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The Effect of an Aquatic Exercise Intervention on Positive Emotion States of Three Participants with MS.

Dr. Ellen Broach, CTRS, ATRIC
University of South Alabama, Mobile, Alabama
Aquatic Therapy & Rehab Institute Symposium June, 2012

Introduction and Purpose
Research supports the belief that participation in goal-oriented aquatics programs can not only provide individuals with realistic solutions for achieving fitness and rehabilitation goals, but also for attaining positive emotion states that improve health and longevity. While positive emotion is often marginalized, one’s state of positive emotion or negative emotion affects all aspects of that person’s life (Broach & McKenney, 2012). Meyers (1993) emphasized that individuals who have negative mood states are self-preoccupied and depressed. Moreover, negative moods result in reduced activity levels and more days sick from work (Lyubomirsky, Sheldon, & Schkade, 2005). A push for holistic treatment that includes positive emotion in rehabilitation is emphasized by the World Health Organization (WHO 2005, 2009). Specifically, the WHO confirmed that positive emotions potentially lessen the emergence of disabilities and promote more rapid recovery from illness. Fredrickson (2005) and Seligman (2002) supported this contention by extensive reviews of research that showed improved health and well-being associated with positive emotion. In addition, since water activity is often more conducive to independent participation than many land-based exercise programs, goal-oriented aquatic rehabilitation may facilitate positive emotions that result in adherence to the activity (Broach & Dattilo, 2003).

Two positive emotions states of enjoyment and fun were examined for this study. Enjoyment is a positive emotion from investing attention in an activity that is intrinsically motivating (Csikszentmihalyi, 1988). Enjoyment is likely to occur from a “flow state.” Enjoyment pushes us to do things beyond our present ability (Csikszentmihalyi, 1996). Fun and enjoyment involve active involvement, a resulting positive state, feeling of control, and successful engagement. While similar to enjoyment, fun is not only the absorption in the individual activity; it is activity with others that makes it fun. Therefore, fun contributes to social growth.

Potential behavioral health benefits of participation in aquatic activity include improved mood (Berger & Owen, 1992), and decreased anxiety and depression (Stein & Motta, 1992; Weiss & Jamieson, 1989).

While symptoms associated with MS often include mood changes (Schapiro, 1987), there has been few examinations of the effects of AT on these symptoms. While aquatic interventions may promote development of an enjoyable lifetime activity, few studies have described the use of aquatic rehabilitation or exercise to enhance the enjoyment or fun of participants with disabilities. Aquatic exercise and rehabilitation has the potential to assist participants to improve or maintain function while participating in an activity that results in positive emotions (Broach & Dattilo, 1996). Therefore, the purpose of this report is to examine effects of an aquatic exercise program on factors that affect the positive emotions of enjoyment and fun.
Method
A single subject multiple probe design across three participants was used for this study. Participants participated in a baseline condition from one to three weeks that involved independent aquatic activity in a pool that was maintained at 86 to 87 degrees Fahrenheit. An experience questionnaire was administered to the participants each day that they came to the pool for independent water activity. Upon entry into the intervention condition, participants participated in an aquatic exercise class that followed an Aquatic Exercise format described by Broach et al. (2003) for 7 to 10 weeks. Dependent measures for positive emotion were administered after each time participants participated in aquatic exercise. For procedural reliability 20% of the aquatic rehabilitation classes were observed to assure that at least 80% of the potential exercises in each exercise sequence of the MS aquatic exercise manual were maintained.

To participate in the program volunteer participants had to have physician orders and no current exercise interventions. Details on participants are described in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Physical Ability</th>
<th>Age</th>
<th>Employment</th>
<th>Living Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>John</td>
<td>ambulates with cane</td>
<td>53</td>
<td>un-employed school administrator</td>
<td>Married with 3 children</td>
</tr>
<tr>
<td>Jessica</td>
<td>ambulates with cane or walker</td>
<td>52</td>
<td>unemployed secretary</td>
<td>Lives with daughter</td>
</tr>
<tr>
<td>JoAnne</td>
<td>Ambulates with no assist</td>
<td>30</td>
<td>un-employed teacher</td>
<td>married</td>
</tr>
</tbody>
</table>

The experience questionnaire was used to examine conditions for positive emotions (Broach, Dattilo & McKenney, 2007). Conditions that contributed to fun or enjoyment were assessed by examining participants' ratings of nine statements of experience that affects enjoyment using a zero to nine point scale. These items included: (a) five items of the flow model (challenge/skill ratio resulting in flow or enjoyment, anxiety, boredom, satisfaction, and focused attention), (b) two items of intrinsic motivation (a desire to continue, desire to be doing something else), (c) one item of social enjoyment or fun (enjoy others), and (d) one item of activity enjoyment. While eight of the nine items are not measures of specific enjoyment, the responses to the items identified experiences that contributed to enjoyment.

