



Improving functional and motor capacity through means/resources and methods specific to aquatic activities



WEB OF SCIENCE

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Abstract

Introduction. Exercise programs in the aquatic environment have as their main objective the improvement and maintenance of physical capacity/ capability, these being in continuous development and diversification. Water exercise amplifies the effects of general physical exercise, by allowing a more precise control over the movement of each body segment and of the body as a whole. The aquatic environment offers a number of beneficial effects compared to ones offered by the terrestrial environment. The benefits obtained through the aquatic activities are fundamental and are reflected throughout the entire body including both motor, functional and aesthetic level. **Material and method.** The objective of this study is represented by the identification of new forms of physical exercise that will increase the effort's capacity. In order to achieve this goal, several methodological requirements were met, such as: successive engagement of the joints and muscle groups in effort (starting with the neck's muscles, shoulders, arms, torso and legs, simultaneously with scapular-humeral joints, spine and coxo-femoral joints and legs), the gradual usage of exercises, starting with the most basic and then increasing the complexity of the exercises, the usage of the accessible exercises in the beginning of the training, executed with high amplitude and reduced speed, focusing on the correctness of the execution, the selection and the adequate/ appropriately usage of the initial positions according to the subject's particularities and the shape/form of the exercise, the optimal control of the effort, achieved through a number of iterations, optimal execution time and breaks, the sets of general physical exercises will consist of sets of 8-12 exercises/reps, the principle of symmetry in the execution of the exercises has to be respected, the continuity of practicing a set of exercises for 6 to 8 consecutive lessons, the recommended work method is fragmented-imitative, efficiently combining the explication with the demonstration, the number of repetitions and the movement's correction. **Results and discussions.** Analyzing results obtained after the evaluation, we have noticed significant growth in the functional and motor capacities. **Conclusions.** The systematization of water activities on objective criteria effectively contributes to their knowledge, while allowing them to be included in the spectrum of recreational, sporting, relaxing or therapeutic activities.

Keywords: *aquatic activities, physical exercise, evaluations,*

Introduction

The aquatic environment offers a number of opportunities compared to the terrestrial one [1,2]. The benefits obtained from performing aquatic activities are fundamental and are reflected on the whole body both motor, functional and aesthetic [8,11].

Effort capacity is defined as the ability of an organism to produce as much mechanical work as possible and to maintain it for as long as possible. In other words, the more effort a person can sustain in terms of intensity and duration, the better his capacity for effort is. The improvement of this parameter can be achieved through training, this being in fact, along with the series of technical-tactical skills, the final goal of the training process on which sports performance depends directly [6,7].

The aims of the study is improve somatic parameters, functional and motor capacity by implementing exercise programs performed in water by people aged between 40

and 55 years. In establishing the hypothesis we started from the assumption that performing water activities by people aged between 40 and 55, will improve their motor and functional capacity, compared to activities in the terrestrial environment (physiotherapy room) [9].

General objectives:

- improving somatic parameters;
- improving functional capacity;
- achieving an optimal psycho-physical balance;
- awareness of the advantages and characteristics of performing activities in the aquatic environment;
- diversification of exercise programs [10].

The stages of this research focused on the following aspects:

- establishing study groups;
- periodizing the research and establishing the conditions for conducting the study;
- establishing specific training objectives;

- selecting and elaborating the means of action specific to aquatic activities;
- elaboration of aquagym programs on difficulty levels;
- establishing evaluation tools and rules [13].

Matherial and Methods

The study was conducted over a period of 3 months, and consisted of 3 sessions per week, with a duration of 50 minutes.

The research included a number of 45 subjects, organized in three groups: two experimental groups and a control group. The experimental groups were formed each of 15 subjects aged between 40-45 years, as follows [12]:

- the first experiment group (E1), consisting of subjects, who performed a specific program of aquagym exercises;
- the second experiment group (E2), consisting of patients who practiced a specific program of aquagym exercises using various devices such as dumbbells or steppers.
- The control group (C) consisted of patients aged between 40 and 55 years who performed ground exercise programs.

