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The benefits of a high-intensity aquatic exercise program (HydrOS) for bone metabolism and bone mass of postmenopausal women.

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Date study completed: June 2011

Location: São Paulo city, São Paulo-Brazil

Objectives:

This study aimed to evaluate the chronic effects of a high-intensity aquatic exercise program on bone remodeling markers and bone mass of postmenopausal women.

Method:

In this randomized, controlled trial we studied 108 women (58.8±6.4 years), randomized into Aquatic Exercise Group (AEG), n= 64, performing 24 weeks of aquatic exercises, and Control Group (CG), n=44, sedentary. They had their fasting morning blood sample collected for the measures of Procollagen type 1 amino-terminal propeptide (P1NP) and Carboxy-terminal cross-linking telopeptide of type I collagen (CTX). Bone mass was measured by dual-energy X-ray absorptiometry before and after the intervention. Participants of both groups received a daily supplementation of 500mg of elementary calcium and 1,000IU of vitamin D (cholecalciferol).

Results:

Results showed an augment in bone formation marker (P1NP) only in the AEG (15.8%; p=0.001), and although both groups experienced significant enhancements in bone resorption marker (CTX), this increase was less considerable in the AEG (15% in the AEG and 29% in the CG). The femoral trochanter BMD presented a 1.2% reduction in the CG (p=0.009), whereas in the AEG no change was observed (p=0.069).

Conclusion:

The proposed aquatic exercise program was efficient in attenuating bone resorption elevation and enhancing bone formation, which prevented the participants in the AEG from reducing the femoral trochanter BMD, as happened in the CG.

Application to Practice:

For postmenopausal women that are certainly losing bone, the HydrOS program turned out to be an efficient non-pharmacological strategy to maintain femoral bone mass and positively stimulate bone metabolism.

Brasil Scales during water cycling maximal protocol.

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Location: University of Valencia, Valencia, Spain

Date study completed: 2013

Support: MundoHidroBrasil and Hydrorider®

Objective:

The purpose of this study was to examine the correlation between the Borg 6-20 rating of perceived exertion (RPE) and Brasil scales during water cycling maximal protocol.

Method:

Thirty physically active and healthy young men (age: 22.46 ± 2.35 years; body mass: 72.95 ± 7.77 kg; height: 176.93 ± 0.07 cm and body fat: $14.83 \pm 3.50\%$) volunteered to take part in the present study. Each subject took part in 2 data collection sessions: familiarization and protocol. All the instructions about the Borg 6-20 RPE and Brasil scales were explained to the participants. The subjects performed the water cycling maximal protocol at all effort levels progressively to familiarize them with the minimal effort and graduation until the maximal effort. The protocol started at a rate of 100 beats per minute for 3 minute with subsequent increments of 15 beats per minute every two minutes until exhaustion. Immediately following the end of each stage the overall body RPE was collected. The scales were visible to the subjects throughout the test session.

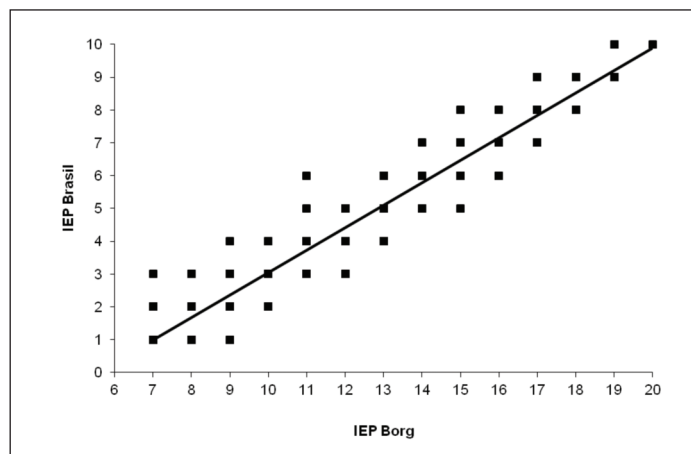
Results:

Spearman's rank correlation coefficient was used to check the level of relationship between Borg 6-20 RPE and Brasil scale during all effort of the water cycling maximal protocol. An alpha level of 0.05 was used for all statistical tests which were performed using SPSS software (version 15.0).