Results
The three participants in this study perceived high levels of experiences that related to enjoyment or fun (challenge/skill ratio, focused attention, satisfaction, and enjoyment of the activity and others) during AT. Ratings of boredom, anxiety, and the desire to do something else were low during AT. However, the data indicated that the AT program did not increase experience levels for all participants. This conclusion, in part, was due to the fact that some participants scored extremely high or low across all conditions.
resulting in a ceiling effect. Despite numerous design limitations, the pattern of experience evidenced by participants indicated that, while improved scores were not apparent across all participants, positive experiences during the AT program was indicated by all participants and participants who scored low during baseline clearly improved their experience scores during the intervention. These findings were similar to findings in Broach and colleagues (2007).

Conclusion and Implications for Practice
Based on what is known about the importance of positive emotions states and the aquatic environment that is conducive to conditions for enjoyment, attempts to assess changes in affect associated with aquatic interventions are warranted. Aquatic practitioners are encouraged to create an organizational environment that encourages outcomes through challenges that facilitate absorption in the activity which result in positive emotions and a desire to continue. These individualized challenges provide participants with a sense of being in control and feelings of self-determination during treatment (Broach & Mckenney, 2012) that will promote activity adherence and health after discharge. Finally, the literature strongly supports promoting social engagement among clients. Therefore, when appropriate, small group rather than individual treatment sessions may enhance fun, social learning and adherence.

References
Core muscle activation during aquatic resistance exercise performed with different devices.

Borreani S, Moya D, Martin J, Calatayud J, Martin F, Colado JC. University of Valencia, Laboratory of Physical Activity and Health, Valencia, Spain. Aquatic Therapy & Rehab Institute Symposium June, 2012

Core training is important to enhance spine stability, to prevent low back pain and to improve performance. The water environment has been shown to be safe and effective to rehabilitate low back disorders. Many different devices are used in aquatic resistance training. There are two kinds of devices: floating and drag, which may be of different sizes. However, the evidence for the effect of carrying out the maximum velocity of movement with different devices is scant.

**Purpose**
To compare core muscle activation during shoulder extension performed at maximum velocity with 4 different aquatic devices.

**Methods**
24 physically fit and healthy subjects (23.2 ± 1.18 years) took part in a randomized, within-subject design assessment. The maximum isometric voluntary contraction (MIVC) was evaluated for the normalization of the electromyographic measures. Rectus Abdominis (RA) and Lumbar Erector Spinae (LES) muscular activities were recorded and the maximum root mean square values were calculated for each condition. Surface electromyography was isolated and the activity was analyzed during shoulder extension of 3 repetitions performed with 4 aquatic devices: Drag Gloves (DG), Drag Wetshapers (DW), Floating Dumbells (FD) and Floating Wristbands (FW). All values were expressed as the %EMG and compared using Analysis of Variance (ANOVA) with repeated measures. Significance level was set at p<0.05.

**Results**
There were no significant differences between the performance of the aquatic exercise in the four conditions (DW, DG, FD and FW) for both muscles, RA (p = 0.132) and LES (p=0.230) (Graph 1).

**Conclusion**
The core muscle activation was the same, independent of the use of one device or another.

**Practical Application**
Bigger devices are not the best choice to increase core muscle activation in the water environment. Floating and drag devices are both feasible, however, drag devices present great advantages for resistance training, for example, they allow the implication of a greater number of muscle groups with a smaller number of movements. Applying the maximal velocity of movement is more important than the size and kind of the
additional device, thus, the maximum velocity of movement seems to be the best strategy to optimize the neuromuscular activity.

Graph 1: Percentage of maximum muscle activation of rectus abdominis (%EMG RA) and lumbar erector spinae (%EMG LES)
Effects of Ai Chi on pain and function for an individual with fibromyalgia – a case report.
Janet Gangaway, PT, DPT, OCS, ATC, ATRIC
Aquatic Therapy & Rehab Institute Symposium June, 2012

Abstract
This is a case study of a 58 year old woman who is a subject from a pilot study on the physiological effects of Ai Chi on the symptoms related to fibromyalgia. The study focuses on Fibromyalgia (FMS) which is a syndrome characterized by widespread pain in all four quadrants of the body, chronic fatigue, emotional dysfunction, and cognitive difficulties. All of these symptoms are increased with stress which is a common occurrence in most people's daily lives. Even though this diagnosis is one of exclusion, it currently affects approximately 2 million Americans. It is potentially a very disabling condition for most people who live with it as there are few effective, non-pharmaceutical treatments available to help manage the symptoms. One possible treatment would be Ai Chi which is an aquatic therapy technique that uses diaphragmatic breathing and slow movements of the arms, legs, and torso in flowing patterns. By using this technique, it is hypothesized that there will be an improvement in pain, stiffness, anxiety, depression, and physical functioning in patients with fibromyalgia. The study also anticipated an improvement in balance and an increase in muscle endurance. These would be indicated by increased distance during a 6-minute walk test, improved postural sway measurements on the Accusway, and more positive responses to the surveys looking at pain and function.