The research included two tests, a initial test and a final test, arranged as follows:

- initial testing
- implementation of the proposed programs of aquatic activities and those in the gym
- final testing

Aquagym operational programs were differentiated on three levels: beginner, intermediate and advanced, depending on the degree of difficulty, intensity and complexity of the drive systems [4]. Measurements and tests applied in research: tests to determine the development of functional capacity: Ruffier test and walking test 2 Km [3].

Results and Discussion

Effort capacity - Ruffier test. Starting from approximately similar values at the initial test, after practicing the programs proposed the following differences of the arithmetic means between the two tests were obtained: 0.76 in the control group, 1.23 in the E1-Aquagym experiment group, and the E2-Aquagym experiment group - 1.75.

Reporting the values of the averages to the evaluation grid, it is found that at the initial testing all the groups included in the research were at a satisfactory level, with values between 10.1 -15, and after performing the proposed programs, in the final testing they registered an obvious progress, falling to the average level, with values below 10.

The analysis performed with the t-Student test is statistically significant for the E1-Aquagym experiment group compared to the control group, in the case of the E2-Aquagym experiment group, comparing the averages

with those of the control group, the statistical analysis indicates a strongly significant difference, $p < 0.000$, thus accepting the alternative hypothesis.

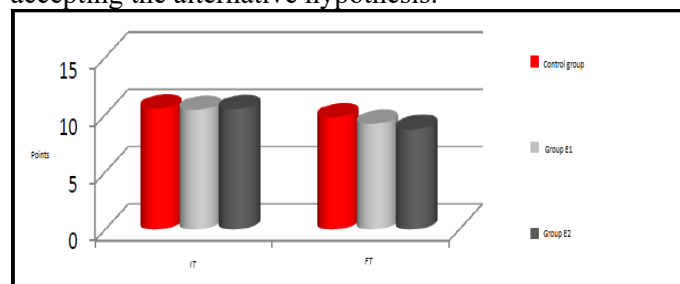


Fig 1. Graphical representation of athermic averages of effort capacity

Fitness index (FI). The calculation of the fitness index (FI), which represents the level of maximum oxygen absorption capacity in relation to age, sex, weight and height [5,12], shows that all research subjects showed increases in the arithmetic mean between tests, but those of the experiment groups were superior to the progress made by the control group.

The control group obtained a difference of the arithmetic means of 4.88, which determined a transition to a higher level, so in the initial test the subjects were at a score of 88.98, and in the final test they evolved at a score of 93.87.

The results obtained in the final evaluation are on average higher than the initial evaluation, which determined a progress in the experimental groups of the fitness index (IF) level. The differences of the arithmetic means between group tests are: in the E1-Aquagym group of 10.02, and in the E2-Aquagym group of 17.98, as it also results from the graphical representation of the means.

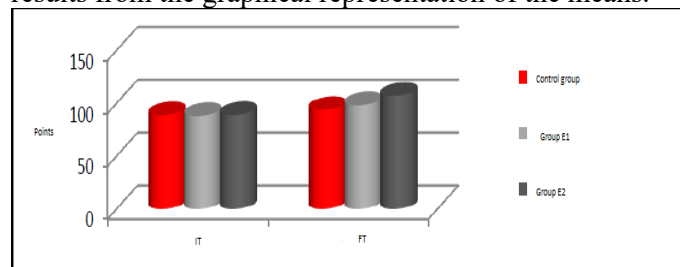


Fig 2. Graphic representation of environments - Physical condition index

Maximum heart rate HR max. Following the research, by completing the 2 km gait test, the cardiac capacity represented by HR max., Decreased the arithmetic mean, in all subjects, in the final test compared to the initial test. The experimental group E1- aquagym, recorded a difference of the averages between the two tests of 0.28 b / min, and the experimental group E2- aquagym a decrease of the averages by 0.17 b / min., This parameter of the functional capacity is directly dependent on the age of the subjects during the experiment. The control group

obtained an initial value of 195.06 on the initial test and 194.91 on the final test, the difference being 0.15 b / min, lower than the experimental groups.

