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Response of aquatic activities on levels of grip strength, muscle power, and lower body strength in elderly women.

Francisco Ozinaldo de Oliveira², Antonio Michel Aboarrage Jr.², Paulo Dantas¹, José Carlos Gomes da Silva¹.

Contact: Antonio Aboarrage Email: ninousa@hotmail.com
Location: Brazil

Across the globe individuals are prolonging their lifespan resulting in an ever growing elderly population. With the expansion of the aging population, the necessity of maintaining or improving an individual’s independance is paramount. Several factors have been known to contribute to the level of physical independance an individual possesses, with one of the primary factors being physical activity level. It is well documented that many older individuals possess physical limitations that restrict them from participating in certain types of physical activity. It has therefore been recommended that low impact activities, such as water exercise, be utilized to develop the older adult’s fitness level. Though aquatic exercise has been considered an advisable option for this population, some studies have not found statistically significant improvements in the fitness parameters tested.

Objective:
The present study aimed to determine the influence of a specific aquatic training program (Hydrotreinamento) on muscle power, grip strength, and lower body strength in elderly women.

Methods:
The study participants were comprised of 14 women between the ages of 60-74 years (66.8 ± 5.4) that had not participated in Hidrotreinamento for at least two months prior to the beginning of the study. Preliminary testing consisted of BMI (height and weight), hand grip (palm) test (grip strength), sit to stand (lower body muscular strength) (Rikle and Jones, 1990), vertical jump (muscular power). After the preliminary testing, the participants took part in an 8 week intervention consisting of 24 aquatic exercise session in water that was 82.4- 86°F (28-30°C) and 5 feet (1.50m) deep. Each aquatic exercise session was comprised of a 15 minute warm up, 25 minute strength and plyometric (150 contacts) exercise session, and concluded with 5 minutes of stretching and relaxation exercises. At the conclusion of the intervention, the study participants were retested using the same procedures.

Results:
The study results show a statistically significant improvement in all variables studied. Significant improvements in grip strength, muscle power, and lower body muscular strength were all observed when comparing pre- and post-tests. (See tables at the right)

Conclusion:
It was therefore concluded that the aquatic exercise intervention (Hydrotreinamento) improved grip strength, muscle power, and lower body muscular strength all of which are related to improvements in physical independence.

Relative strength of the lower body in elderly women, before and after the implementation of the program hydrotreinamento.

Absolute power of the lower body in elderly women, before and after the implementation of the program hydrotreinamento.

(Continued on page 5)
Number of repetitions of the sit and stand test in elderly women, before and after the implementation of the program hydrotreinamento.

![Bar chart showing the number of repetitions before and after the program.](chart1)

Strength of right and left handgrip, and older women, before and after the implementation of the program hydrotreinamento.

![Bar chart showing the strength of handgrip before and after the program.](chart2)
Objective:
The control of the workout intensity in head-out aquatic exercise programs is a key-factor for its effectiveness. One way to promote changes in acute physiological responses is through musical cadence. It was reported that increases in musical cadence leads to increases in the acute physiological responses\(^1, 2\). The main aim of this study was to develop a target zone and a feasible way to control the intensity of exertion in head-out aquatic exercises.

Methods:
Thirty-seven women were split in Elderly Group (EG, \(n=18, 65.06\pm5.77\text{-y}\)) and Young Adult Group (YAG, \(n=19, 22.16\pm2.63\text{-y}\)) and underwent an intermittent and progressive protocol of \(N_i \times 6\text{-min} (3 \leq N_i \leq 8)\) from 90 bpm to 195 bpm performing the head-out aquatic exercise “rocking horse”\(^2\). Rate of Perceived Exertion (RPE), heart rate (HR) with a heart monitor (Polar RS200, Kempele, Finland), oxygen uptake (\(V_{O_2}\)) and energy expenditure (EE) with a metabolic cart (Metalyzer 3B, Cortex Biophysik, Leipzig, Germany) were assessed. The individual metabolic equivalent of task (MET) was calculated for each participant measuring the \(V_{O_2}\) and thereafter its value divided by the value at rest \(^3\). To compare with ACSM’s guidelines, the percentages of \(V_{O_2}\) reserve (%\(V_{O_2}\text{res}\)) were also calculated. For that, \(F_{C\text{max}}\) was estimated using the formula proposed by Tanaka et al. \(^4\):

\[
HR_{\text{max}} = 208 - 0.7 \times \text{age} \quad (1)
\]

The %HR\(_{\text{res}}\) was calculated for the last step of the protocol as:

\[
\%HR_{\text{res}} = \left( \frac{HR_{\text{peak}} - HR_{\text{rest}}}{HR_{\text{rest}}} \right) \times 100 \quad (2)
\]

The %\(V_{O_2}\)\(_{\text{res}}\) elicited in the last step was determined having as an assumption that during exercises \(\%FC_{\text{res}} = \%V_{O_2}\text{res}\)\(^5, 7\). Thereafter the \(V_{O_2}\text{max}\) was extrapolated. Remaining %\(V_{O_2}\)\(_{\text{res}}\) were calculated as:

\[
\%V_{O_2}\text{res} = \left( \frac{VO_{2\text{peak}} - VO_2_{\text{rest}}}{VO_{2\text{rest}}} \right) \times 100 \quad (3)
\]

The regression models between musical cadence and each of the physiological variables were computed. The quality of the models was checked with coefficient of determination and standard error of the estimation. Thereafter, it was calculated by interpolation the lower and upper limits of each zone, according to the ACSM guidelines\(^8\): (i) light intensity \((20 \leq %V_{O_2}\text{res} \leq 39)\); (ii) moderate \((40 \leq %V_{O_2}\text{res} \leq 59)\); (iii) hard \((60 \leq %V_{O_2}\text{res} \leq 84)\); (iv) maximal \((85 \leq %V_{O_2}\text{res} \leq 100)\).

Results:
All variables showed significant and strong relationships with the %\(V_{O_2}\)\(_{\text{res}}\) (EG: 0.79\( \leq R^2 \leq 0.90\), \(P<0.001\); YAG: 0.75\( \leq R^2 \leq 0.96\), \(P<0.001\)). Table 1 shows the target zones of each selected variable to control different levels of exertion according to the interpolations outputs.

Table 1. Target zones for head-out aquatic exercises of elderly (EG) and young adults (YAG).

<table>
<thead>
<tr>
<th>%(V_{O_2})(_{\text{res}})</th>
<th>RPE</th>
<th>%HR(_{\text{res}})</th>
<th>MET (kcal·kg(^{-1})·min(^{-1}))</th>
<th>EE</th>
<th>Music cadence (bpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{Maximal / Very Hard} )</td>
<td>(100)</td>
<td>18</td>
<td>19</td>
<td>90</td>
<td>96</td>
</tr>
<tr>
<td>(85)</td>
<td>16</td>
<td>17</td>
<td>77</td>
<td>82</td>
<td>6.7</td>
</tr>
<tr>
<td>(\text{Hard (vigorous)} )</td>
<td>(84)</td>
<td>16</td>
<td>17</td>
<td>76</td>
<td>81</td>
</tr>
<tr>
<td>(60)</td>
<td>13</td>
<td>14</td>
<td>54</td>
<td>58</td>
<td>5.1</td>
</tr>
<tr>
<td>(\text{Moderate} )</td>
<td>(59)</td>
<td>13</td>
<td>14</td>
<td>53</td>
<td>57</td>
</tr>
<tr>
<td>(40)</td>
<td>11</td>
<td>12</td>
<td>36</td>
<td>38</td>
<td>3.8</td>
</tr>
<tr>
<td>(\text{Light} )</td>
<td>(39)</td>
<td>11</td>
<td>11</td>
<td>35</td>
<td>37</td>
</tr>
<tr>
<td>(20)</td>
<td>8</td>
<td>9</td>
<td>18</td>
<td>19</td>
<td>2.6</td>
</tr>
</tbody>
</table>
| \(\text{Continued on page 7}\)
Conclusion:
The main conclusion is that musical cadence is a feasible and straightforward way to control the intensity of exertion in head-out aquatic exercises and can be associated to other physiological parameters.

Application to Practice:
Table 1 can be used as rule of thumb to control in a more accurate way the intensity of exertion in head-out aquatic exercises for both elderly and young adults. If a moderate/vigorous intensity is needed to have an effect on cardiovascular fitness, instructors should select music cadences between 91 and 169bpm for elderly and 108 and 202bpm for young adults.

References:
**Comparison of heart rate and perceived exertion during a maximal exercise protocol performed in aquatic bike and aquatic elliptical.**

Diego Magalhães¹,², Roxana M. Brasil²,³,⁴, Mauricio Nigri², Renato Paiva², Jamile Almeida², Ana Cristina Barreto³ and Vicente Lima¹.

¹Bennett Metodist University Center, Rio de Janeiro, Brazil
²Velox Fitness Gym Facility, Rio de Janeiro, Brazil
³Department of Physical Education and Sports, University of Valencia, Valencia, Spain.
⁴Laboratory of Physical Activity and Health
⁵Celso Lisboa University, Rio de Janeiro, Brazil

Contact: Roxana Brasil  Email:roxanabrasil@gmail.com
Location: Botafogo Club and Velox Fitness Gym Facility, Rio de Janeiro, Brazil
Date study completed: 2013

**Objective:**
The purpose of this study was to compare heart rate and subjective perceived exertion during a maximal exercise protocol performed on an aquatic bike and an aquatic elliptical.