The movement pattern of Ai Chi consists of 19 specific positions repeated to both sides with the study only including the first 16 positions. The study was to last for 20 weeks which were broken into a 4 week baseline period, an 8 week pool period, and an 8 week post treatment period. The subject was asked to fill out a visual analogue pain scale (VAS) every day for the full 20 weeks as well as participate in a weekly data collection session for application of the 6 minute walk test, postural sway measurement, and completion of the fibromyalgia impact questionnaire (FIQ). The subject was given 2 pool sessions per week for the 8 week pool period which were held in a warm pool up to shoulder height. Music with a script was introduced after the subject was fully taught the pattern. While the subject did experience many physical difficulties during the study, including a hiatal hernia, pleurisy, and breathing difficulties, she was able to complete most of the pool sessions without incident. However, it took 6 of the 8 weeks to get the patient through the full pattern due to breathing complications which potentially limits the benefits of the study.

Upon analysis of this subject's data, there was a significant improvement in FIQ scores indicating reduced impact on daily life activities. There was also a marked decrease in level of depression, pain severity, and anxiety. There were some indications of improved balance as well. The subject showed marked improvement in the 6-minute walking distance and reported feeling more “strength” in her legs. She also showed significant decrease in sensitivity of tender points. Her own personal opinion of the study included comments of improved breathing capacity and overall improved well being. While a single subject is not enough to draw any conclusive findings, it does point towards the benefits of using Ai Chi to help manage the symptoms of FMS. It is suggested, based on these findings, that the practice of this aquatic therapy technique be utilized on a consistent and weekly basis for maximal lasting benefits with sessions of 3 times per week if possible. Further research is needed on this technique to determine the most appropriate dosage.
The effect of regular aquatic exercise on improvement of physical fitness level, static and dynamic balance capacity, and muscular activity in elderly arthritis patients.
SunYoung I, SongJune K, SeongKyeong K, JongSam I.
Exercise and Sport Science Research Group, Daegu University
Aquatic Therapy & Rehab Institute Symposium June, 2012

Purpose
The aim of this study was to examine the effect of regular aquatic exercise on body composition, physical fitness, static and dynamic balance capability, muscular activity and weight distribution, and articulation pain control in elderly arthritis patients.

Method
A total of 22 elderly women subjects, who registered in a beginner’s class in aquatic exercise operated by Sports center in the city of Daegu, voluntarily participated in this study. Subjects were allocated one of two experimental groups: either arthritis (ART, n=11) or control (CON, n=11). All subjects from both experimental groups participated in an exercise program that was designed for the same exercise intensity and work volume, and exercise was performed three times a week (60 min·session⁻¹) at the 12-16 level of rate of perceived exertion (RPE). Before and after 12 weeks of the aquatic exercise program participation, percent body fat (%BF, Inbody 330, Biospace, Korea), physical fitness status (include muscle strength, muscular and cardiovascular endurance, power, flexibility, and agility), muscle activation ratio (using surface electromyography (EMG), Telescan, Laxtha, Korea) and static-dynamic balance capability (SpaceBalance 3D Posturography, CyterMedic, Korea), weight distribution, and pain recognition level (VAS scale) were measured using appropriate tools and methods.

Windows SPSS (Version 18.0) was used and means and standard deviations were drawn from all data obtained from this study. TWOWAY ANOVA was used to analyze the interaction between groups (ART vs. CON) and time (PRE vs. POST), and the main effect of each factor was examined when no significant interaction was found. Paired t-test to test the mean differences between PRE and POST and independent t-test to test the mean differences between ART and CON was adopted. All statistical significance levels were set at α=.05.

Results
Results obtained from this study were summarized as follows:

1. %BF and body mass index (BMI) was significantly decreased while lean body mass (LBM) and muscle mass was significantly increased in both groups after the 12 week aquatic exercise program. However, statistical difference did not show between ART and CON.
2. Physical fitness level was improved from both experimental groups but revealing different patterns between the groups. Power was significantly improved in both groups, and Back (not grip) muscle strength increased in ART but grip (not back) muscle strength increased in CON. Agility and flexibility was only significantly increased in CON (not in ART). Muscular endurance was significantly increased only in ART (not in CON) whereas cardiovascular endurance was significantly improved only in CON (not in ART).

3. From both groups, static balance capability was significantly improved in both side of the body (i.e., left and right side) after 12 weeks of aquatic exercise. Dynamic balance capability was also significantly improved in both experimental groups. Specifically there was a significant improvement of dynamic balance from all aspects of experimental conditions (i.e., object to be focused was given with eyes opened, object to be focused was not given with eyes opened, as well as eyes closed) in ART, but it was only partially increased in CON showing only significant improvement when object to be focused on was not given to subjects with eyes opened condition. Muscle activation ratio tended to increase after regularly performed aquatic exercise even though maximal strength was not measured in this study. Using load cell, weight distribution was measured during static balance test, and showed remarkable improvement in ART after 12 week aquatic exercise program.

4. The degree of pain recognized during walking was significantly reduced after the 12 week aquatic exercise program in both experimental groups. The degree of difficulty during routine life was also partially but significantly decreased in both groups, and the stiffness level was also significantly improved in ART after regular aquatic exercise program.

