THE IMPACT OF AQUA PILAYOGA PROGRAM ON FUNCTIONAL FITNESS IN ELDERLY WOMEN

Agnieszka Koteja, Katarzyna Kucia, Małgorzata Potocka-Mitan, Grażyna Kosiba, Maria Gacek, Joanna Gradek, Magda Majer

1 Institute of Sport, Department of Water Sports, University of Physical Education, Krakow, Poland
2 Institute of Humanities, Social Sciences and Tourism, Podhale State College of Applied Sciences in Nowy Targ, Poland
3 Department of Theory and Methodology of Physical Education, University of Physical Education, Krakow, Poland
4 Department of Sports Medicine and Human Nutrition, University of Physical Education in Krakow, Krakow, Poland
5 Institute of Sport, Department of Track and Fields, University of Physical Education, Krakow, Poland

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Abstract:

Background: The literature highlights the benefits of physical activity using water resistance during movement in the aquatic environment, and the combination of pilayoga with the activity in the aquatic environment offers an interesting alternative to modern training and inspires research in this field. Nowadays, aquatic fitness is one of the most widely recognized fitness programs among health specialists, sports professionals, and practitioners.

Aims: The main aim of the study was to assess the effect of three months of participation in an aqua pilayoga program on the functional fitness of women over 60 years of age.

Method: The study group followed a supervised training routine 2 times per week for 3 months. The variables assessed at baseline and after 3 months included body composition (BIA), anthropometric indices i.e. body mass index, and results of the Fullerton Fitness Senior Test (FFST) which evaluated functional fitness. Fitness parameters measured in the study were strength and muscular endurance, mobility, dexterity, speed, body balance, motor coordination, reaction time, and flexibility.

Results: After 3 months of the experiment, the greatest changes were found in endurance, agility, and strength of the upper and lower limbs. Positive adaptations were also observed in increased leg strength and flexibility of the lower and upper body. After 3 months, body mass index and fat mass decreased significantly (p<0.05), whereas basal metabolic rate, fat-free mass, and total body water increased significantly (p<0.001).

Conclusions: Our findings indicated that aqua pilayoga programs can improve health parameters better and faster than in other sports. This is probably related to the specificity of the aquatic environment (buoyancy, density, resistance force, or waves) and physical exercise in water.

Introduction

As the European population is aging, additional attention should be given to individual requirements and challenges posed to older people [1]. In 2019, before the COVID-19 pandemic and related restrictions, approximately one million people in Europe and 50,000 in Poland had participated in aquatic fitness training, and currently, this
number keeps growing [2]. Moreover, new workouts and training programs attract much attention, and these are popularized in the media and developed for society every year. Therefore, the growing number of participants in physical activity requires new solutions.

However, certain limitations may restrict people’s ability to take part in physical activity programs, specifically obesity, low levels of physical fitness, locomotion difficulties caused by aging, orthopedic or neurological disabilities, or pulmonary disease [3-7].

The literature highlights the benefits of physical activity using water resistance during movement in the aquatic environment such as increased muscle strength and endurance, improved flexibility and mobility, reduced blood pressure, improved joint health, weight loss, reduced stress, and the risk of injury or fall [8-11]. Therefore aquatic fitness is advantageous for whole-body exercise and recovery from injuries.

Nowadays, aquatic fitness is one of the most widely recognized fitness programs among health specialists, sports professionals, and practitioners. This fact may be attributed not only to the body adaptations caused by hydrostatic pressure, buoyancy, and thermodynamics but also the diversity of activities that can be performed using the properties of water to create resistance to movement with reduced neuromuscular activity required from the antigravity muscles [3,12-13].

Pilayoga is a training program based on Pilates and yoga principles and helps develop aerobic capacity, endurance, strength, flexibility, and balance. It induces training adaptations in spite of low impact and difficulty levels; it is suitable for both males and females and is adaptable for all ages and fitness levels in physiotherapy, intervention therapies, and in orthopedics in the aquatic environment [14]. Basic scientific results may allow for the development of programming and teaching methods of pilayoga. Furthermore, such efforts will contribute greatly to the rapid popularization and establishment of Pilayoga as a new trend. [15].

Few studies so far have examined the effects of pilayoga. Consequently, the combination of pilayoga with the activity in the aquatic environment offers an interesting alternative to modern training and inspires research in this field.

The main aim of the study was to assess the effect of three months of participation in an aqua pilayoga program on the functional fitness of women over 60 years of age.

Material and Methods

Participants

The study involved 28 older adults qualified for the Healthy and Active Senior program at the University of Physical Education in Krakow in the academic year 2019/2020. The participants were selected for the aquatic fitness double-blind randomized trial (n=28, aged 68±9, body mass index BMI 27.7±4).

The study group followed a supervised training routine 2 times per week for 3 months. The variables assessed at baseline and after 3 months included body composition analysed using bioimpedance impedance analysis (BIA), anthropometric indices i.e. body mass index, and the Fullerton Functional Senior Fitness Test (FFST) which evaluated functional fitness. Fitness parameters measured in the study were muscle strength and endurance, mobility, dexterity, speed, body balance, motor coordination, reaction time, and flexibility.

The procedures were performed according to the Declaration of Helsinki and were approved by the review board in Sports Institute – Department of Water Sports, Faculty of Physical Education and Sport of the University of Physical Education, Cracow, Poland.

Measures

Original program of aqua pilayoga

The aqua pilayoga sessions held for the period of three months (24 sessions/12 weeks) were mostly conducted at the organization. The participants followed the training routine twice a week, with each session lasting 60 minutes. They were divided into groups of twelve to fifteen people. The pool had a depth of 1.20 m in the central area and 1.50 m at the end. Water temperature was approximately 30°C-32°C.