**Method:**
Seven physically active and healthy young men volunteer athletes of swimming and waterpolo (20.12 ± 2.10 years of age, body weight 81.76 ± 7.46 kg, height 182.93 ± 7.53 cm, 9.52 ± 2.43% BF, HR rest land 68.00 ± 8.00 bpm and HR rest water 66.00 ± 6.00 bpm) took part in the present study. Each subject took part in 3 data collection sessions: familiarization and 2 protocol. All the instructions about the Borg 6-20 RPE and Brasil scales were explained to the participants. The subjects performed the water 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 (b.min⁻¹) for 3 min with subsequent increments of 15 b.min⁻¹ every two minutes until exhaustion. Immediately following the end of each stage the overall body RPE was collected and also the heart rate. The scales were visible to the subjects throughout the test session with both types of equipment. The volunteers underwent a draw so there would be a random feature, thus some realized the full protocol in aquatic bicycle; while others performed the same protocol in elliptical alternately. The water temperature was maintained between 28 and 29°C.

**Statistics:**
The descriptive analysis was delineated by estimates of central trend (average and medium) and of dispersion (shunting line standard and coefficient of variation). The inferencial analysis included the Shapiro-Wilk test and to analyze the differences between the modalities the test of variance analysis (Factorial Anova). For verification of the possible differences the Bonferroni post hoc test was applied. The study admitted level of significance of p<0.005.

**Results:**
Figure 1 shows the HR response between the bike and the elliptical from rest to maximum effort. Mean values were significantly higher (p = 0.00, <0.05) in the cadence of 110 bpm (125.75 ± 12.85 bpm x 105.12 ± 13.18 bpm); 115 bpm (143.75 ± 13.95 bpm x 113.55 ± 11.40 bpm); 130 bpm (162.00 ± 7.85 bpm x 143.87 ± 14.31 bpm); 145 bpm (179.37 ± 6.23 bpm x 115.80 ± 10.50 bpm) in elliptical exercise when compared to the bicycle, respectively. However, subjects performed physical exercise cadences of 175 bpm (173.25 ± 8.13 bpm) and 190 bpm (181.00 ± 8.86 bpm) only on the bike.

Figure 2 on page 9 shows the response of Brasil Scale when subjects exercised on the bike and elliptical. Here, it is observed that the cadences of 145 bpm (8.51 ± 1.51 x 5.37 ± 1.71) and 160 bpm (9.33 ± 1.15 x 6.27 ± 1.76) the values were significantly higher in comparison to the elliptical bike, respectively.

(Continued on page 9)
Figure 3 shows the response of the Borg Scale when subjects exercised on the bike and elliptical. Here, it is noted that the cadences of 130 bpm (13.2 ± 1.68 x 10.75 ± 1.77), 145 bpm (16.75 ± 2.37 x 13.75 ± 2.31) and 160 bpm (20.00 ± 2.64 x 15.62 ± 2.66) values were significantly higher in elliptical exercise when compared to the bicycle, respectively.

Conclusion and Application to Practice:
From the results it can be suggested that the elliptical induces a higher overload when compared to exercises performed with the same intensity on a bicycle. Thus the proper choice of equipment is the key to better use of classes.

References:
A profile of total body weight and body mass index in women practitioners of aquatic exercises in the city of Rio de Janeiro, Brazil, during pregnancy.

Renata Tarevnic¹, Roxana M. Brasil²,³, Ana Cristina Barreto³, and Jefferson Novaes¹.
¹ Federal University of Rio de Janeiro, Brazil
² Department of Physical Education and Sports, Laboratory of Physical Activity and Health, University of Valencia, Valencia, Spain.
³ Celso Lisboa University, Rio de Janeiro, Brazil

Contact: Renata Tarevnic Email: renata@hidrogestante.com
Location: Federal University of Rio de Janeiro, Rio de Janeiro, Brazil
Date study completed: 2014

Objective:
The purpose of this study was to compare the body mass index (BMI) and total body weight gain (TBWG) throughout pregnancy (gestational moment) in women who participated in a specific program of aquatic exercises (AE).

Method:
The study of longitudinal section was developed with 12 pregnant women (age = 32.0 ± 2.4 years, total body weight = 63.2 ± 4.9 kg, height = 0.04 ± 1.6 cm, BMI = 23.0 ± 2.0 kg/m²). The subjects performed a specific program of aquatic exercises for six months, three times a week per 45 minutes. Total body weight and height were evaluated: before training (between 17th and 24th gestational week), during training (between the 25th and 32nd gestational week) and after training (between 33rd and 40th gestational week). The statistical procedure was performed using descriptive analysis with average, median, standard deviation, standard error and coefficient of variation and inferential analysis was used to test the uniformity of Shapiro-Wilk and comparisons of variables by analysis of variance (ANOVA one way) with post hoc Fisher test. The study admitted α = 0.05 level of significance.

Results:
From the results it was observed that total body weight (TBW) between moments before (67.57 ± 6.69 kg), during (71.29 ± 8.06 kg) and after (74.19 ± 7.86 kg) of the AE program showed no significant difference (p = 0.17, > 0.05). The BMI variable also showed no statistically significant difference (p = 0.06, > 0.05) when comparing the three moments (24.65 ± 2.45, 26.02 ± 2.92, 27.09 ± 3.02, respectively). The TBWG over the weeks gestation showed an increasing trend between moments before (4.29 ± 3.96); during (7.67 ± 5.52) and after (10.82 ± 5.48), however the results were not significantly different (p = 0.06; > 0.05).

(Continued on page 11)
Conclusion:
After the program of AE it was observed that there were no significant changes in TBW, BMI and TBWG over the pregnancy weeks. It may be suggested that the activities in the AE program could help in controlling the TBWG over the gestational weeks.

Application to Practice: An AE program could help with the control of weight gain in pregnant women.

References:
Correlation between double (rate-pressure) product and perceived exertion on aquatic bicycle during maximal protocol.

Lais L. Tavares¹, Roxana M. Brasil²,³, Maria F.A. Falci¹, Jonas A.N. Martins⁴, Ana C. Barreto³ and Selva M.G. Barreto¹.

¹ Federal University of Juiz de Fora, Minas Gerais, Brazil.
² Department of Physical Education and Sports, University of Valencia, Valencia, Spain.
³ Celso Lisboa University, Rio de Janeiro, Brazil.
⁴ President Tancredo de Almeida Neves Institute, Minas Gerais, Brazil.

Contact: Roxana Brasil Email: roxanabrasil@gmail.com
Location: Federal University of Juiz de Fora, Minas Gerais, Brazil.
Date study completed: January 2014

Objective:
The purpose of this study was to examine the correlation between double product (rate-pressure) and perceived exertion on aquatic bicycle during maximal effort protocol.

Methods:
Twelve physically active and healthy young volunteers (six men: 21 ± 1 years of age, height 175 ± 10 cm, body mass 69.9 ± 16 kg and 17.99 ± 11.44% of body fat; and six women: 21 ± 2 years of age, height 168 ± 10 cm, body mass 68.8 ± 15.2 kg and 24.24 ± 5.19% of body fat) took part in the present study. An inclusion criterion was six months of practice of physical activity not to be an expert or instructor of aquatic cycling and have no clinical contraindications for physical tests. Each subject took part in 2 data collection sessions: familiarization and protocol. The subjects were submitted to the protocol of Conconi, adapted to the aquatic cycling by Martins et al. (2007), which consists of a graded test in aquatic bicycle, with initial load of 50 RPM and 3 RPM increment every minute until exhaustion. HR, BP and RPE were recorded throughout the test. For data analysis, descriptive statistics were used applying the normality test of Shapiro-Wilk and Pearson’s correlation between the variables targeted in the study for each stage of the protocol. A p-level of 0.05 was utilized for all statistical tests, with the STATISTIC software (version 8.0).

Results:
The correlation values between double product (DP) and rating of perceived exertion (RPE) were classified as mid-level stages: 7 (r = 0.61; 0.50), 8 (r = 0.62; 0.56) and 9 (r = 0.64; 0.56) in the central perception, regardless of scale used. However, the correlation between the variables showed high average rating by the Borg scale and medium average by Brasil scale in stages 7 (r = 0.66; 0.44), 8 (r = 0.71; 0.51) and 9 (r = 0.70; 0.49) in peripheral perception.

Conclusion and Application to Practice:
From these results it is suggested that for the studied subjects the correlation between DP and RPE is average and the correlation values between the dependent variables are higher in the Borg scale when compared to the Brasil scale.

References:
Objective:
To investigate the effects of a community-based, post-rehabilitation exercise program in adults with total joint replacement (TJR) and establish procedural feasibility.

Method:
A controlled clinical trial was designed to evaluate the effects of a fitness instructor-led exercise program for older adults who had elective TJR within the previous 6 months. The Joint Replacement Recovery (JR2) program consists of group land- and pool-based exercises 2x/week over 6 weeks. Individuals who chose to participate in JR2 (exercise group) were compared to matched subjects (control group) who chose not to use two performance-based and two self-report measures: 6-minute walk test (6-MWT), stair climbing test, Hip/Knee injury and Osteoarthritis Outcome Score (HOOS/KOOS), and Rapid Assessment of Physical Activity scale. Outcome measures were administered by a blinded assessor at baseline and 6 weeks (post-intervention). Over 12 months, 16 adults (mean age 69 yrs; 56% hip replacements) were recruited (exercise group n=12, control group n=4) thus preventing between-group comparisons.