**Conclusion**

Based on these results, it was concluded that the aquatic exercise applied to the elderly women who were not only in normal healthy condition but those who suffer from arthritis symptoms was effective to improve their overall healthy status as well as to reduce the degree of pain during their routine everyday life.

Although variety in aquatic exercise tools and methods were used to prevent boredom throughout the participation period, some further considerations associated with individual physique and physical fitness level need to be more precisely considered to increase the effectiveness and achievement of aquatic exercise.

It would also be beneficial to use an additional control group where participants do not perform any scheduled exercise throughout the experimental period. This aspect can be further examined in subsequent study.
Overall health and wellbeing involves interactions between genetic, biochemical, environmental and psychosocial factors, which may play a role in learned adaptive response. However, this response can be unlearned and what was forgotten can be remembered.

It is important to influence, maintain and improve physical, emotional and learning abilities at any age in order to have clients experience their body the way it is meant to be. With improvement of sensory motor learning abilities, a client can develop skills and knowledge not to “fight,” but rather meet the challenges of life without fear and uncertainty.

The SykorovaSynchro Method teaches about land and water based somatic exercises and how to teach them properly. It will demonstrate how to incorporate and achieve positive changes in your life: a new sense of self awareness and control, stress reduction, revitalization of energy flow, postural alignment and flexibility, circulation, sensory-motor learning ability and creativity.

- SykorovaSynchro is a therapeutic Body and Mind balancing educational method of integrated techniques.
- SykorovaSynchro Method focuses on achieving physical symmetry, between muscular and skeletal structures. It also focuses on Mind and Body symmetry by using targeted movements to trigger valuable information flow between the muscles and the brain. The focus of all of this is to improve function while reducing muscular effort to perform basic needs and live a healthy lifestyle.
- This method will help to identify which muscles / movements are involved in a particular discomfort and teach the most efficient way to relieve excess tension.
- An exercise program based on the “SykorovaSynchro method” incorporates Somatic exercises in which “self-sensing” is essential. This internalized perception /body awareness is a skill that allows a person to accurately assess what they are experiencing somatically: “What is happening to my body?”
- Somatic exercises are highly valued for their contribution to successful pain management and the recovery process. Conscious control over learned habits is taught to improve posture for the relief of pain.
- An aquatic/ land based exercise program based on the SykorovaSynchro Method will help to stabilize and harmonize emotional, social, physiological, spiritual and intellectual aspects of health.

This is all accomplished by applying the neurological rule: “The less muscular effort, the more enhanced sensory awareness becomes for learning and physical performance.”
The 100 Step Deep Water Test was designed to track the cardiorespiratory improvement and fitness of injured warriors and athletes. The U. S. Army’s Office of the Surgeon General through the Proponency Office for Rehabilitation and Reintegration contracted with MW Associates to conduct a Performance Improvement Study and the development and implementation of Aquatic Rehabilitation and Aquatic Warrior Exercise Programs. The goals of the study were re-conditioning to achieve improved function and fitness for musculoskeletal injuries, provision of a workout of sufficient intensity and duration to improve fitness that could accommodate large groups, and provide a viable option for non-swimmers or those not desiring to swim for fitness.

Factors impacting program development and program components included:

- Addressing Fear of Water
  - Obesity and physical inactivity linked to
    - Medications
    - Pain
    - Drug and Alcohol Abuse
    - Inactivity

- Physical limitations – Moderate to Extreme Difficulty to perform
  - Hopping – 75%
  - Walking 1 mile – 64%
  - Going up or down 1 flight of stairs – 57%
  - Standing for 1 hour – 67%
  - Running on even ground – 79%
  - Running on uneven ground – 81%
  - Making sharp turns while running fast – 84%

- Developing a cooperation with aquatic directors at facilities

- Implementation of the Deep Water Interval Cadence Training Program

  Validated land scales were used to evaluate and track changes in Pain, Low Back Pain, Upper Extremity Function and Lower Extremity Function. A validated cardiorespiratory test specific to deep water was not available, so through trial and error, the current test was developed. The initial test design was extremely simple and did not measure with any reliability. As now defined, the test is appropriate not only for those recovering from injuries, but for any active aquatic participant desiring to monitor their fitness level. It is a natural component of Deep Water Running or Deep Water Interval Cadence training program.
After trial and error, the current administration of the test is in Deep Water with adequate floatation to maintain correct buoyancy. The test requires the subject to take 100 steps – or as many as their ability permits. The steps are counted as the non-dominant leg steps down. Knee flexion is to 45˚ and less than 90˚. To closely monitor the alignment, knee lift, and step count, the subject is tethered to the edge of the pool. Bent arm swing is emphasized. The subject counts steps aloud, emphasizing each ten steps (10, 20, 30, etc.). If unable to continue counting aloud, the test administrator assumes the counting. There is no time limit to the test. The total time to complete the 100 steps is recorded on the data sheet in seconds.