The early stage lasted two weeks of low-intensity training: this time was used to assess the average fitness level in the group. Next, the group went on to perform the exercises at an advanced level, where the number of repetitions and intensity were progressively increased each week from three to twelve. The basic session structure consisted of five minutes of initial joint mobility exercises, warm-up, and aerobic exercise, to stimulate all the body (25 minutes), resistance strength exercises (ten minutes), during which target body areas varied depending on the purpose of the session (chest, shoulder, and dorsal region, arm and forearm region, lower limbs, and abdominal muscles), specific exercise (ten minutes), and active recovery connected with stretching (ten minutes). This training session was equivalent to 4 METS.

Fullerton Functional Senior Fitness Test

The individual fitness test items involve common activities such as getting up from a chair, walking, lifting, bending, and stretching. The tests were developed to be safe and enjoyable for older adults, while still meeting scientific standards for reliability and validity. Here is a list of the tests, with links to more details for each [16].
Chair Stand Test (30 s’ SC) – testing lower body strength
Arm Curl Test (ACT) – testing upper body strength
Chair Sit and Reach Test – lower body flexibility test
Back Scratch Test (BST) – upper body flexibility test
8-Foot Up and Go Test (U&G) – agility test

Step in Place Test (2SinP) – The walk test is used to assess aerobic fitness unless the person uses orthopedic devices when walking or has difficulty balancing, in which case they do the step in place test.

Procedure

The examinations were complemented with the Rikli and Jones [17] Senior Fitness Test (FFST), which evaluated functional fitness, and the SF-12 Health Survey that measured quality of life in relation to health. Throughout the study, two data-collection points were set.

(i) Initial test: prior to the aqua pilayoga program. A doctor checked the health status of the participants and their possible restrictions or contraindications to the performance of any program’s activities. Subsequently, anthropometric measures such as height, weight, and BMI were taken.

(ii) Final test: at 12 weeks. It is equal to the initial test. All the evaluations were carried out by monitors and graduates in physical therapy, previously instructed and trained for these procedures. All participants were randomized into three groups. The different programmes were given by monitors and graduated in physical therapy and lasted six months.

Statistical analysis
Basic statistical methods were chosen to calculate means, standard deviations (SD), and 95% confidence limits. We did not control for gender since almost all par-
Participants were females. The normality and homogeneity of variance were verified by using Shapiro-Wilk and Levene’s tests. Independent samples t-test was used to compare dependent variables at baseline between groups. Within-group changes were considered significant at the 0.05 level if accompanied by 95% CI that did not cross zero. Furthermore, Student’s paired t-test was used for repeated measurements (pre vs. post) in each group to deepen the analysis. All these statistical procedures were performed using Statistics for Windows®, version 16.0. (Statistica, Poland) and the level of statistical significance was set at $p \leq 0.05$.

**Results**

After three months, the greatest changes were found in endurance, agility, and strength of the upper and lower limbs. Positive adaptations were also observed in increased leg strength and flexibility of the lower and upper body. After 3 months, body mass index and fat mass decreased significantly ($p<0.05$), whereas basal metabolic rate, fat-free mass, and total body water increased significantly ($p<0.001$).

**Discussion**

A tendency towards improved endurance and strength of the lower and upper limbs in the FFST were observed after aqua pilayoga sessions, with better results found for the strength of the lower limbs. Similarly, after 12 weeks of aquatic fitness program, there was a significant increase in the flexibility of the lower and upper body. This phenomenon can be explained by the overload provided by water resistance and activities performed at high intensity [13,18,19]. In our study, an increase in the lower limbs was greater, perhaps because the modifications performed accelerated changes in these limbs. Previous studies have indicated that aquatic resistance training results in significant improvements in muscle torque and “… and provides neural stimulation to the muscles involved [20] or authors indicated better results for the explosive strength of the upper limbs [13]. However, some aquatic fitness programs were not adequate to produce a significant increase in strength and power in older women [21]. This can determine different types of training fitting the purpose of individual training sessions (chest, shoulder, and dorsal region, arm and forearm, lower limbs, and abdominal muscles). Furthermore, the stimulus intensity should be adequate to induce changes; however, there are no accurate guidelines and indications in the literature concerning aquatic training.

**Conclusions**

Our findings indicated that aqua pilayoga can improve some health parameters better and faster than in other sports. This is probably related to the specificity of the aquatic environment (buoyancy, density, resistance force, or waves) and physical exercise in water.

The present findings indicate that a 12-week water aqua pilayoga training program with two sessions a week for 60 min per session helps progressively improve explosive strength, especially of the upper limbs. It also reduces body fat mass. However, it does not appear to cause significant changes in the muscle mass of older adults. Furthermore, in a real-life environment, training sessions for older adults tend to be characterized by low intensity, which could possibly provide valuable data for experts and scientists. Sessions should be prescribed and performed at sufficient intensity to optimize the stimulus, especially for strength exercises. Further high-quality research with ecological validity should be performed to better determine the ef-
fects of the methods implemented and to optimize the benefits of this physical activity, which is increasingly practiced today.

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Conflict of Interest
All authors confirm that they have no financial benefit or gain from the reported work and that they have no conflicts of interest to report.

References:


Author for correspondence

Katarzyna Kucia
ORCID: 0000-0002-3510-0277
Affiliation: Institute of Sport, Department of Water Sports, University of Physical Education, Cracow, Poland
E-mail: katarzyna.kucia@awf.krakow.pl