Results:
Descriptive analysis of demographic and feasibility data, and paired t-tests and calculation of within-group mean differences (MD) with 95% confidence intervals for continuous data were performed. The exercise group had statistically significant pre-post test changes in the 6-MWT and SCT tests (p < .001 both) and HOOS/KOOS Quality of Life (QoL) subscale (p < .02). Mean change scores were also clinically significant for the 6-MWT (MD = 67.1 m [39.2, 95.0]), SCT (MD = 4.48 sec [-2.46, -6.49]) and HOOS/KOOS QoL (MD 13.45 [4.2, 22.7]). No other statistically significant within group changes were observed. Adherence to the JR2 program was satisfactory (74%) and no exercise-related adverse events were reported. Blinding of the assessor was problematic in 69% of participants (risk of measurement bias). Three of the four outcome measures were deemed appropriate and responsive.

Conclusion:
A post-rehabilitation community-based exercise program may further enhance physical recovery and health-related quality of life after TJR. Refinement of study design and methods are necessary before undertaking a larger trial to establish effectiveness.

Application to Practice:
Due to the increasing prevalence of osteoarthritis, volume of TJR surgeries and health care budget restraints, patients are commonly discharged from formal rehabilitation programs early and before important functional milestones have been achieved. With limited publicly-funded rehabilitation resources for hip or knee TJR rehabilitation and closures of hospital-based outpatient programs, further research is warranted to determine the role of community-based programs after TJR.

References:
AquaLogix vs. “standard” aquatic equipment in cardinal and multi-planar (PNF) patterns with patients who have non-descript low back pain.

Jordan Amodeo, Nicholas Bresso, John Calati, and Aaron Duca.

Research Mentor and Contact: Jon Nettie, MPT Email: jon.nettie@team-rehab.com
Location: Wayne State University and Detroit Medical Center at Rehabilitation Institute of MI
Date completed: December 2013

Objective:
This investigation sought to determine the efficacy of an aquatic therapy protocol using AquaLogix technology in order to improve function and reduce symptoms in patients with non-descript low back pain. It is hypothesized that an aquatic rehabilitation protocol involving AquaLogix technology will provide increased function and a reduction of symptoms related to low back pain when compared to an aquatic rehabilitation protocol without AquaLogix technology.

Methods and Materials:
Approval of the Institutional Review Boards of Wayne State University (WSU), the Detroit Medical Center (DMC), and the Rehabilitation Institute of Michigan (RIM) was first attained prior conducting any research. The study was a comparison study with random assignment to two treatment groups. The first group consisted of patients utilizing the AquaLogix equipment, and the second group consisted of patients utilizing standard aquatic foam dumbbells and ankle weights. 12 subjects participated in the study with 6 randomly being assigned to each group. Prior to participation in the study, each participant signed an informed consent approved by the IRB of each facility, filled out a past medical history form, and received information regarding the exercise protocol.

In both groups, consecutive patients who were referred to physical therapy were screened for eligibility requirements. Inclusion criteria for this analysis was men and women ranging from 18-65 years of age with chronic low back pain for 2-6 months. Exclusion criteria consisted of the patient's inability to participate due to fear of being in the water, uncontrolled cardiac problems, incontinent, and uncontrolled diabetes. After consent and before treatment, each patient underwent a health history and physical examination. Each group performed eight training sessions for fifty minutes over a period of four weeks. The Aquatic Protocol for this research consisted of a warm-up, upper extremity work, lower extremity work, and a cool down. Before the patients entered the pool water, they attached the ankle aquatic equipment. During the warm-up, the participants walked the width of the pool for three minutes with the aquatic equipment on their ankles. Submerging their body in the water to shoulder height they performed general squats, 3 sets of 10, and patients were permitted to rest their hands on the side rail for balance. The upper extremity and lower extremity exercises were also performed for three sets of ten. The upper extremity exercises consisted of alternating shoulder flexion, bilateral shoulder abduction, internal/external rotation with arms at the side (both sides at the same time), horizontal abduction/adduction (both sides at the same time), bilateral shoulder flexion, proprioceptive neuromuscular facilitation (PNF) D1 bilaterally patterns (both sides at the same time), PNF D2 bilaterally patterns (both sides at the same time), punches by grasping the equipment with thumbs up and elbows bent while fully extending the arm to simulate a punch. The lower extremity exercises included bilateral hip extension, bilateral hip abduction, and bilateral hamstring curls; each of which will be performed one side at a time. The cool down consisted of a walk across the width of the pool for three minutes with the aquatic equipment on the participant’s ankles. The subject’s self report of pain using the Numeric Pain Rating Scale (NPRS) was completed at the beginning and end of each of the (8 or 16) physical therapy aquatic classes. The Oswestry Disability Index (ODI) was completed prior to the first and following the last intervention. Following the aquatic therapy, the subjects in both groups received other interventions planned by the treating physical therapist.

The power analysis for the number of subjects the study needed in each group consists of a t test with a difference between two independent means of two groups. With an effect size of 0.60 and an alpha of 0.05 at 80% power, the goal was to have approximately 45 subjects per group (N=90). In reality, a number of factors led to a low sample size. This was a predicted possibility at the beginning of the study due to limitations of the occurrence of LBP patients that are referred to RIM and by the possible apprehension of the patients’ willingness to participate in the research.

Results:
Results from the independent samples test comparing the ODI scores are shown in Table 1. There was no significant difference between the Dumbbell group and the AquaLogix group for scores on the ODI (p<0.05).

Table 1 – Independent samples test comparing Oswestry Disability Index scores

<table>
<thead>
<tr>
<th></th>
<th>Levene’s Test for Equality of Variances</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
<td>df</td>
<td>Sig. (2-tailed)</td>
<td>Mean Diff</td>
<td>Std. Error Diff</td>
</tr>
<tr>
<td>Difference</td>
<td>3.839</td>
<td>0.079</td>
<td>2.014</td>
<td>10</td>
<td>0.072</td>
<td>6.3333</td>
<td>3.14466</td>
</tr>
<tr>
<td>Equal Variances</td>
<td></td>
<td></td>
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<tr>
<td>Assumed</td>
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</tbody>
</table>

(Continued on page 15)
Table 2 demonstrates the difference between the pre- and post- ODI scores for both groups. Although the results are not statistically significant, the AquaLogix group showed greater reduction in ODI scores when compared to the Dumbbell group. All subjects in the AquaLogix group demonstrated improved function as evidenced by a decrease in the ODI score, while one subject in the Dumbbell group had an increase of 2% on the ODI.

Table 2 – Pre- and post- ODI scores for the Dumbbell and AquaLogix groups

<table>
<thead>
<tr>
<th></th>
<th>Pre ODI</th>
<th>Post ODI</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>AquaLogix</td>
<td>42%</td>
<td>38%</td>
<td>-4%</td>
</tr>
<tr>
<td></td>
<td>60%</td>
<td>38%</td>
<td>-22%</td>
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<td></td>
<td>40%</td>
<td>32%</td>
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<td></td>
<td>46%</td>
<td>30%</td>
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<td></td>
<td>16%</td>
<td>12%</td>
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<tr>
<td></td>
<td>48%</td>
<td>38%</td>
<td>-10%</td>
</tr>
<tr>
<td>Dumbbells</td>
<td>38%</td>
<td>30%</td>
<td>-8%</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>12%</td>
<td>2%</td>
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<tr>
<td></td>
<td>18%</td>
<td>10%</td>
<td>-8%</td>
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<tr>
<td></td>
<td>42%</td>
<td>38%</td>
<td>-4%</td>
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<tr>
<td></td>
<td>22%</td>
<td>20%</td>
<td>-2%</td>
</tr>
</tbody>
</table>

Pre- and post- NPRS scores for the Dumbbell group and the AquaLogix group are shown in Figure 1 and Figure 2, respectively. There was no significant difference between the two groups for both pre- and post- NPRS scores (p<0.05), however, a general trend toward a greater reduction in pain symptoms was seen for the AquaLogix group compared to the Dumbbell group.

Conclusion:
The research correlates with previous studies on therapeutic aquatic exercise in regards to showing no identified negative effect on low back pain (LBP). In fact, there were strong relationships with the ODI between the AquaLogix group in a therapy pool and a decline in LBP. Our goal was to identify a positive correlation with the reduction of LBP and the use of AquaLogix Fitness equipment in a therapy pool.

We found a linear decline in LBP with the AquaLogix group and the Dumbbell group for NPRS when examining Figure 1 and Figure 2 (shown above), despite a lack of statistical significance. Furthermore, we found an increased decline in LBP in the AquaLogix group compared to the Dumbbell group for ODI displayed on Table 2 (shown above), despite a lack of statistical significance.

Due to the shared therapy pool times and the consistent commitment required from the subject population, some limitations were noted in our study. Finding subjects that fall within the research criteria that can participate/commit to a study over the course of an 8-week period as well as getting subjects to consistently commit up to twice per week proved to be difficult due to subjects changing schedules. It was also difficult to monitor subject’s physical activity outside the study parameters that may have a negative or positive effect on their low back pain.
Reference:


Effects of two aerobic trainings on sleep quality, depressive symptoms, and quality of life in patients with type 2 diabetes mellitus.

Marindia T. Becker¹, Rodrigo S. Delevatti¹, Felipe Schuch¹, Ana Carolina Kanitz¹, Cristine Alberton², Elisa C. Marson¹, Salime C. Lisboa¹, Luciana P. Bregagnol¹, Carolina D. F. Pinho¹, Beatriz D. Schaan¹ e Luiz Fernando Martins Kruel¹.

Location: ¹Universidade Federal do Rio Grande do Sul, Porto Alegre – RS, Brasil; ²Universidade Federal de Pelotas, Pelotas – RS, Brasil.
Support: FIPE-HCPA, CNPq, CAPES, FAPERGS.

Background:
Type 2 diabetes mellitus (T2DM) is a chronic and highly prevalent disease and is also associated with physical and psychological problems that may impact on sleep quality, depressive symptoms and quality of life (QOL). Exercise is an effective strategy in the treatment of T2DM. However, to our knowledge no study has examined the effects of aquatic training and land training in these variables.

