Effects of a 26-week shallow water head-out aquatic exercise program on the anthropometrics, body composition, and physiological response of healthy middle-aged women.

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The aim of this study was to assess the chronic adaptations (anthropometrics, body composition, physiologic) of the middle-aged women participating in a head-out aquatic exercise program for 26 weeks. Twenty-three healthy middle-age female subjects participated in a head-out aquatic exercise program (26 weeks, two sessions per week, and 40 minutes per session). Data was collected before starting the program (pre-test), at the 13th week (post-test 1) and at the 26th week (post-test 2). Anthropometrical data included body mass, body mass index and several anatomical perimeters. Body composition was assessed measuring several body skinfolds. Physiological measures included the resting heart rate, systolic, diastolic and mean blood pressures. The body mass and the body mass index presented non-significant improvements throughout the program. On the other hand, subjects improved their body composition, decreasing fat mass. Main improvements happened in the first 13 weeks, since most variables did not present significant improvements between the post-test 1 and post-test 2. As a conclusion, a head-out aquatic exercise program with 26 weeks promotes a significant improvement in the anthropometrics, body composition and physiological response of healthy middle-age women.

Introduction

Research about head-out aquatic exercise can focus on acute or chronic responses. Chronic adaptations represent the accumulation of acute responses during each aquatic session. To promote these cumulative effects of acute responses over time, the use of appropriate means and methods of work during the sessions (i.e., mode or type of exercise, frequency of participation, duration of each exercise bout, and intensity of the exercise bout) are warranted (Barbosa et al., 2009). Aerobic capacity, body composition, flexibility, muscular strength and endurance are monitored on a regular basis to assess chronic adaptations (Wilmore & Costill, 1994).

One trend of research regarding this topic is the effect of a head-out aquatic exercise program in elderly subjects with an injury or pathology and even physically challenged. However, a small quantity of research is done with middle-aged healthy women, although they are a large part of the persons participating in head-out aquatic exercise sessions.

The aim of this study was to assess the chronic adaptations (anthropometrics, body composition, physiologic) of middle-aged women participating in a head-out aquatic exercise program during 26 weeks. It was hypothesized there would be a significant improvement in the anthropometrics, body composition and physiological response throughout the exercise program.

Methods

Subjects: Twenty-three middle-age women (47.6 ± 10.1 years-old; 160.4 ± 1.7 cm of body height) participated in the head-out aquatic exercise program. None of the subjects were involved in any other fitness program during the research. Subjects were asked to maintain their daily routines. Subjects reported no previous history of orthopedic or muscle-skeletal injuries in the previous six months. All procedures were in accordance with the Declaration of Helsinki with respect to human research. The Institutional Review Board of the Polytechnic Institute of Bragança approved the study design. Women were informed of the experimental risks and signed an informed consent document before the investigation.

Head-out aquatic exercise program: The head-out aquatic exercise program had 26 weeks and followed the main Aquatic Exercise Association guidelines (Aquatic Exercise Association, 2008). The program included two sessions per week, with 40 minutes of duration each. All sessions were conducted in a shallow water swimming pool, immersed to the xiphoid process. Music cadence ranged between approximately 125-150 bpm and exercises were cued to be most of the time performed at water tempo. In some sessions, rubber bands, buoyancy and drag equipment were used. Sessions were structured taking into account the technical literature (Kinder and See, 1992) starting with a warm-up (5 minutes), followed by cardio-respiratory conditioning (20 minutes), muscle strength conditioning (10 minutes) and, stretches and/or cool down (5 minutes). Subjects participated in 80.1 ± 10.1 % of the sessions.