Resting heart rate and ending heart rate are recorded. Individual assessment of RPE based on a scale of 1 to 10 is also recorded. Heart rate readings are achieved using a Heart Rate Monitor with chest strap. The one being used in the pilot study currently being conducted is the Polar RS300X. It is extremely important to quickly obtain accurate ending heart rate immediately upon ending the 100 steps while in the water.

Preparing to take the test requires practicing the correct stepping form while tethered. Subjects are taught the correct form before the first test is administered. Exercise at moderate intensity is permitted the day prior to the test. Tests are at scheduled appointment times. The subject should arrive early to warm-up prior to the test with shallow water walking. Ten minutes prior to taking the resting heart rate, subject moves to a bench at the deep end of the pool and sits quietly with feet on the deck for approximately ten minutes, puts on Heart Rate Monitor, and test administrator records resting heart rate. Subject then puts on the floatation belt with tether attached and enters the water – using the ladder or sliding in. The free end of the tether is attached to a secure object such as the diving block or lane line “eye” hook and the subject begins slowly jogging to establish a rhythm. Using a stopwatch, the test administrator gives the commands to begin jogging and to start counting.

All test administrators were trained in Step Test Administration.

Required equipment:
- Stopwatch
- Heart Rate Monitor with Chest Strap (recommend Polar RS300X)
- Floatation belt(s) of adequate buoyancy
- Tether (the study uses Aqua Jogger tethers/hitches & floatation belts)

Instructions:
- Tester completes test administration training and administers practice tests
- Test subject practices the step test in at least one session prior to scheduled time of testing
- On day of test, subject warms up with shallow water walking
To administer the test:

- Move subject to a bench by the pool and ask them to sit quietly with both feet on the floor/deck – recommend 10 minutes
- Assist subject with putting on the Heart Rate chest strap and watch, take resting pulse – Tester records on form
- Put on the floatation belt with tether attached
- Ask subject to enter the water by going down the ladder
- Attach the loose end of the tether to a secure object on pool edge – diving block, lane line “eye” hook, etc
- 10 to 15 seconds before giving the command to start counting, ask them to do an easy jog to get in the rhythm – tester checks knee lift, body position
- Command to begin is “Start Counting”
- They should count aloud until too difficult to count and breathe
- Tester takes over the counting until 100 is reached if subject cannot continue counting
- Command is “Stop Stepping, Check Pulse”
- Tester records Time and Ending Heart Rate on form that will be input into the computer
- Tester must instruct the subject to strive for a RPE 8 or 9 on a scale of 10

For accurate administration of the test and collection of data, one tester at a site should be identified and conduct all testing. The test administrator is responsible for ensuring correct execution of the steps, counting of steps, time, and motivation for the subject. The desired Rate of Perceived Exertion (RPE) is based on a scale of 1 to 10 with 10 being maximum effort. An RPE of 8 or 9 is expected. Data from the first round of testing is collected and tracked. Data should be collected monthly and comparisons analyzed. The hypothesis is to see ending heart rates drop along with the time to take 100 steps in Deep Water. At the completion of this phase, it is anticipated that total step time will drop along with resting to ending heart rate ratios.

The results of 100 Deep Water Step Test for the Army showed:

- Resting Heart Rate – decreased an average of 4 BPM. 49% of the Soldiers decreased their resting heart rate between the first and last test.

- Ending Heart Rate – increased an average of 7 BPM. 61% of the Soldiers increased their ending Heart Rate between the first and last test.

- Time to Complete (Seconds) – reduced an average of 11 seconds. 75% of the Soldiers reduced the amount of time required to take the 100 Steps in Deep Water.

The current goal is to assess applicability of this test for use by health-fitness professionals to have a tool to use in evaluating cardiorespiratory improvement in their participants interested in noting fitness improvement and to serve as a motivation tool for self-challenge.
2011-2012 was the initial application and recording of test results by volunteer test administrators and participants interested in personal evaluation. Additional testing sites are still being recruited. The first results show that the Deep Water Step Test is an effective tool to evaluate participate fitness improvement. All that took part recorded scores showing increased cardiorespiratory fitness as noted below.

100 Deep Water Step Test conducted by Aquatic Exercise Association (AEA) instructors using the program showed:

- Age range – 50 to 63 years old - female
- Average Resting Heart Rate – 79.2
- Average Ending Heart Rate – 145
- Time to Complete 100 Steps – 75 seconds (age group 50 – 59 y/o)
- Time to Complete 100 Steps – 120 seconds (age group 60 – 65 y/o)
- All participants improved (elevated) Ending Heart Rate with each test while decreasing the time required to complete the 100 steps
- Assumption – cardiorespiratory fitness can be increased in all age groups and novice to experienced aquatic exerciser when putting forth effort of 8 to 10 on a scale of 10

Summary
- Army programs continue and are growing.
- The program has expanded to include all U. S. Marine Corps installations.
- Community pools are encouraged to add deep water interval training as a regular class or as a monthly Intro class – participants track own progress and select their pool time.
Calming Fearful Patients
Belinda Stillwell, Ph.D. California State University, Northridge