Objective:
To analyze the effects of aerobic training performed in different means, on the quality of sleep, depressive symptoms and QOL of patients with T2DM.

Methods:
The study is a randomized clinical trial with 21 patients divided into two groups (land training group, GTT, n = 10 and aquatic training group, GTA, n = 11). The experimental period lasted 12 weeks, with a frequency of three times per week. Each session had a total duration of 45 minutes, of these, 35 minutes with intensities ranging between 85% and 100% of heart rate in the second threshold (FCLV2). The experimental groups differed in relation to the environment in which the exercises (walking and / or jogging in deep vs / walking and / or jogging on athletic track) were performed. The dependent variables assessed were sleep quality, depressive symptoms and QOL. Sleep quality was assessed by the Pittsburgh Scale, the Beck Scale for depressive symptoms and QOL using the WHOQOL-BREF. To compare groups we used ANOVA for repeated measures with group factor.

Results:
We found a significant improvement (time effect) in both groups in sleep quality (p = 0.022) and quality of life related to physical (p = 0.019) and psychological (p = 0.027) parameters. No significant effects were found for depressive symptoms (p = 0.155), social relationships (p = 0.544), environment (p = 0.196) or overall quality of life (p = 0.123) were found. There was no significant group effect or interaction (time x group) in any of the other studied variables.

Conclusion:
Aerobic training improved sleep quality and QOL related to physical and psychological health, regardless of the medium in which it was conducted. However, this study did not show the effects of aerobic training on land or water in depressive symptoms and domains of QOL related to social relationships and the environment, and the general perception of QOL.
Effects of two training programs of deep water running on blood pressure and functional fitness in the elderly.

Thaís Reichert¹, Ana C. Kanitz¹, Rodrigo S. Delevatti¹, Natália C. Bagatini¹, Luciana P. Bregagno¹, Bruna Barroso¹, Salime C. Lisboa¹, Carolina Pinho¹, Elisa C. Marson¹, Luiz F. M. Krue1.¹

Contact: Thaís Reichert   Email: thais_reichert@hotmail.com
Location: ¹Universidade Federal do Rio Grande do Sul/RS, Brasil
Support: CNPq e CAPES.

Introduction:
The aging process is accompanied by a series of changes, such as the reduction of functional fitness and increased blood pressure. In this context, it is known that exercise can attenuate these effects. Deep water running is an interesting alternative, because it is performed with cardiovascular protection and no impact in the lower limbs, allowing the individual to exercise at high training loads with less risk of injury.

Objective:
To evaluate the effects of two training programs of deep water running on functional fitness and blood pressure in the elderly.

Methods:
Thirty-six elderly individuals of both genders were divided into two groups: the continuous group (CO, n=12, 67.25 years) and interval group (IN, n=13, 68.61 years). Both groups trained for 28 weeks (twice weekly). The functional fitness was assessed using the battery of tests Rikli & Jones, and blood pressure was measured after the individual remained seated for 15 minutes. The measures were performed before starting the training period (week 0), at week 12 and after the training period (week 28). For statistical analysis, ANOVA was used for repeated measures with a group factor (α=0.05).

Results:
There were no differences between the training groups in all variables of functional fitness (p>0.05). The foot up-and-go test, that evaluates the speed, agility and dynamic balance, showed a reduction in time of execution from week 0 to week 12 (p=0.012) and a maintenance of the week 12 to 28 (p=0.251). The flexibility of upper limb test showed a maintenance of week 0 to week 28 (p=0.677) and the lower limbs showed a maintenance of week 0 to week 12 (p=0.093) and an increase from week 0 to week 28 (p=0.019). The strength of the upper members showed an increase in week 0 to week 12 (p<0.001) and a maintenance of week 12 to 28 (p=0.236), whereas the lower limbs strength increased significantly from week 0 to week 12 (p<0.001) and from week 12 to week 28 (p=0.004). Finally, the 6-minute walk test that evaluates aerobic endurance, showed a maintenance from week 0 to week 12 (p=0.999) and a significant increase from week 0 to week 28 (p=0.042). The systolic blood pressure did not show differences between the training groups, but diastolic blood pressure remained higher in the continuous group during all training. The systolic and diastolic blood pressure showed a maintenance from week 0 to week 12 (p=0.999 and p=0.542), however, from week 0 to week 28, it decreased significantly (p<0.001).

Conclusion:
The continuous and interval training programs of deep water running provide improvements of similar magnitude in all parameters of functional fitness and blood pressure in the elderly. It may improve the functional independence of this population.

Poster presented at International Aquatic Fitness Conference May 13-17, 2014
Palm Harbor, Florida USA
Resting blood pressure and heart rate responses before and after resistance training in water in young women.

Maira Cristina Wolf Schoenell, Roberta Bgeginski, Roberto Fernandes da Costa, Natália Soares dos Santos and Luiz Fernando Martins Kruel

Location: Exercise Research Laboratory, School of Physical Education, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

Objective:
The aim of the present study was to compare resting heart rate and blood pressure responses before and after a resistance training program in water with different volumes (single and multiple sets) in sedentary young women.

Methods:
Twenty-one young women (23.73±4.22 years old, 67.01±18.60 kg, 164.66±7.05 cm) performed 20 weeks of resistance training in water, 2 times per week. Subjects were divided in two training groups: Single Set (1 set of 30 seconds) or Multiple Set (3 sets of 30 seconds). Heart rate and blood pressure were verified after a 10-minute rest period pre- and post-resistance training in water. Two-way ANOVA for repeated measures (factor: group and time) was used with $\alpha=0.05$ and SPSS 17.0.

Results:
Heart rate, systolic and mean blood pressure responses showed no significant differences between pre- and post-resistance training, or single vs multiple sets. Diastolic blood pressure was significantly different ($p=0.046$) between pre- and post- single set (75.20±9.08 mmHg and 71.70±7.49 mmHg) and multiple set (72.45 ±8.06 mmHg and 68.18±8.85 mmHg) resistance training in water.

Conclusion:
Diastolic blood pressure showed a significant decrease after the resistance training program in water with different volumes (single and multiple sets) in sedentary young women. As a practical application, a resistance training program in water, with single and multiple sets, can be used as a non-pharmaceutical intervention to help control diastolic blood pressure responses.
Effects of shallow water aerobic exercise training on arterial stiffness and pulse wave analysis in older individuals.

Lori Sherlock, Sara B. Fournier, Evan DeVallance, Stacee Carte, and Paul D. Chantler.

Contact: Lori Sherlock  Email: Isherlock@hsc.wvu.edu
Location: West Virginia University
Date Study Completed: April 2014

Objective:
To test the hypothesis if arterial stiffening (AS) can be positively affected by shallow water aerobics in older individuals with cardiovascular risk factors.

Method:
Participates were randomized into either a control (Con; n=16, age = 69 ± 2), or a shallow water aerobic exercise training (ExT; n= 17, age = 68 ± 2) group. The Con group remained inactive, whereas the ExT group exercised for 10 weeks, 3 days/week, for 1 hour/day at predetermined heart rates. AS was measured by carotid-to-femoral pulse wave velocity, and pulse wave analysis was used to measure central blood pressures (applanation tonometry) before and after the intervention. Two-way repeated measures ANOVA was used to determine statistical significance.

Results:
A significant group (Con vs. ExT) by time (pre vs. post) interaction was identified for AS, whereby AS slightly increased in the Con group (0.35 ± 0.21 m/s), and decreased in the ExT group (-0.77 ± 0.40 m/s). No differences were found pre-and post-training in brachial or central systolic pressures; however, a reduction in brachial and central diastolic pressure was evident in ExT group.

Conclusions:
These findings indicate the introduction of shallow water aerobic exercise training positively influences the AS and blood pressure of individuals with cardiovascular risk factors, suggesting that aquatic exercise training may be useful in managing cardiovascular related diseases.

Application to Practice:
Shallow water aerobic training can produce favorable effects on arterial health, as well as blood pressure, in individuals with cardiovascular risk factors.
The impact of an aqua yoga session on mood states and cardiovascular responses during pregnancy.

Ioanna Vaporidi, Spyros Karytsas, Helen Soultanakis
Faculty of Physical Education and Exercise Science, Aquatics Division, Kapodistrian University of Athens, Greece

Objective:
The purpose of the present study was two fold, to examine, (a) whether participation in an aqua yoga class produces an enhancement in the mood state of pregnant women, and (b) to observe whether there was a concomitant shift in blood pressure and resting heart rate.

Method:
Twenty one pregnant women, with a mean age of 35.19±2.91 years, a mean weight of 67.33±8.46, and a mean height of 166.43±3.34, between their 2nd and 3rd trimester of pregnancy (25.10±6.34 weeks of pregnancy), volunteered to participate in this study. Data was collected within a month, and pregnant women came to the pool rested in a post absorptive state. Water temperature was 30ºC, and ambient temperature was 28ºC. All pregnant women performed the same standardized aquanatal yoga session, which lasted 43-45 minutes and consisted of the following sections: warm up (12 min), stretching and balance (6 min), muscle conditioning (15 min), aerobic (5 min), cool down (5 min). Fifteen minutes prior to, and fifteen minutes after, the aquatic session the participants completed the Mood State Questionnaire, and in a rested state their systolic and diastolic blood pressure and hearts rates were measured. A Wilcoxon paired ranks test at a predetermined 0.05 level of significance was used to analyze the data before and after the aquanatal yoga exercise intervention.

