

# **The effect of regular aquatic exercise on improvement of physical fitness level, static and dynamic balance capacity, and muscular activity in elderly arthritis patients.**

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## **Purpose**

The aim of this study was to examine the effect of regular aquatic exercise on body composition, physical fitness, static and dynamic balance capability, muscular activity and weight distribution, and articulation pain control in elderly arthritis patients.

## **Method**

A total of 22 elderly women subjects, who registered in a beginner's class in aquatic exercise operated by Sports center in the city of Daegu, voluntarily participated in this study. Subjects were allocated one of two experimental groups: either arthritis (ART, n=11) or control (CON, n=11). All subjects from both experimental groups participated in an exercise program that was designed for the same exercise intensity and work volume, and exercise was performed three times a week (60 min·session<sup>-1</sup>) at the 12-16 level of rate of perceived exertion (RPE). Before and after 12 weeks of the aquatic exercise program participation, percent body fat (%BF, Inbody 330, Biospace, Korea), physical fitness status (include muscle strength, muscular and cardiovascular endurance, power, flexibility, and agility), muscle activation ratio (using surface electromyography (EMG), Telescan, Laxtha, Korea) and static-dynamic balance capability (SpaceBalance 3D Posturography, CyterMedic, Korea), weight distribution, and pain recognition level (VAS scale) were measured using appropriate tools and methods.

Windows SPSS (Version 18.0) was used and means and standard deviations were drawn from all data obtained from this study. TWOWAY ANOVA was used to analyze the interaction between groups (ART vs. CON) and time (PRE vs. POST), and the main effect of each factor was examined when no significant interaction was found. Paired *t*-test to test the mean differences between PRE and POST and independent *t*-test to test the mean differences between ART and CON was adopted. All statistical significance levels were set at  $\alpha=.05$ .

## **Results**

Results obtained from this study were summarized as follows:

1. %BF and body mass index (BMI) was significantly decreased while lean body mass (LBM) and muscle mass was significantly increased in both groups after the 12 week aquatic exercise program. However, statistical difference did not show between ART and CON.
2. Physical fitness level was improved from both experimental groups but revealing different patterns between the groups. Power was significantly improved in both groups, and Back (not grip) muscle strength increased in ART but grip (not back) muscle strength increased in CON. Agility and flexibility was only significantly increased in CON (not in ART). Muscular endurance was significantly increased only in ART (not in CON) whereas cardiovascular endurance was significantly improved only in CON (not in ART).

3. From both groups, static balance capability was significantly improved in both side of the body (i.e., left and right side) after 12 weeks of aquatic exercise. Dynamic balance capability was also significantly improved in both experimental groups. Specifically there was a significant improvement of dynamic balance from all aspects of experimental conditions (i.e., object to be focused was given with eyea opened, object to be focused was not given with eyes opened, as well as eyes closed) in ART, but it was only partially increased in CON showing only significant improvement when object to be focused on was not given to subjects with eyes opened condition. Muscle activation ratio tended to increase after regularly performed aquatic exercise even though maximal strength was not measured in this study. Using load cell, weight distribution was measured during static balance test, and showed remarkable improvement in ART after 12 week aquatic exercise program.

4. The degree of pain recognized during walking was significantly reduced after the 12 week aquatic exercise program in both experimental groups. The degree of difficulty during routine life was also partially but significantly decreased in both groups, and the stiffness level was also significantly improved in ART after regular aquatic exercise program.

### **Conclusion**

Based on these results, it was concluded that the aquatic exercise applied to the elderly women who were not only in normal healthy condition but those who suffer from arthritis symptoms was effective to improve their overall healthy status as well as to reduce the degree of pain during their routine everyday life.

Although variety in aquatic exercise tools and methods were used to prevent boredom throughout the participation period, some further considerations associated with individual physique and physical fitness level need to be more precisely considered to increase the effectiveness and achievement of aquatic exercise.

It would also be beneficial to use an additional control group where participants do not perform any scheduled exercise throughout the experimental period. This aspect can be further examined in subsequent study.