Who’s Afraid
National Swimming Pool Foundation (NSPF)
About half of Americans either fear deep water or cannot swim (Lachocki; 2012)

Barriers
Fear, drowning, disease, injuries, social and cultural concerns
As a result the “Step Into Swim” campaign is a 10-year effort to encourage public and private sectors to sponsor and support exceptional organizations that help people become competent swimmers (NSPF, 2012)

Exceptional Programs (NSPF 2012):
Swim Programs for Children
YMCA of the USA
Jewish Community Centers
U.S. Swim School Association
World’s Largest Swim Lesson™

Swim Programs for Fearful People/Adults
Miracle Swimming Institute
Strategies for Overcoming Aquatic Phobias (SOAP)

Swim Programs for Minority Populations
American Red Cross
Make-a-Splash Campaign
Swim America – American Swim Coaches Association

Alternative Approach
Systematic Desensitization (Joseph Wolpe, 1950) - A gradual exposure therapy

How Does It Work?
Step 1: Practice relaxation techniques (e.g. deep breathing, progressive relaxation, mental imagery)
Step 2: Gradually expose individuals to situations they find fearful (first virtually then in vivo hierarchies)

The essential component is repeated exposure **WITHOUT** experiencing any negative consequences

Sample Hierarchy
1. Back floating with assistance **(no anxiety – least fearful situation)**
2. Back floating unassisted
Up to…. 10. Back floating unassisted while exhaling out of my nose. Finding myself alone in the water after “falling down”, exhaling out of my nose, putting my chin to my chest while simultaneously bringing my knees to my chest, holding myself in a “ball” for at least 3 seconds until I see my feet, placing my feet on the pool bottom, extending my arms to balance in an upright position and walking to safety.

*(overwhelming anxiety – most fearful situation)*
**Intervention Studies**

Stillwell (2011)  Exploratory Case Study  
**Participant:** Female, Mid 30's, TBI  
**Intervention:** Semester long, 1 hour, 2x/week, recover from back float  
**Results:** Successful and at 2-year follow-up  
*Study demonstrated working with individuals with special needs

Menzies and Clark (1993)  
**Participants:** 48 water phobic children assigned to four conditions (IVVE, VE, IVE, Control-Wait)  
**Intervention:** 3 sessions, 30 minutes each  
**Results:** IVVE and IVE produced significant gains over VE but did not differ significantly from one another  
*Strong experimental study

Pomerantz et al. (1977)  
**Participants:** 4 year old boy with water phobia and his mother  
**Intervention:** ~12 weeks in vivo desensitization with participant modeling, 5 days per week/ 30 minutes - twice demonstrated by interventionist then mother took over  
**Results:** Child's fear was eliminated in 11 training days  
*Training paraprofessional undergraduate students as direct treatment agents

**Now What?**
- Stay connected
- Much more research is needed in terms of successful interventions for all age and ability groups
- Create a deliverable educational program for aquatic professionals to assist those who are afraid in water
Chronic Pain and Aquatic Exercise: Therapy Intervention
Maria Sykorova-Pritz, PhD Aquatic Exercise Association Research Committee

Some Facts:
• One and half billion people worldwide suffer from chronic pain.
• Approximately 3-4.5% of the global population suffers from neuropathic pain.
• Chronic pain costs society at least $560-$635 billion annually.
• Cost of health care due to chronic pain costs $261 to $300 billion and $297-$336 billion from lost productivity (based on days of work missed, hours of work lost, and lower wages).

Theoretical Analysis
• Pain: An unpleasant sensation that can range from mild, localized discomfort to agony.
• Acute Pain: Pain that comes on quickly, can be severe, but lasts a relatively short time.
• Chronic Pain: Pain that persists or progresses over a long period of time and is often resistant to medicinal treatments.
• Neuropathic pain: A complex, chronic pain state that usually is accompanied by tissue injury. With neuropathic pain, the nerve fibers themselves may be damaged, dysfunctional, or injured. The impact of nerve fiber injury includes a change in nerve function both at the site of injury and areas around the injury.

Chronic Pain Treatment and Pain Management:
• We need to know:
  – Diagnosis
  – Prognosis
  – Treatment options
• Provide relief of symptoms and improve an individual’s level of functioning in daily activities.
• Effective integrated treatment fosters self-awareness and teaches appropriate and effective self-care.

Treatment Plan may include:
• Orthopedic and neurological exam
• Medical consultation and care
• Psychological evaluation
• Awareness based-sensory integration
• Cognitive behavioral therapy
• Exercise and movement therapy
• Manual therapies
• Pool and Hydrotherapy
• Sleep restoration plan
• Anti-inflammatory
• Nutrition instruction
• Relapse prevention
**Exercise Therapy and Hydrotherapy:**
Exercise Therapy: helps patients reduce or eliminate many forms of acute or chronic pain.
- Increase strength
- Increase flexibility
- Increase range of motion

Achieves a state of physical fitness that allows performance of everyday activities without pain or discomfort

Hydrotherapy: also called whirlpool, pool therapy, Hubbard tank therapy or water therapy
- Swimming pools: relieving therapy
- Hubbard tank: range of motion exercises and easing condition
- Whirlpool: help relax tight muscles
- Sitz bath, saunas and steam
- Damp hot/cold packs

**Research**
- Research supports the benefits of Water Exercise in Chronic Pain Treatment/Therapy Intervention.
- Studies have confirmed that water exercise provides a physical and emotional benefit to a population with chronic pain.
- Reduced pain, improved physical and emotional health.
- Long-term benefits from water exercise.