Results:
The analysis of the data revealed a significant and beneficial effect of exercise, by demonstrating an improvement in every single mood state and in the overall combined mood state profile (p<0.05). Specifically, tension, depression, fatigue, anxiety and anger levels all dropped while vigor improved after aquatic exercise. A significant reduction in systolic and diastolic blood pressure and heart rate were also observed after the aquanatal session (p<0.05).

Conclusion:
These results are indicative of the benefits that a session of aqua yoga in warm water can elicit during pregnancy especially when taking into consideration that pregnancy places both an emotional as well as a cardiovascular strain on pregnant women. Further research needs to elucidate whether these differences are attributed to the benefits of warm water immersion per se, or the impact of aqua yoga, or the combination of both, and how these would compare with other forms of aquatic exercise.

Application to Practice:
Pregnant women often avoid exercise during pregnancy as the term progresses, and often times become completely sedentary. However, all pregnant women could possibly benefit by participating in aquanatal yoga exercise, which is milder in intensity and is designed to meet their needs. Based on our data mood state can be considerably enhanced, in addition to blood pressure and resting heart rate, leading possibly to an easier delivery. More research needs to further substantiate the above.

References:
Aqua Pilates vs land Pilates: physical fitness outcomes.

Mandy Persaki¹, Nikos Apostolides¹, Helen Soultanakis¹
¹Faculty of Physical Education and Exercise Science, Aquatics Division, Kapodistrian University of Athens, Greece

Contact: Helen Soultanakis Email: elenisoul@hotmail.com
Date study completed: February 2014

Objective:
The purpose of this study was to evaluate the differences on physical fitness gains and cholesterol levels between women training regularly over a year with either a Land Pilates or an Aqua Pilates program.

Method:
Overall, forty females with a mean age of 23.63±2.71 participated in the present study. Twenty of the women had been regularly training in a land Pilates program, and the remaining twenty in an aqua Pilates program, at two different recreational centers. To participate in the study women had to be training at least twice a week for an hour for over a year. The contents of both courses followed basic Pilates guidelines, aiming for core stability and spine alignment, in combination with overloading the aerobic system, strength, and flexibility.

All women were tested on site, and were evaluated for their physical fitness by the use of the EUROFIT battery of tests for strength (hand-grip dynamometer), abdominal endurance (repetitions in 30 seconds), flexibility (sit and reach test), balance (standing beam test) and body fat determination (skinfolds from 5 sites), in addition to the performance of a submaximal Astrand-Rhyming test for the determination of aerobic endurance. Cholesterol was measured by a Roche instant analyser, at a post-absorptive state. Means between the two groups for every measurement were compared and statistically analysed, by the use of the T-test for independent samples at a pre-selected level of significance of 0.05.

Results:
The results revealed similar improvements in strength, aerobic endurance, balance and cholesterol levels in both groups (land Pilates or the aqua Pilates). However, there were significant differences between the two groups in muscular endurance between land Pilates and aqua Pilates (16.8±0.96 reps vs 14.2±0.66), as tested by the maximum sit-ups repetitions in 30 seconds, flexibility (30.00±1.14 cm vs 19.9±1.95) via the sit and reach test and percent body fat (26.91±0.73 % vs 30.64±0.77). Women exercising on land Pilates exhibited better values in the above parameters, than women exercising in aqua Pilates.

Conclusion:
Overall women in both pilates programs exhibited a good physical fitness based on norms for their age. However, women exercising on land aquired more benefits in flexibility, abdominal endurance and body composition. Further research needs to elucidate whether these differences stemmed from a different initial level of fitness or a difference in the level of intensity of the programs that were followed the year preceding the measurements.

Application to Practice:
Based on the above data it appears that various exercise modalities that are applied on land may possibly not carry over the same benefits when transferred into the water. This needs to be taken into consideration when prescribing exercise that aims in improving and benefiting all fitness parameters. Due to the lack of gravity in the pool, it is possible that certain fitness parameters can be enhanced and supplemented with exercise on land as well.

References:
• Kovach M.V. et al, Effects of Pilates and aqua fitness training on older adults’ physical functioning and quality of life; Biomedical Human Kinetics, 5, 22-27, 2013
Effect of Aquatic Exercise on Fall-related Fitness and Posture Stability in Elderly Women.

Sung-Sun Kang, Jae-Moo So.

Contact: Sung-Sun Kang  Email: sungsun@kkea.or.kr
Location : Seoul, South Korea  Konkuk University
Date study completed : November 30, 2013

Objective:
The purpose of this study was to investigate body posture, stability, and fall related physical fitness in elderly women.

Method:
Sixteen elderly women subjects participated in this study (n=16, mean age:72.63±2.79-79.38±3.46yrs, mean BMI: 25.03±2.83-27.99±2.78). They were divided into two groups (aqua exercise group, n=8, control group, n=8). Participants were tested before and after the study to measure body composition, lower body strength and flexibility, agility, balance (static and dynamic), timed up and go (TUG), and tandem gait for functional fitness. Body posture stability and advanced balance ability (limits of stability) were also measured with Biorecure (RM Ingenierie Co, France) which has % quarterly sector (RF, LF, RB, LB). An aqua exercise training program was performed for 50 minutes per session, 3 times per week for 12 weeks. Data was analyzed with ANOVA for repeated measures, t-test using SPSS ver 19.0 program.

Results:
Results indicate there were significant changes between group and period on body weight, % fat, and waist-hip ratio (WHR) in the aqua exercise group (p<.05,p<.001). Lower body strength and agility were also significantly changed between group and period. However changes in tandem gait were not significant. Limits of stability with eyes closed status was significantly changed in the aqua group.

Table 1. Change of Body Composition in Pre-post Test (12 weeks)

<table>
<thead>
<tr>
<th>Items</th>
<th>Time Group</th>
<th>Pre</th>
<th>Post</th>
<th>Effect</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>AG</td>
<td>59.35±9.05</td>
<td>58.30±9.35</td>
<td>T</td>
<td>.934</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>65.44±7.91</td>
<td>65.98±8.53</td>
<td>G</td>
<td>.034*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T×G</td>
<td>.799</td>
</tr>
<tr>
<td>Body fat (%)</td>
<td>AG</td>
<td>34.46±3.55#</td>
<td>32.43±4.04++</td>
<td>T</td>
<td>.400</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>41.20±4.16++</td>
<td>40.90±3.69</td>
<td>G</td>
<td>.000***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T×G</td>
<td>.531</td>
</tr>
<tr>
<td>LBM (kg)</td>
<td>AG</td>
<td>20.91±3.96#</td>
<td>21.14±3.99</td>
<td>T</td>
<td>.830</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>20.26±1.69</td>
<td>20.51±1.96</td>
<td>G</td>
<td>.565</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T×G</td>
<td>.991</td>
</tr>
<tr>
<td>BMI (kg/ m²)</td>
<td>AG</td>
<td>25.03±2.83</td>
<td>27.54±6.78</td>
<td>T</td>
<td>.387</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>27.99±2.78</td>
<td>28.06±2.74</td>
<td>G</td>
<td>.246</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T×G</td>
<td>.246</td>
</tr>
<tr>
<td>WHR (%)</td>
<td>AG</td>
<td>0.89±0.04+++</td>
<td>0.89±0.03+++</td>
<td>T</td>
<td>.648</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>1.05±0.07</td>
<td>1.04±0.07</td>
<td>G</td>
<td>.000***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T×G</td>
<td>.927</td>
</tr>
</tbody>
</table>

Values were expressed by means (standard deviation); Significant difference to GROUP ( ++p<.01, +++p<.001); Significant difference to TIME (#p<.05); Significant difference to GROUP×TIME (*p<.05, ***p<.001) AG : Aqua exercise group, CG : Control group

(Continued on page 24)
### Table 2. Change of Fall-Related Fitness in Pre-post Test (12 weeks)

<table>
<thead>
<tr>
<th>Items</th>
<th>Time Group</th>
<th>Pre</th>
<th>Post</th>
<th>Effect</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AG</td>
<td>16.50±1.41###</td>
<td>24.13±4.26+</td>
<td>T</td>
<td>.007**</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>17.63±5.48</td>
<td>18.63±4.57</td>
<td>T×G</td>
<td>.034*</td>
</tr>
<tr>
<td>Muscular Strength for the Lower Body</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(time)</td>
<td>AG</td>
<td>18.00±7.84#</td>
<td>22.81±8.88++</td>
<td>T</td>
<td>.524</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>8.24±10.81</td>
<td>7.81±10.63</td>
<td>T×G</td>
<td>.444</td>
</tr>
<tr>
<td>Muscular Flexibility for the Lower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body (cm)</td>
<td>AG</td>
<td>6.36±1.14</td>
<td>4.95±0.83++</td>
<td>T</td>
<td>.038*</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>6.87±1.55</td>
<td>6.44±1.12</td>
<td>T×G</td>
<td>.254</td>
</tr>
<tr>
<td>TUG (sec)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AG</td>
<td>5.05±3.11</td>
<td>6.33±5.38</td>
<td>T</td>
<td>.649</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>6.33±5.38</td>
<td>2.64±1.56</td>
<td>T×G</td>
<td>.521</td>
</tr>
<tr>
<td>Balance (sec)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AG</td>
<td>8.81±2.13</td>
<td>8.77±1.22</td>
<td>T</td>
<td>.370</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>7.82±2.69</td>
<td>9.47±3.40</td>
<td>T×G</td>
<td>.346</td>
</tr>
</tbody>
</table>

Values were expressed by means (standard deviation); Significant difference to GROUP (+p<.05, ++p<.01); Significant difference to TIME (#p<.05, ###p<.001); Significant difference to GROUP×TIME (*p<.05, **p<.01). AG: Aqua exercise group, CG: Control group.
Table 3. Change of Postural Stability Balance in Pre-post Test (12 weeks)

