85), muscle power 0.42 (0.07, 0.77), and quality of life -0.54 (-0.97, -0.10). Ejection fraction was not significantly changed after water exercise, 0.08 (-0.30, 0.45). Measures for between group differences were not statistically significant [VO₂ 0.16 (-0.42, 0.75), muscle power 0.47 (-0.12, 1.06)]. Additionally, clinically

significant improvements were found within-groups, and in favor of aquatic exercise for between-groups.

Conclusions: Aquatic exercise is a safe and effective form of exercise for adults with mild to moderate chronic heart failure. Patients with chronic heart failure who participate in aquatic therapy programs can expect an increase in exercise tolerance and quality of life, without significant changes in ejection fraction. Additionally, no statistically significant differences in functional outcomes were found between land-based exercise and aquatic exercise for this population; however, more research is needed to corroborate obtained clinical differences that favored aquatic exercise.

Clinical Relevance: Aquatic exercise can be recommended and encouraged for patients with mild to moderate chronic heart failure as a safe alternative or adjunct to land-based cardiac rehabilitation to improve quality of life and physical capacity. There is potential for an increased clinical benefit from exercise in water, and the social aspect and ease of movement in water is likely to keep patients motivated. Aquatic exercise is also important as a viable option for patients who may have comorbidities that keep them from participating in traditional land-based cardiac rehabilitation exercises.

Effectiveness of Aquatic Exercise for Individuals With Systemic Lupus Erythematosus: A Randomized Controlled Trial

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Purpose/Hypothesis: The purpose of this randomized controlled trial was to evaluate the effect of a group aquatic exercise program on physical function and pain in individuals with systemic lupus erythematosus (SLE).

Number of Subjects: Thirty-one subjects diagnosed with SLE were recruited to participate in the study. Subjects were randomly assigned into an experimental group ($n=16$) and a control group ($n=15$). Twenty subjects completed the study, with 9 in the experimental group and 11 in the control group.

Materials/Methods: Subjects in the experimental group participated in a 10-week aquatic exercise program, which included 1-hour aquatic sessions once a week following the principles of Ai Chi in a group format. Subjects in the control group did not receive any intervention in addition to standard care. A battery of assessment tools was applied to the subjects preintervention and postintervention or control period, in a single-blind manner to examine the effect of the aquatic program on physical function and pain. Primary outcome measures were the Timed "Up & Go" test, the 2-Minute Walk Test, gait velocity, grip strength, and visual analog scale. A 2 x 2 mixed between-within subjects analysis of variance was conducted to assess the effectiveness of the aquatic program. Group was the between-group variable, while time was the within-group variable.

Results: All primary outcome measures demonstrated no significant interaction between group and time, as well as no significant main effect for either time or group.

Conclusions: This study revealed that subjects in the experimental group did not demonstrate statistically significant improvements in physical function and pain reduction, compared to subjects in the control group. However, the results should be interpreted with caution due to the small sample size caused by the high attrition rate.

Clinical Relevance: The effect of aquatic exercise on physical function and pain in individuals with SLE needs to be further determined. Future studies with larger sample size and a priori power analysis are warranted.