**References:**
- Kihlstrand M, Stenmam B, Axelsson O. “Water gymnastics reduced the intensity of back/low back pain in pregnant women.”

**Conclusion:** Intensity of back/low back pain increased with advancing pregnancy. Water gymnastic during pregnancy can be recommended as a method to relieve back pain.


**Conclusion:** For patients with NSCLBP, the addition of DWR to GP was more effective in reducing pain and disability than standard GP alone, suggesting the effectiveness and acceptability of this approach with this group of patients.

- Munguía-Izquierdo D, Legaz-Arrese A. “Assessment of the Effects of Aquatic Therapy on Global Symptomatology in Patients With Fibromyalgia Syndrome: A Randomized Controlled Trial.”

**Conclusions:** An exercise therapy in a warm pool could improve most of the symptoms of FM and cause a high adherence to exercise the research participant.

**Conclusion:** According to these findings, an Ai-Chi aquatic exercise program improves pain, spasms, disability, fatigue, depression, and autonomy in MS patients.


**Conclusion:** Both water-based and land-based exercises reduced knee pain and increased knee function in participants with OA of the knee. Hydrotherapy was superior to land-based exercise in relieving pain.

- Electroencephalography EEG is the recording of electrical activity along the scalp produced by the firing of neurons within the brain. In clinical contexts EEG refers to the recording of the brain's spontaneous electrical activity over a short period of time, usually 20–40 minutes.

**Conclusion:** This study found that the subjects showed increased physiological and psychological indices of relaxation after underwater exercise.

- Oda S, Matsumoto T, Nakagawa K, Moriya K. “Relaxation effects in humans of underwater exercise of moderate intensity.”

- Vaile J, Halson S, Gill N, Dawson B. “Effect of hydrotherapy on recovery from fatigue.”

**Conclusion:** Overall, no significant differences were observed in HR or RPE regardless of day of trial/intervention. CWI and CWT appear to improve recovery from high-intensity cycling when compared to HWI and PAS, with athletes better able to maintain performance across a five-day period.
Bone Density and Aquatic Exercise

June M. Chewning, MA  Aquatic Exercise Association Research Committee Chair

Bone Density and Aquatic Exercise
○ Does water exercise maintain or build bone density?
○ Reduced weight bearing reduce effect?
○ Why do many doctors tell their clients to exercise on land to preserve bone density?
○ What kind of exercises work in the water?
○ Is there any research about bone density and aquatic exercise?

Past Research

Goldstein et al, Israel: 1994 (Wingate Institute)
○ Significant increases in bone density in both groups pre and post measurements: Water group showed significantly greater increases compared to the land group
○ Wrist measurement = first clue that water’s resistance may play a factor in building bone density

Harush et al, Israel: 2004  (University of Haifa)
○ Results indicated water exercise had a positive effect on bone density: allowed women in the experimental group to preserve and even increase their bone density, in comparison to the control group which registered a loss. (DXA 4 sites)

Ay et al, Turkey: 2003
○ Evaluated with quantitative ultrasound and hormonal variables (anabolic effects).
○ Positive results.
○ Difficult for elderly people to do weight bearing exercises. Aquatic exercise is a good alternative.

Ay et al, Turkey: 2005
○ Concluded that aquatic and weight-bearing (land) exercises are both determined to increase ultrasound scores for calcaneal bone.

New Study in Brazil (Linda Moriera-Pfrimer et al. 2012)
○ Femoral neck bone density improved in the exercise group (p=.782) and decreased in the control group.
○ Conclusion: In relation to femoral neck BMD, the groups were similar at baseline. After the protocol became statistically different due to the HidrOS program. The HidrOS group showed a 6.4% better femoral neck BMD after the protocol.
○ The benefits of a high intensity aquatic exercise program (HidrOS) on bone mass and metabolism, neuromuscular parameters and falls in postmenopausal women.

Exercise Program Variables

○ Israel, Oregon, and both Turkey studies used exercise protocols considered to be “average” or “typical” following basic guidelines set by AEA and ACSM
○ A direct comparison of actual movements and additional variables such as water depth, state of BMD at study onset, initial physical conditioning, etc would provide additional insight into forming a “general” exercise protocol that would optimize bone health in shallow water.
Protocol in Land Research

- Cells respond to ion fluid flow from impact exercise (current)- Fluid vanishes after two strikes
- 4 strikes should be target- then allow a 10 second gap
- 14 Times greater Gains (American College of Sports Medicine 2004)
- Fluid flow communication
- Allow non-impact time ~15–20 seconds
- Provide Objective to class
- Apply force quickly (Impact)
- Impact in various directions
- Allow recovery time (be active)

Class Planning Factors (Wasserman, 2006)

Consider incorporating the following examples into your class structure:
- 4 jumping jacks followed by 20 seconds of jacks at level 2.
- Walk for 20 seconds, stop and cross country ski 4 times.
- Side step 4 right and 4 left, do 4 tuck jumps driving legs down.
- Knee swing 3 bounce center R then L, double knees up- out- in- down.