<table>
<thead>
<tr>
<th>Standing Position (EO/EC)</th>
<th></th>
<th>Eyes open surface area ellipse</th>
<th></th>
<th>Eyes open length</th>
<th></th>
<th>Eyes open average speed</th>
<th></th>
<th>Eyes closed surface area ellipse</th>
<th></th>
<th>Eyes closed length</th>
<th></th>
<th>Eyes closed average speed</th>
<th></th>
<th>Limit of Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AG</td>
<td>26.13±21.83</td>
<td></td>
<td>41.38±36.16</td>
<td></td>
<td>T</td>
<td></td>
<td>68.75±46.24</td>
<td></td>
<td>6.64±1.91</td>
<td></td>
<td>7.66±1.84</td>
<td></td>
<td>0.25±0.05</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>51.88±33.82</td>
<td></td>
<td>68.75±46.24</td>
<td></td>
<td>G</td>
<td></td>
<td>68.75±46.24</td>
<td></td>
<td>7.55±0.68</td>
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<td>7.55±0.68</td>
<td></td>
<td>0.25±0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T×G</td>
<td></td>
<td></td>
<td></td>
<td>.212</td>
<td></td>
<td></td>
<td></td>
<td>.949</td>
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<td>Eyes closed</td>
<td>90.1±45.6</td>
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<td>53.8±40.4+</td>
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<td>127.4±64.4</td>
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<td>9.88±5.60</td>
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<td>Backward area</td>
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<td>738.9±494.5</td>
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<td>T×G</td>
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<td>T×G</td>
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Values were expressed by means (standard deviation); Significant difference to GROUP (+p<.05); Significant difference to TIME (##p<.01); Significant difference to GROUP×TIME (*p<.05). AG: Aqua exercise group, CG: Control group

(Continued on page 26)
Conclusion:
In conclusion, a 12-week aqua exercise training program had positive effects on fall related physical fitness and postural stability except for BMI and tandem gait.

Application to Practice:
These results could recommend that aqua exercise also be used for prevention programs of fall risk factors for elderly women.
Preliminary Analysis of the Effect of Aquatic Exercise (AE) on Physical and Quality of Life Outcomes of Breast Cancer Survivors

Ellen Broach, Phillip Norrell, Sarah Schrenk, Shawn Mitchell, Randi Henderson

Contact: Ellen Broach Email: ebroach@southalabama.edu
Location: University of South Alabama

Introduction:
Breast cancer (BC) is one of the most common cancers to occur in the United States (American Cancer Society (ACS), 2013) and the world (WHO, 2013). The majority of cancer patients encounter a number of physical and psychological difficulties after finishing cancer treatment including distress, fatigue, pain, physical ability, and quality of life (ACS 2013; Chung, 2008; Ganz, 2004; Klein, 201; Mols, Vingerhoets, Coebergh, & van de Poll-Franse, 2005). Fatigue, the most common symptom of long term cancer survivors, is commonly associated with feelings of psychological distress and reduced quality of life (Groenvold et al., 2007). Physical exercise was identified as a potential intervention to improve quality of life and health of women with breast cancer (Kendall et al., 2004). Exercise reduces the risk of cancer recurrence among cancer survivors (Warburton, Nicol, & Bredin, 2006). Also, exercise can facilitate positive psychological and quality of life benefits in cancer survivors (Galvao & Newton, 2005; Schmitz et al, 2004). However, some land-based physical activities are difficult or contraindicated for some individuals because of the stress placed on their muscular or skeletal systems (Becker, 2011). AE has numerous known benefits that can enhance an individual’s physical, psychological, and psychosocial performance (Broach & Dattilo, 1996). In addition, AE as a complement to other therapies is a modality that is more conducive to independent participation in a challenging activity that may facilitate enjoyment, thus adherence to the activity (Broach, Dattilo & Mckinney, 2007).

While water exercise has been identified as beneficial for physical and psychological outcomes (Becker, 2011; Broach & Mckinney, 2011), the potential benefits for individuals recovering from BC are discussed mostly in informative but anecdotal manuscripts. Only three quasi-experimental studies were found to focus on aquatic exercise or therapy interventions for individuals with cancer. These studies found decreases in body fat and breast symptom ratings (Fernandez-Lao et al., 2012), pain (Cantarero-Villaneuva et al., 2012), short term limb volume, and enhanced adherence (Tidhar and Katz-Leurer, 2009). Therefore, the purpose of this examination was to evaluate the effect of an aquatic intervention on physical and psychosocial ability of breast cancer survivors. Specifically, this study examined the effects of AE on fitness and arm edema as well as perception of fatigue, quality of life, and distress. Social validity of effects was also assessed pre and post intervention.

Methods:
Participants: The participants included 19 women (12 in the exercise group; 7 in the control group) who had a doctor’s permission to participate, a diagnosis of breast cancer, breast cancer treatment, at least 8 weeks post surgery; not participated in AE prior to this study and no medical condition precluding their participation as indicated by a health history questionnaire. Individuals were excluded if they were receiving radiation during the study period or had uncontrolled blood pressure, active cancer, very low white cell counts or open wounds. Participants were selected from a pool of volunteers in a mid-size city in the southeast United States. They were recruited by email and written announcements from breast cancer survivor support groups, physicians, therapists, and the local chapter of the American Cancer Association.

Design:
This study was a non-randomized control trial. These groups included the water exercise group and the control group who received the usual care treatment for breast cancer.

The Intervention:
The BC Aquatic Exercise program (manuscript in progress) included exercises from Broach et al. (2007), Aaronson & ESSERT (2007), and Ai Chi (Sova &Konno, 1999). The water exercise program was at 11:00 a.m. in an 86 to 87 degree outdoor pool over 8 weeks (3-x wk; 24 sessions). Each 50-minute session included an 8-minute warm-up, 8 minutes of upper extremity exercises, 8 minutes of upper body exercises (optional barbells), 7 minutes of lower extremity exercises, 11 minutes of low intensity endurance and core stability exercises, an 8-minute cool down that included stretching and relaxation exercises. The instructor varied the exercises while following 80% of the total program content each session.

Data Collection:
In addition to fitness and arm edema, the participants completed questionnaires to determine perceptions of fatigue, quality of life, distress, and social validity pre and post intervention. First, fatigue was measured using the Multidimensional Fatigue Inventory Short Form (Stein, Jacobsen, Blanchard, Thors, 2004). Health related quality of life was evaluated using the HRQOL scale developed by the Centers for Disease Control. Emotional Distresses, as measured by intrusive and avoidant thoughts of cancer, was evaluated using the Impact of Event Scale (Horowitz, Wilner, & Alvarez, 1979). Cardiovascular fitness was assessed using the 12-Minute Walk (Cooper, 1968). Body composition was assessed using height and weight to calculate body mass index and use of bioelectrical impedance to measure changes in body composition. Arm edema was assessed using an arm volumeter.

(Continued on page 28)
Social validity of the procedures during the study was monitored at week 4 and at the end of the study using five open-ended questions. These questions reflected the participants’ opinions regarding the importance of the program, least important part of the program, what could change satisfaction, and comments.

Data Analysis:
Descriptive analysis of the demographic characteristics that include age, type of surgery, years post surgery are presented in Table 1 using frequency distribution for the type of surgery (categorical variable) and mean for the continuous variables. The equality of the groups was examined using a t-test for mean and years post surgery, based on unequal sample sizes with equal or unequal variance, which was determined using the Levene’s test (continuous data) and the Fisher’s Exact test (for the type of surgery). To test for the effect of the aquatic exercise, paired t-tests were performed for the MFIS, HRQOL, IES, and the physical measures. The differences from baseline to week 8 were calculated for each participant. Results were considered statistically significant when the p value was <0.05. Data were analyzed using SPSS 20.

Results:
The mean age was 63 (48 to 79 years old). There were no statistical differences in demographic parameters between the groups.

Table 1

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Exercise (N-12)</th>
<th>Control (N-7)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>63.08</td>
<td>62.85</td>
<td>.955*</td>
</tr>
<tr>
<td>Years since surgery</td>
<td>3.75</td>
<td>7.0</td>
<td>.375*</td>
</tr>
<tr>
<td>Type of surgery</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Lumpectomy</td>
<td>7</td>
<td>3</td>
<td>.650**</td>
</tr>
<tr>
<td>Mastectomy</td>
<td>5</td>
<td>4</td>
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</tbody>
</table>

*As determined by independent sample t-tests
** As Determined by Fisher’s Exact test.

For preliminary analysis, samples t-tests were used to compare the exercise findings for the control and exercise group. There was a significant difference in scores in the exercise group for the 12-Minute Walk (t = -4.93, p = .001, pre-test M = 587.42 ± 79.02, post-test M = 607.22 ± 70.22), BMI t = 3.844, p = .03, pre-test M = 30.15 ± 7.77, post-test M = 29.4 ± 7.73), Impact of Event (t = -1.82, p = .002, pre-test M = 20.16 ± 12.7, post-test M = 13.50 ± 13.05), and the Multidimensional Fatigue Inventory (t = -2.35, p = .038, pre-test M = 14.6 ± 18.2, post-test M = 1.75 ± 14.72). There were no significant differences in the control group. In addition, there were no significant differences in arm edema and health day scores for the either group.