Conclusion:

Given the results of the present study, it can be concluded that the Borg 6-20 RPE and Brasil scales showed high relationship during all effort in the water cycling maximal protocol, especially because it was done with more volunteers. Thus, the Brasil scale can be safely used when prescribing the intensity of the water cycling modality for young men.

Figure 1: IEP Brasil x IEP Borg $r=0.96$ $p < 0.001$



Keywords: water cycling, maximal protocol and rating of perceived exertion

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Effects of aquatic exercise on gait parameters in older adults with knee osteoarthritis.

Cameron Lievense, Gioella Chaparro, Konstantinos Vrongistinos, Mai Jara, and Taeyou Jung

Date Completed: April 1, 2013

Location: Center of Achievement, California State University Northridge

Objective:

To examine the effects of aquatic exercise on gait parameters in older adults with knee osteoarthritis.

Methods:

Fourteen individuals with knee osteoarthritis (Mean age 74 ± 14 ; 13 females, 1 male) were recruited and randomly assigned to an aquatic exercise or land-based exercise control group. Each exercise group performed 45 minutes of similar exercise components three times a week for 12 weeks. Pre and post-intervention gait data were collected from fastest walking trials on an 8-meter carpeted walkway using a 3D motion analysis system (Vicon Motion Systems, Inc., OMG Plc.). Dependent variables consisted of spatiotemporal and lower extremity kinematics in the hip, knee and ankle joints.

Results:

MANOVA showed a significant group interaction in hip flexion ($p=.017$) and stride length ($p=.017$) in the aquatic-based exercise group compared to land-based exercise group. Within group analyses revealed significant increases in walking speed and cadence in aquatic group and increased cadence in land group after 12-week intervention ($p < .05$).

Conclusion:

Our findings suggest that aquatic exercise programs can be beneficial for older adults with knee OA to improve these effects by significantly improving hip joint ROM. Although some effects of exercise (increased hip flexion and stride length) improved after aquatic exercise when compared to land, it is unclear whether or not aquatic exercise is a better alternative to land exercise.

Clinical Application:

Aquatic exercise can be clinically significant in enhancing hip movement strategies associated with efficient ambulation while keeping pain and stress in arthritic joints under control.

Comparison of the effectiveness of exercises practiced in and out of the water on the knee muscle strength of women with rheumatoid arthritis: a randomized, controlled 16-week intervention – The Hydrotherapy in Rheumatoid Arthritis (The HydRA trial)

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Date study completed : november 2012

Location: São Paulo city, state of São Paulo-Brazil

There are many controversies concerning exercise prescription for patients with rheumatoid arthritis (RA), due to disability and greater risk of injury in chronically inflamed joints. Additionally, little is known about the effectiveness of exercises performed in the aquatic environment without the concomitant use of equipment to overload and promote the increase of muscle strength (MS).

Objective:

To compare the peak torque of knee extensor muscles in exercises performed in and out of the water, following a 16-week intervention in women with RA, as well as to verify changes of disease activity, functional capacity and body composition between interventions.

Methods:

133 women with RA (ACR, 1987), 40-65 years of age were included in this randomized, blinded, prospective 16-week controlled clinical trial. Patients with intense disease activity (DAS-28 > 5.2) and functional class III and IV were not included. Participation in a rehabilitation program or physical activity in the past three months prior to randomization was not allowed. Individuals with circulatory problems, lower limb ulcers or other untreated skin lesions were excluded. Three groups were randomized: water (GW, N = 33) and land (GL, N = 33) to perform exercises in and out of water, respectively, and control (GC, N = 34), without any physical activity. All groups were evaluated at three time periods: before randomization (T0), after eight (T8) and 16 (T16) weeks of intervention. Muscle Strength (MS) was measured with an isokinetic dynamometer. Disease activity (DAS-28) and functional capacity (HAQ) were measured by the same rheumatologist. Total body bone densitometry (DXA) was used to assess body composition. Intervention was performed three times per week for 16 consecutive weeks, totaling 48 sessions, conducted by a physical education professional. Compliance, concomitant medications and adverse events were recorded through a spreadsheet in each session. Data were analyzed by intention to treat (ITT). ANOVA was used to detect the difference in lower-limb MS and other outcomes

of the study with normal distribution. The statistical package SPSS/PC for Windows, version 15, was used for processing, analysis and production of all models of analysis. For all analysis, a significance level $p < 0.05$ was set.