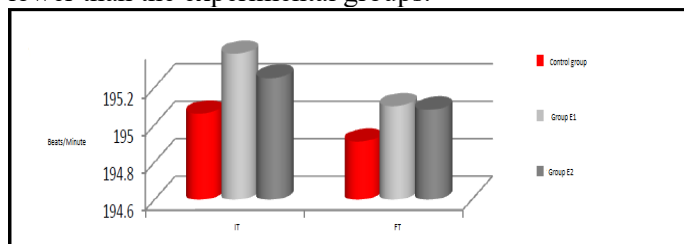


Fig 3. Graphical representation of HR max

Heart rate after exercise in the 2 km gait test. Heart rate after exertion at the 2 km walk test, in the final test compared to the initial test was better in all groups, especially in group E2 compared to the control group. After completing the 2 Km walking test, a significant progress of the FC indicator was observed after exertion, registering a difference of the arithmetic means between tests of 2.1 bpm in group E1-Aquagym, of 5.4 bpm in group E2 - Aquagym and of 2.2 bpm the control group. The statistical analysis with the t-Student test is insignificant, the values of p being higher than 0.05, which determines the acceptance of the null hypothesis at this functional cardiac indicator. The values recorded by us confirm the previous results of various studies. An important factor to consider is the environment, water, which under normal conditions determines an adaptation of the body by lowering the heart rate by 10.17 bpm.

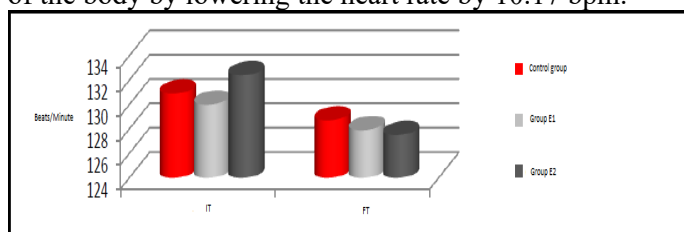


Fig 4. Graphical representation of FC averages after effort in the 2 km walking test

Vital capacity. VO2max. determined by performing the 2 km gait test recorded a higher average difference in both experimental groups compared to the control, following the application of operational programs specific to aquatic activities.

The control group obtained in the initial test an average value of 35.39 mL / Kg / min, and in the final test 37.02 mL / Kg / min, with an improvement difference of 1.63 mL / Kg / min. The E1-Aquagym experimental group recorded a progression of the mean difference of 3.36 mL / Kg / min. The most obvious improvement was found in the experimental group E2, the average difference between the tests being 6.21 mL / Kg / min.

Comparing the results of the experimental groups with the control group between tests: between the E1 group and the control group the average difference was 1.73 mL

/ Kg / min, and between the E2 group and the control group 4.58 mL / Kg / min.

Statistical analysis by the t-Student test shows a significant strong threshold, thus accepting the alternative hypothesis. According to the vital capacity assessment grid, at the initial testing all the samples were classified at the “average” level, and after the experiment they were classified at the “good” level.

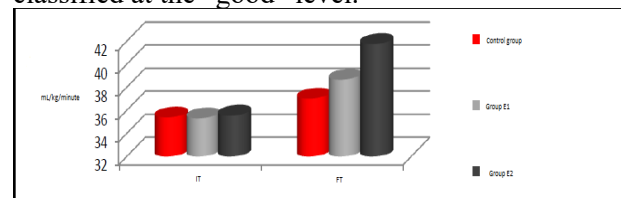


Fig 5. Graphic representation of average VO2max

Conclusions

The systematization of water activities on objective criteria effectively contributes to their knowledge, while allowing them to be included in the spectrum of recreational, sporting, relaxing or therapeutic activities. Introduction of a new activity, with a specific, innovative methodology called aqua gym, is part of the modern development and research trends of the activities domestically and internationally. Studying the development of motor skills through aquatic recreational activities, it is a modern trend, which in general can contribute to improvement human performance.

Author contributions.

All the authors had the same contribution.

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