Data Collection

Data was collected before starting the program (pre-test), at the 13th week (post-test 1) and at the 26th week (post-test 2). Anthropometrical data included the measurement of the body mass (BM) in the upright position with a digital scale (SECA, 884, Germany). Body mass index (BMI) was computed as BMI=body mass/height2. The chest, waist, hip, lower leg and brachial perimeters were measured with a flexible anthropometrical tape (RossCraft, Canada). For body composition assessment, a skinfold caliper (Harpenden, RossCraft, Canada) was used to measure the triceps, subscapular, abdominal, germinal skinfolds and the sum of the triceps plus the subscapular skinfolds with the subjects in the specific anatomical position. Physiological measures included the resting heart rate (HRr), systolic (SBP) and diastolic blood pressure (DBP) (M4-I, Omron, Netherlands) with the subjects in a seated position. Mean blood pressure was calculated as MBP=DBP+[0.333x(SBP-DBP)] (Wilmore & Costill. 1994).

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Statistical Procedures

The normality of the distributions was assessed with the Shapiro-Wilk test. For descriptive analysis, box plots, including quartiles, were performed. Non-parametric Friedman test was used to compare each variable throughout the exercise program. Whenever a significant difference was verified, Pairwise Wilcoxon Rank Sum Tests were used to identify between each moment those differences happened. The level of statistical significance was set at $P \leq 0.05$.

Results and Discussion

Figure 1 presents a box plot of variables with significant changes. Significant differences were verified throughout the three evaluation moments in: (i) the brachial perimeter ($X^2(2) = 7.811$; $p = 0.02$) with significant decrease from pre-test to post-test 1 ($p = 0.03$) and post-test 2 ($p = 0.01$); (ii) waist perimeter ($X^2(2) = 7.634$; $p = 0.02$) with significant decreases from pre-test to post-test 1 ($p = 0.05$); (iii) hip perimeter ($X^2(2) = 15.367$; $p < 0.001$) with significant decrease between all evaluation moments; (iv) lower leg perimeter ($X^2(2) = 24.641$; $p < 0.001$) with significant decrease between all evaluation moments; (v) triceps skinfold ($X^2(2) = 9.566$; $p < 0.01$) with significant decrease between pre-test and post-test 1 ($p < 0.001$) and post-test 2 ($p< 0.01$); (vi) subscapular skinfold ($X^2(2) = 10.541$; $p < 0.01$) with significant decrease between pre-test and post-test 1 ($p < 0.01$) and post-test 2 ($p< 0.01$); (vii) abdominal skinfold ($X^2(2) = 13.390$; $p < 0.01$) with significant decrease between pre-test and post-test 1 ($p < 0.01$) and post-test 2 ($p< 0.01$); (viii) lower leg skinfold ($X^2(2) = 6.100$; $p = 0.05$) with significant decrease between pre-test and post-test 1 ($p = 0.01$) and post-test 2 ($p = 0.04$); (ix) the sum of triceps with subscapular skinfold ($X^2(2) = 18.396$; $p < 0.001$) with significant decrease between pre-test and post-test 1 ($p < 0.001$) and post-test 2 ($p < 0.001$); (x) the SBP ($X^2(2) = 8.000$; $p = 0.02$) with significant decrease between pre-test and post-test 1 ($p = 0.01$) and post-test 2 ($p < 0.01$) and; (xi) MBP ($X^2(2) = 12.568$; $p < 0.01$) with significant decrease between pre-test and post-test 2 ($p = 0.04$) and between post-test 1 and post-test 2 ($p = 0.01$). Remaining variables did not present significant improvements.

Comparing data between the pre-test and the pos-test 2 there was a significant improvement in body composition. However, main improvements happened in the first 13 weeks, since most variables did not present significant improvements between post-test 1 and post-test 2.