Results:

Out of the initial 133 recruited patients, 100 were randomized and 82 completed the study. In the first evaluation, the three groups were homogenized for age, body composition, functional capacity, MS and concomitant medications. After 16 weeks of intervention there was no significant change in body composition between the three groups. There was a significant reduction in disease activity and improvement in functional capacity in GW after 8 and 16 weeks. There was no modification of the doses of concomitant medications. GW showed lower consumption of nonsteroidal anti-inflammatory drugs after 8 weeks. We found that GW showed significantly better compliance to the intervention and lower adverse event reporting than GL or GC at 16 weeks. Eighteen patients (18%) were discontinued from the study. The main reason was poor adherence to the exercise program, especially in GL. Concerning the MS of knee extensors of the right knee, after 16 weeks there was a clinical improvement by 7.12% in the GW, 0.18% in the GL and a decrease by 3.4% in the GC, although these results did not reach statistical significance (GW x GL x GC $p = 0.25$).

Conclusion:

Due to the activity of the disease participants could not execute movements in water at high speed, which prevented the clinical improvement in MS of knee extensor to be statistically significant. However, the HydRA program provided significant improvement in the general state of the participants, with a significant reduction in the disease activity and pain, together with an enhancement in the functional capacity of the studied women with RA.

Keywords: rheumatoid arthritis, muscle strength, body composition, physical activity, aquatic exercise, hydrotherapy.

A Five Year Comparison of Professionalism in the Aquatic Exercise and Therapy Profession

Dr. Kim Beason, CPRP; Kristopher Brasher, CTRS, CPRP; Mary Wheat, CTRS, CPRP; and James Lee, M.A.

Study Completed: July 2012.

Location: The University of Mississippi; Subjects from the membership of the Aquatic Exercise Association and Aquatic Therapy Research Institute

Objective:

Professionalism and credentialing are important issues facing the field of aquatic exercise and therapy. Credentialing sets minimum standards of practice within the aquatic industry while professionalism explains how individuals carry out their roles and responsibilities related to their job competencies; specifically as aquatic exercise and/or therapy practitioners. Both are essential to building a profession. This poster presents the findings of a study that provides a 5 year comparison of aquatic exercise and therapy practitioner's level of professionalism.

Method:

In 2006, a study was completed that examined the attitudes and behaviors regarding professionalism among aquatic professionals that were members of the Aquatic Therapy Research Institute. In 2010-11 researchers re-surveyed the field including members of the Aquatic Exercise Association using the same instrument to determine if significant differences in professionalism occurred. During 2010-11, 632 aquatic professionals completed the Professionalism and Credentialing survey including 417 former or currently certified AEA members and 156 former or currently certified ATRI members. Of the 288 ATRI professionals who participated in 2006, 153 participated in 2011-12 (57.6 percent). The AEA and ATRI provided membership email lists and promoted taking the survey in association emails and newsletters.

Professionalism was assessed and measured using an inventory that included questions related to practitioner attitudes toward professional development and credentialing provided by professional aquatic exercise and therapy associations. The survey had been determined to be reliable and valid in past studies ($\alpha = .88$).

Eight subcategories of aquatic professionalism were assessed: 1) sense of calling, 2) autonomy, 3) indispensable service, 4) peers as referents, 5) peers as judges of competence and performance, 6) ethics, 7) professional associations and continuing professional education, and 8) certification. Each participant completed the 37 professional inventory questions including 25 personal professional inventory questions and 12 related to how professional associations contribute to professionalism. All questions were measured by a likert-type scale of 1 to 5 (1-corresponds very well with your own attitude and/or behavior to 5-corresponds very poorly). Scores that were closer to 1 reflected a higher level of professionalism.

Results:

The eight categories used to measure professionalism are found in Table One, a comparison between Professionalism reported by ATRI members in 2006 and 2011. (See Table One on page 8)

Scores were lower, indicating a greater amount of agreement and therefore higher professionalism score for all categories and significantly ($p < .05$) higher professionalism for the categories Sense of Calling, Peers as Referents, Ethics, Professional Association and Continuing Education, and Certification. Overall there was a significant increase in Professionalism between 2006 and 2011-12.