Summary
- Research indicates that shallow water exercise maintains and even builds BMD.
- Shallow water provides the anabolic stimulus needed to maintain and build BMD.
- Program must be appropriate.
- Use land guidelines at this point for program guidelines.
- Need more research and comparison of variables to determine the best exercise to build BMD in the water.

Case Study

Aquatic Therapy and Osteoporosis
Aquahab Physical Therapy Case Study
(Cherry Hill, NJ)
- Client had problems with land-based therapy
- Combined water and land therapy
- Improved strength, gait pattern, gait tolerance, standing tolerance, decrease in pain intensity and frequency, helped her with independence in land therapy and quality of life.
- Exercising in water reduces risk and fear of falls or injuries that can occur on land.
- Added Benefit!

Dr. Kim Beason: “I do know that the older adults that participate in aquatic exercise are more likely to continue their active lifestyles out of the water. Therefore, water exercise, if not a direct BMD influence, allows participants the ability to ambulate on dry land and THAT does maintain BMD in older adults, especially my group with MEAN 77 years old.”
- Ongoing study and data collection being conducted by Dr. Kim Beason, University of Mississippi.
Back, Core, Stabilization
June M. Chewning, MA Aquatic Exercise Association Research Committee Chair

Back and Core

• Land Treadmill: Loss of 4.59 mm
• Shallow Water: Loss of 5.51 mm.
• Waist deep water
• Rotation movement of upper torso need to maintain balance may have contributed
• Deep Water: Loss of 2.29 mm. Why any loss? Postulated that could be due to muscle tension in maintaining an upright posture in water?

Immediate Changes in Spinal Height and Pain After Aquatic Vertical Traction in Patients with Persistent Low Back Symptoms: a Crossover Clinical Trial. (Simmerman et al 2011)
• Compared aquatic vertical traction on spinal height, pain intensity, and centralization response with a land based supine flexion position.
• Loaded walking 15 minutes then 15 minutes of either intervention.
• Height Change: 4.99 mm after aquatic and 4.21 mm after land based supine stretch.
• Decrease in pain significantly greater after aquatic.
• Centralization of symptoms more pronounced after aquatic.

Acute Effects of Exercise on Posture in Arthritic Patients. (Fukusaki et al 2011)
• “This study reports that a single session of (aquatic) exercise has a subtle but detectable acute effect on postural balance in arthritic patients.”
New Research
June M. Chewning, MA  Aquatic Exercise Association Research Committee Chair

Review: PT for Osteoarthritis (Brakke et al 2012)
- Common therapies identified: strength training, manual therapy, aquatic therapy, electrical stimulation, balance and perturbation training.
- “A review of the most recent and highest-quality literature regarding these modalities found that strength training, aquatic therapy, and balance and perturbation therapy were the most beneficial with respect to reducing pain and increasing function.”

American College of Rheumatology 2012 recommendations for the use of nonpharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee. (Hochberg et al 2012)
- Recommendations based on the consensus judgment of clinical experts from a wide range of disciplines, informed by available evidence, weighing pros and cons, incorporating their preferences and values. Review of literature conducted.
- Nonpharmacologic modalities strongly recommended for the management of knee and hip OA were aerobic, aquatic, and/or resistance exercises as well as weight loss for overweight patients.

Exercise Recommendations in Patients with newly Diagnosed Fibromyalgia. (Wilson et al 2012)
- “Aquatic exercise was most frequently recommended (56%), followed by combined aquatic-aerobic exercise (26%), and, infrequently, aerobic exercise only (5%); only 7% of these patients were referred for physical therapy.
- Less than ½ were provided recommendations to initiate an exercise program as part of their treatment plan.

- Important for practitioner to focus on the underlying physics and biomechanics of running in water in order to produce desired physiological, metabolic, and psychological outcomes.
- Deep water maximal HR and O2 consumption consistently lower than treadmill running.
- Recent evidence reveals less of a difference with increased DWR experience.
- Submaximal values strikingly similar.
- Skill level of DWR technique, psychological comfort, perception of work, muscle recruitment patterns, and running kinematics are well affected by physics (temperature, buoyancy, hydrostatic pressure, specific gravity, drag)
- Must factor in all for conditioning and rehabilitation prescriptions.

Effects of Pool Based Exercise in Fibromyalgia Symptomatology and Sleep Quality: A Prospective Randomized Comparison Between Stretching and Ai Chi. (Calandre 2009)
- “Although no global differences were found between groups, Ai Chi significantly improved fibromyalgia symptomatology and sleep quality, whereas stretching only improved subject’s psychological well-being.”