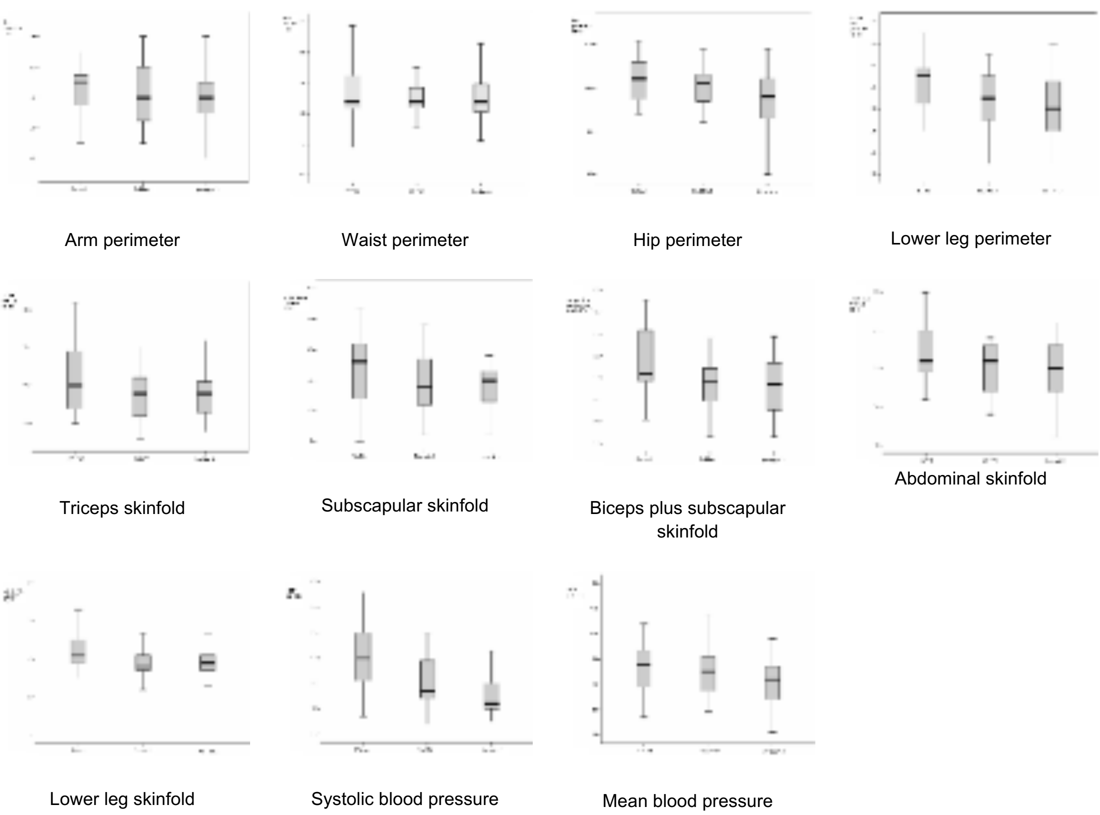

Figure 1. Quartiles of the variables with significant improvements throughout the program.

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Main anthropometrical variables selected (i.e., BM and BMI) presented non-significant improvements. On the other hand, subjects decreased slightly most of the anatomical perimeters but, mainly the skinfolds assessed. So, a non-significant change in the BM and BMI associated to a main decrease in the fat mass can be related to an increase of the lean mass, mainly of the muscle mass. Muscle mass was not considered in this manuscript. However, it should be included in future research. In the same way, the understanding of the co-variation between physical activity and food in-take should also be considered.

The SBP and the MBP presented significant improvements throughout the 26 weeks. In this sense, a half-year head-out aquatic exercise program has a significant effect in improving the cardio-vascular response of healthy middle-age women. Earlier observations have already suggested these exercise programs for subjects with a high blood pressure condition (Aoba, Hamai & Nomura, 2008).

Conclusions

As a conclusion, a head-out aquatic exercise program for 26 weeks promotes significant improvements in anthropometrics, body composition and physiological response of healthy middle-age women. Such improvements happened mainly in the first 13 weeks of the program. As a practical implication, instructors should design and conduct head-out aquatic exercise programs according to Aquatic Exercise Association guidelines for at least 13 to 26 weeks to promote significant body composition and physiological changes in middle-age women.

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