Then Aquatic Exercise Association members were compared to the ATRI membership and the 2006 cohort. The results are presented in Table Two. Both the AEA and ATRI 2010-11 cohorts demonstrated higher professionalism scores for all eight subcategories except Peers as Judges of Competence and Performance where the 2006 Cohort scored higher levels than the 2010-11 AEA cohort. Several interesting differences in professionalism scores were noted between the AEA and ATRI Cohort. The ATRI Cohort scored significantly ($p < .05$) higher subcategory scores for Peers as Judges of Competence and Performance, Ethics, Professional Association and Continuing Professional Education, and Certification. No significant difference was found in the overall Mean Professionalism Score. (See Table Two on page 8)

Conclusion:

Aquatic therapists, many whom are licensed (PT/OT), displayed several significantly higher professionalism sub-category scores than aquatic exercise professionals. This is not surprising when one considers the additional amount of education, training, and continuing education needed to maintain licensure. Peers as judges of Competence and Performance, Ethics, Professional Association and Continuing Professional Education and Certification should be higher for a group that includes licensed practitioners. Aquatic exercise professionals have benefited from training sponsored and provided by professional associations like the AEA and ATRI. Based on past research, increased competency is associated with higher Professional Association and continuing Professional Education scores; evidenced by the significantly higher score over the past five years.

(Continued on page 8)

Application to Practice:

Between 2006 and 2010-11 professionalism among aquatic exercise and therapy professionals significantly increased overall. As aquatic exercise and therapy professionals continue to attend education and training sponsored by professional associations, utilize evidence-based exercise and therapy regimen and maintain related certifications the professionalism scores are expected to increase. Moreover,

practitioners, professional associations, and advocates of aquatic exercise and therapy should be encouraged by their efforts to build an aquatic exercise and therapy profession. Clearly the professionalism components measure by this study show professionalism has moved forward over the past 5 years.

Table One: 5 Year Difference in Professionalism Mean Scores of ATRI Members.

Sub-measures of Professionalism	2006 Mean	2011 Mean	Sig. (2-tailed)
Sense of Calling	2.57	2.49	.035
Autonomy	2.87	2.81	.206
Indispensable Service	3.12	3.05	.249
Peers as Referents	2.61	2.49	.006
Peers as Judges of Competence and Performance	2.74	2.68	.201
Ethics	2.14	1.97	.004
Professional Association and Continuing Professional Education	2.02	1.57	.000
Certification/Licensure	3.05	2.73	.000
Overall Mean Professionalism Score (total of 37-item questionnaire)	2.66	2.54	.000

Table Two: Comparison of Professionalism Mean Scores of 2006 ATRI Cohort, 2011-12 ATRI Members and 2011-12 AEA Members.

Sub-measures of Professionalism	2006 ATRI	2011 ATRI	2011 AEA
Sense of Calling	2.57	2.49	2.51
Autonomy	2.87	2.81	2.75
Indispensable Service	3.12	3.05	3.04
Peers as Referents	2.61	2.49	2.48
Peers as Judges of Competence and Performance	2.74	2.68*	2.81
Ethics	2.14	1.97*	2.12
Professional Association and Continuing Professional Education	2.02	1.57*	1.71
Certification/Licensure	3.05	2.73*	.3.05
Overall Mean Professionalism Score (total of 37-item questionnaire)	2.66	2.54	.2.61

**between 2011 ATRI & 2011 AEA ($P < .05$)

The effects of a single AquaStretch™ session on lower extremity range of motion.

Authors: Lori A. Sherlock, M.S. & George Eversaul, A.P.H.

Date Study Completed: December, 2012

Location: West Virginia University

Objective:

AquaStretch™ is a novel aquatic technique reported to improve many aspects of function and performance. The technique is described as a myofascial release technique using intuitive movement and facilitator-assisted stretching. Clinicians have been using AquaStretch™ and reporting a wide array of clinical benefits, though no research currently exists on the technique. This project provides practitioners with valuable, research-based information on the effect of AquaStretch™ on lower extremity range of motion (ROM).