Discussion:
This pilot study found improvement in fitness, BMI, multidimensional fatigue, and levels of distress in breast cancer survivors who received a water exercise program as compared to breast cancer survivors who received their usual care without water exercise. There is limited research using aquatic exercise to compare findings. Our findings agree with previous studies that show that those who exercise have improved fitness levels than those who did not participate (Schwartz, 2000). The water exercise did indicate improved quality of life measures, which agree with Fernandez-Lao et al. (2012) who found that water exercise resulted in improved scores on a quality of life symptoms scale over a land exercise group. However, Fernandez-Lao also emphasized that this improvement was not maintained during follow-up. One explanation for the improvements in quality of life may be related to the existence of a more enjoyable and comfortable atmosphere. Findings indicated no reductions in edema. This finding was most likely because the majority of participants did not have significant arm edema. One participant with lymphedema indicated physical irritation when using small floating barbells. Social validity questionnaires indicated that aquatic exercise participants perceived that AE had a positive effect of various physical outcomes including fitness, tone, and range of motion, fatigue and quality of life. In addition, participants stated that they felt as though the most important outcomes included energy and social well-being. Perceived psychosocial most noted by participants included increased overall well being, improved confidence, being with other survivors in an enjoyable activity, and acquiring an active habit. All participants expressed a desire to continue participation in aquatic exercise.

There are a number of limits to this study. First, this was a small group quazi-experimental design with volunteers who were recruited or referred by their physician. Participants were able to choose their participation in the control or exercise group. This restricts generalization in addition to having other inherent threats to validity. However, the improvements in physical and psychosocial measures are important to consider for outcomes related to aquatic exercise and future research. Future studies could include some of the same important physical, as well as psychosocial, measures that are important for engagement in life activities, health and quality of life.

References:
• Canterero-Villanueva, I., Fernandez-Lao, C., Fernandes-de-las-Penas, C., Lopez-Barajas, I. B., Del-Moral, Avila, R.,Isabel de la Llave-Rincon,


Case Study Submittals

Effects of Aquatic Physical Therapy Interventions on Functional Outcomes of Young Adults with Congenital Disorders: A Case Study

Christina O’Brien

Contact: Cristina O’Brien  Email: martinez.obrien@gmail.com
Location of Study: Milwaukee Center for Independence

Purpose:
For the majority of school-age children with cerebral palsy (CP), physical therapy is used as an early intervention to maximize potential with mobility and activities of daily living (ADLs) as they pertain to school tasks (Gannotti, Christy, Heathcock, & Kolobe, 2014). Post school, many young adults between the ages of 20 -35 with a congenital disorder such as CP may only receive physical therapy to address a secondary condition, such as orthopedic impairments (Robert, Ballaz, Hart, & Lemay, 2013). There is limited research about treatment plans or interventions in physical therapy for young adults with cerebral palsy indicating that this population may be underserved. Aquatic therapy is one intervention that can treat a variety of impairments that a person with CP exhibits simultaneously (Kelly & Darrah, 2005). The aim of this case study is to highlight improvements in functional mobility a young adult with cerebral palsy can achieve with aquatic therapy interventions.

Background:
Cerebral palsy is a disorder of movement, muscle tone, and posture caused by an insult to the brain (Mayo Clinic, 2014). Signs and symptoms appear at a young age usually before preschool and can portray a wide range of impairments from flaccidity to rigidity of the limbs and trunk, and abnormal posture (Gorter & Currie, 2013; Kelly & Darrah, 2005; Mayo Clinic, 2014). Impairments can be severe and cause the person to be dependent in a wheelchair or unsteady with walking. Children with lower extremity spasticity demonstrate impairments in strength, flexibility, motor control and muscle selectivity (Carlton, et. al., 2013; Gorter & Currie, 2013). These impairments can lead to limitations in functional ability, balance, ambulation and endurance compared to typically developing peers (Carlton et. al., 2013; Verschuren & Wiart & Ketelaar, 2013). The injury to the brain that leads to cerebral palsy does not change as the person matures, so symptoms do not worsen with age. However, due to decreased or impaired positioning and/or mobility, the shortening of muscles and muscle rigidity may lead to contractures, further impairing ability to transfer or ambulate as a person ages (Mayo Clinic, 2014).

Method:
Review of articles. This researcher conducted a review of the literature using PubMed Database with the key words physical therapy and cerebral palsy. One hundred articles were reviewed. There was no research found that included participants who were considered young adults (between ages 20-35). Based on the review of literature (N=100) there is limited research associated with physical therapy for young adults with cerebral palsy and no aquatic related research (see Figures 1 and 2). The vast majority of articles involved subjects labeled children who were under the age of 18. No manuscripts with subjects between the ages of 20 - 35 were found. This sampling illustrates the lack of research for persons with CP over the age of 20.
Results:
Following 12 weeks of physical therapy twice a week, with on-land assessments at the initial evaluation and at 12 weeks discharge, measures for trunk control, transfer ability, ambulation, and flexibility were taken. The findings indicate that this young adult with a congenital disorder progressed with functional mobility and ADLs following school-based physical therapy (see Table 2).

Case Description:
The client is a 23 year old female with spastic quadriplegic cerebral palsy. She has had physical therapy in school from the ages of 5 to 12 and 15 to 17. The client attends a day program three times per week. An initial physical therapy evaluation was done on land to obtain baseline functional status. The client’s transfer was measured based on the percentage of her ability to perform sit-to-stand and the amount of assist required by the therapist. Ambulation distance, use of assistive device, and the level of assist were recorded for a baseline mobility status. The Trunk Impairment Scale was used due to its established ability to measure trunk motor impairment through the evaluation of static and dynamic sitting balance as well as trunk movement coordination (Verheyden et. al., 2004).

Aquatic Interventions:
The water properties and parameters that were used throughout the therapy treatments as well as the justification for each were recorded (see Table 1).

Table 1.
<table>
<thead>
<tr>
<th>Water Property</th>
<th>Parameter/ Treatment Progression</th>
<th>Justification</th>
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</thead>
<tbody>
<tr>
<td>Pool Temperature</td>
<td>92 degree</td>
<td>muscle relaxation and decrease tone/spasticity</td>
</tr>
<tr>
<td>Water Resistance</td>
<td>moving both arms and legs in supine  slow → fast</td>
<td>spasticity is velocity dependent; improve hip, trunk and arm range of motion to facilitate control of tone</td>
</tr>
<tr>
<td>Water Depth</td>
<td>4ft → 3ft shoulder level → hip level</td>
<td>20% weight bearing (increased standing support and hydrostatic pressure) → 60% weight bearing while standing</td>
</tr>
<tr>
<td>Buoyancy</td>
<td>➢ static standing ➢ ambulation with ankle cuff weights ➢ supine with ankle and hip buoys and knee weights</td>
<td>➢ standing balance using increased reaction time to train proprioception ➢ leg strengthening and foot proprioception feet while advancing legs when walking ➢ improve hip and knee extension flexibility</td>
</tr>
<tr>
<td>Equipment</td>
<td>• cuff and belt buoys • 2lb cuff weights</td>
<td>muscle reeducation, leg proprioception, flexibility, trunk stability</td>
</tr>
</tbody>
</table>

Table 2.
<table>
<thead>
<tr>
<th>Test</th>
<th>Initial</th>
<th>Post 12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trunk Impairment Scale</td>
<td>0/23</td>
<td>13/23</td>
</tr>
<tr>
<td>Sit to Stand Transfer</td>
<td>10% (maximal assist)</td>
<td>80% (minimal assist)</td>
</tr>
<tr>
<td>Ambulation Distance</td>
<td>unable dependent in wheelchair</td>
<td>20ft in parallel bars with minimal assist; 8ft using 2 wheeled walker with moderate assist</td>
</tr>
</tbody>
</table>
As seen in Table 2, the client significantly improved trunk control, transfer ability, and flexibility. Notably, the client achieved ambulation for the first time in her life. Post aquatic therapy, the client is now able to ambulate using an assistive device and is no longer solely wheelchair dependent. The progression made during aquatic therapy carried over to on-land balance and mobility standards.

Conclusion:
The findings from this case study indicate that aquatic therapy was not only rehabilitation but also habilitation for a young adult with a congenital disorder. In this case study, the client’s goals of therapeutic ambulation, strength and flexibility, and unsupported sitting ability were not addressed in her school-based therapy. However, after aquatic therapy as a young adult, this client improved functional mobility. There is limited research for aquatic therapy with persons with congenital disorders, such as cerebral palsy. These findings have implications for practitioners as it indicates that aquatic interventions can be valuable for underserved populations to maximize safety, mobility, and independence as a young adult, as they have for the client highlighted in this study. Future research using aquatic therapy interventions should consider employing a quasi-experimental or experimental design to generalize these findings.

References:

Poster presented at International Aquatic Therapy Symposium June 28-July 2, 2014
Sanibel, Florida USA
Case Study: Perception of pain from an obese subject with patellofemoral pain syndrome after aquatic resistance exercises for the hip adductors and abductors.

Daniela Freitas de Araújo, Riana Duarte Linhares, Paula Roquetti Fernandes, João Regis, José Fernandes Filho, Leandro Nogueira.

Contact: Leandro Nogueira   Email: leandrofilho@uol.com.br
Location: Federal University of Rio de Janeiro, University Hospital Clementino Fraga Filho, Sector of Physical Medicine, School of Physical Education and Sports, Bioscience Laboratory of Human Movement, Rio de Janeiro, Brazil
Date Case Study Completed: October 11, 2013

Objective:
To compile a case study to assess changes in pain perception of an obese subject, class 2, with patellofemoral pain syndrome who was previously operated on by the bariatric surgery program in the Sector of Physical Medicine of the University Hospital Clementino Fraga Filho, with the use of the Visual Analogue Scale (VAS) pain score and semantic analysis of discourse, after prescription of specific aquatic resistance exercises for hip adductors and abductors for 3 weeks. No change was made regarding the aerobic effect from his usual aquatic training program designed for weight loss and/or prevention of weight regain.

Method:
A 3-week case study period was used, from September 9 to October 11, 2013 for a male subject classified with obesity class 2 (50 years old, 146.3 Kg, 1.94m, BMI 38.9). The subject had previous bariatric surgery and had advanced deep water exercise experience (over 1 year). The participant had medical clearance. Before starting the specific aquatic exercises for hip adductors and abductors, which were added to his usual aquatic training program, he related the use of a medicine (Mioflex®) and a 10-minute ice massage each night before sleep, both prescribed for knee pain. In the same period he assigned grade 8 on VAS (1-10) when asked about his knee pain. All training sessions were held during the same time of day, three times a week with primarily walking and multi-joint exercises for cardiorespiratory fitness for a total duration of 60 minutes each session. The following exercises were added to the workout: 3 aquatic exercises in a “sitting” position with 2 for hip abductors (lateral shears and rotations with knees extended) and 1 for adductors ("scissors" or medial rotations with knees extended). The exercise were performed 3 times with a ratio of 40-20 sec. with 9 minutes total duration for each session. The intensity varied from moderate to strong according to the Borg Scale (1-10). The participant did not use any buoyant equipment and he was able to keep proper alignment during all prescribed aquatic exercises. Blood pressure was measured by a sphygmomanometer (Premium®) before each training session and after each training session. In order to estimate the aerobic effect, we measured the heart rate (6-second count at the carotid artery) and RPE at the end of the first part of the workout, the end of the main part, and at the end of each session.

Results:
Concerning the assessment in pain perception after prescription of a specific set of aquatic resistance exercises for hip adductors and abductors (3 weeks), the individual reported a significant reduction by assigning a grade 5 on VAS pain score compared to grade 8 at the beginning of the case study.

Moreover, the semantic analysis from his discourse (FIORIN, 1990) revealed that he abandoned both the Mioflex® medicine and the application of ice massage he used to do each night, due to the reduction of knee pain. This outcome seems very favorable since the individual was absent from two sessions during the study (see Tables 1 and 2 on page 34) and that he reported his renewed perception two days before the end of the prescribed exercise period.


Concerning the aerobic effect, Tables 1 and 2 show figures that the training program was performed with safety and effectiveness. Table 1 displays BP pre and post training of the individual during each session, whose behavior is considered “normal” according to American Heart Association (AHA, 2013). Table 2 displays figures of the aerobic affect that suggest it was achieved based on HR behavior and RPE which meets both ACSM (2009; 2011) guidelines and AEA recommendations (2006; 2010).

(Continued on page 34)
Conclusion:
From this case study it is hoped that similar studies, including different research designs, are employed to provide effective approaches for reducing pain perception related to patellofemoral pain syndrome through prescription of workouts based on aquatic exercise. We believe that the findings from our case study open the possibility for further research to help clients/students/exercisers with patellofemoral pain syndrome through aquatic exercise.

Application to Practice:
The outcomes of our case study suggest that the specific aquatic exercises for hip adductors and abductors, which takes 9 minutes from the total time of a session, can provide a promising approach for reducing pain perception related to patellofemoral pain syndrome. Although it was designed for a male subject with advanced deep water exercise experience (over 1 year), the specific aquatic exercises for hip adductors and abductors from our case study can be added to shallow water programs, including use for beginner exercisers.

References
As a researcher or developer in any field, you can experience blocks that often lead to procrastination. Invariably many projects (some that may in fact change history) would be successful if only they were properly completed. Many fail to see such realization due to perceived or real barriers that block the creative and functional path. These perceived or real barriers can often be successfully circumnavigated with initial contemplation of diversion tactics and by simply applying a number of pragmatic solutions. This model, I believe, gives a well balanced arsenal of systems, solutions, and tools to equip anyone facing a project or goal. This system can easily be used in the health-fitness profession for something as simple as creating choreography or as complex as creating and evaluating a fitness program schedule.

Being a pragmatist, mixed with being very much a visual communicator under neuro linguistic cognitive considerations, I have combined many domains that solve problems into a flowing research and development projects model pulling together many systems I have studied. The goal is to enable easy solution management when one feels the struggle or stress to deliver a project may make it never happen.

Over the past few decades in teaching workshops and courses, it has been my pleasure to develop and introduce a number of pragmatic simple systems that were seeded from multiple other systems and studies to enable easier development and flow of ideas. The overall system, as well as the individual systems, can be applied to simple objective goals, large projects, as well as more subjective concepts. The ‘Keyes Research & Development Projects Model’ gives you 7 distinct tools or systems that hold alone or work wonderfully well when combined with the linking systems. The overall system focuses on conclusions and goal achievement.

The 7 breakdown systems of the ‘Keyes RDP Model’ are:

1. KCCCS: Keyes Core of Concept Creativity System
2. KEGAS: Keyes Exertion, Goal & Achievement System
3. KPPMS: Keyes Project Plan Management System
4. KICS: Keyes Influence & Compliance System
5. KSEAS: Keyes Scopes of Excellent Appraisal System
6. KSSRS: Keyes Scale of Stress Rationale System
7. KFFS: Keyes Foundation of Facts System

Following is a visual interpretation of the systems and a very brief description of each.

1. KCCCS: Keyes Core of Concept Creativity System
   The initial showcase system is KCCCS: Keyes Core of Concept Creativity System. This system is similar to ‘Mind Mapping’ and a host of other models, except the secret is to always comply with the ‘Keep It Simple’ principle. You break things down into 7 fields with the main topic or subject being at the core. If using the method with exercise domains such as choreography and musicology considerations, there then begins the centre of the base move or beat of music in the core, and the 7 other branches are the flow of 8 count beats and music.

2. KEGAS: Keyes Exertion, Goal & Achievement System
   Unlike most Goal Achievement models, the Keyes EGA Scale is similar to a seesaw, which is quite often what trying to achieve goals can be like. Note I have placed the goal in the centre as the pivotal point. As you begin you journey towards the Goal, simi-
lar to climbing a hill, you travel up the see-saw image, and when you reach the mid-way point, as on any see-saw, you can find the centre of balance. When climbing a mountain and your half way, you can see the Goal far clearer and observe the journey you have already done to achieve this point. Often re-evaluation of the route is needed to achieve the goal at this point, and then as you continue on the see-saw, your weight naturally begins its journey toward the ground and achievement of the goal obtained. Often the goal has changed and outcomes are often different from when the journey began. The scale mixes domains such as the Scale of Stress Rationale, the Project Plan Management System, the Scopes of Excellence Appraisal system and various influence and compliance considerations.

3. **KPPMS: Keyes Projects Plan Management System**

   When looking at the human body, the system that enables it to stand erect and act as a foundation is the skeletal system. With any business, project or focus, one needs a strong base to enable achievement. The Keyes Projects Plan Management System utilizes many of the basics of business management, and the domains mentioned are the focus points that are then broken down.

   These are:
   1. Concept Vision, Mission & Goals
   2. Feasibility Study
   3. Legal Analysis & Requirements
   4. Marketing
   5. Financials
   6. Operations
   7. Appraisals, Quality & Assurance

4. **KICS: Keyes Influence & Compliance System**

   With any project or research it is imperative good understandings of compliance methodologies are known. They are used extensively in marketing and influence tactics that are the basis of the ‘KICS’ System, linked in with neuro linguistics, body language, micro expressions, etc.

Considerations are:
1. Neuro Linguistics
2. Proxemics, Body Language, Micros Expression Recognition
3. Consistency, Complacency & Commitment Techniques
4. Liking & Reciprocation Methodologies
5. Social Proof & Authority Techniques
6. Scarcity & Perceived Value
7. Presentation, Performance & Rapport

5. **KSEAS: Keyes Scopes of Excellence Appraisal System**

   This system of appraisal is designed to hopefully take out the emotional interference that can take place when being assessed. The concept is any given number of categories being singularly placed in the domains of A, B, C and D. Obviously you can have any given number of scopes. For example 4 Scopes = 16 categories of possible assessment criteria, which might include punctuality, customer relations, phone abilities, appearance, follow-up, product knowledge, creativity, etc. Then the assessor scores with a 1-7 scale, with 1 being excellent and 7 being very poor. The person being assessed also then scores their belief of their abilities or criteria being assessed and typically there will be discrepancies. Then a composite analysis takes place, and the black area is common ground. The secret is to try for a perfect bulls-eye after a period of time utilizing this system and it seems to take the emotional concerns out of the assessments.
6. KSSRS: Keyes Scale of Stress Rationale System
This domain is rarely taken into account when creating and working on projects yet it affects many of us far more than credit is given. The system mentions 7 Categories or “stresses of true reality.” When compared to the normal considerations of what upsets us, realization of over-reacting is quickly taken into account and a far more rational approach can then be considered. The 7 levels on the left side are markers for considering emotional response, influence considerations in decision making, etc. All link into the ‘KICS’ and ‘KEGAS’ Systems.

7. KFFS: Keyes Foundation of Facts System
Paramount to any research or project development is the credibility of efforts. This links directly into excellent use of the 5 P’s: ‘Prior Preparation Prevents Poor Performance.’ Awareness of the Pareto Principle, or 80/20 Rule, is also critical; spend at least 20% of allocated time in preparation and research, utilizing many of the systems shared in this Model. This should deliver at least 80% of your focus goal/s. When nearing completion of the project and goal, ensure that documentation is well thought out so creditability is forth coming for your hard efforts!

The 7 domains are:
1. Research
2. Legal Restraints and Considerations
3. Academic Traditional Qualifications
4. Reputation, Experitiential, Non-Traditional Qualifications
5. Review Panel / Forum
6. Evaluation Methods
7. Bibliography