Methods:

Participants in this study were asked to come to the West Virginia University Student Recreation Center or E. Moore Hall pool. The study was explained and written informed consent was obtained. Both aquatic facilities being utilized for this project are maintained at 85°-90° and vary in depth to allow for water depth to be maintained during the sessions regardless of participant height. The participants met with a trained AquaStretch™ practitioner and were taken through a series of range of motion measurements using a goniometer. Measurements include: ankle plantar and dorsiflexion, knee flexion and extension, hip flexion and extension, and hip internal and external rotation. All measurements were obtained by an individual trained in goniometry. Immediately following the range of motion measurements, participants were taken through a 20-30 minute AquaStretch™ session. The same range of motion measurements were then taken immediately following the AquaStretch™ session.

Results:

Pre and post measurements were obtained from 35 participants (n = 35) and then compared. Though ROM increased in all variables measured, 4 of the ROM measurements were found to be statistically significant pre-to-post AquaStretch™. Left foot dorsiflexion (p = 0.0006), right foot plantar flexion (p = 0.0023), left hip extension (p = 0.0057), and right hip extension (p = 0.0226).

Conclusions:

A single 20-30 minute session of AquaStretch™ results in positive gains in ROM in the lower extremity with statistically significant improvements in left foot dorsiflexion, right foot plantar flexion, and both left and right hip extension. Individuals with reductions in lower extremity ROM may experience improvements in lower extremity ROM from a single 20-30 minute session of AquaStretch™.

Application to Practice:

A single 20-30 minute session of AquaStretch™ may provide improvements in lower extremity ROM with particular benefit to dorsiflexion, plantar flexion and hip extension. Restrictions in ROM have posed a serious clinical issue for a variety of populations. These restrictions can often lead to reduced ability levels to complete necessary activities of daily living as well as recreational activities. Improvements in lower extremity ROM with a short, non-invasive AquaStretch™ session may assist in returning greater function to these individuals.

The plyometric aquatic training and the answers associated to strength and power of lower body in elderly women.

Isabella Cavalcanti¹, Luciano Alonso Santos^{1, 2}, Antonio Michel Aboarrage Jr.², Jônatas Silveira¹, Paulo Dantas¹, José Carlos Gomes da Silva¹

1 – Federal Rio Grande do Norte University.

2 – University Center of Rio Grande do Norte.

Objective:

The objective of this study is to compare the effectiveness of traditional aquatic fitness classes and plyometric aquatic training using the NINOMAXX Aquatic Systems by comparing lower extremity strength and power.

Method:

30 elderly women, between the ages of 60 and 75 were divided in to two groups: a plyometric training group and a traditional aquatic fitness training group. Both groups had at least six months experience with aquatic exercise. All participants completed an Up and Go test (Rikli e Jones, 2008) and contact carpet test (Jump System Pro) in the beginning and at the end of the study.

Results:

Both groups showed similar results in functional efficiency in lower body. The plyometrics group showed greater improvements in the jump test.

Conclusion:

The NINOMAXX AQUATIC SYSTEMS shows greater improvements in power in lower body compared to traditional water fitness programs.

Effects of aquatic exercise on body composition and gait fitness in obese elderly women in accordance with different water depths.

Sung-Sun, Kang: Jae-Jung, Kim: Jae-Moo, So
Konkuk University

Objective:

The purpose of this study was to examine the effects of exercises performed in deep and shallow water on body composition and gait fitness in obese, elderly women.

Methods:

The participants consisted of 22 obese, elderly women aged 60-70 years with greater than 30% body fat. The participants were equally divided into two groups: aquatic exercise in deep water (n=11) and aquatic exercise in shallow water (n=11). Each group performed exercise in their assigned water depth for 50 minutes, twice weekly, for 16 weeks. Measurements were taken for body composition via Inbody 3.0. Variables related to gait fitness (lower extremity muscular strength, endurance, flexibility, agility, and static balance) were assessed.

Results:

Body fat percent and SMM for both groups improved significantly after exercise, compared to measurements before exercise. Muscular endurance, agility and dynamic balance of lower limbs improved in the deep water, and lower body flexibility and balance improved in the shallow water.

Conclusion:

If training variables are composed appropriately for deep and shallow water when planning aquatic exercise programs, improvements can be expected for body composition and gait fitness for obese elderly women.