An Introduction to

When I first heard of aquatic therapy, my initial thought was, “You can do more than just swim in a pool?” Through my education and experience, I have learned that there is much more than just swimming when it comes to pool use. I have also learned that there are many different techniques to use when providing aquatic therapy. The focus of this article will include a brief history of aquatic therapy, an overview of aquatic principles, the therapeutic benefits, as well as aquatic therapy techniques including, Bad Ragaz Ring Method, Watsu®, Ai Chi, and AquaStretch™.

THE HISTORY OF AQUATIC THERAPY

There is a long history of the use of water for therapy. Over the course of that history, a great number of terms have been generated to describe this type of therapy such as hydrotherapy, balneotherapy, hydrology, hydrogymnastics, water therapy, spa therapy, water therapeutics and water exercise. Today, it is most commonly referred to as aquatic rehabilitation or aquatic therapy.

Aquatic Rehabilitation is a late-twentieth century term that describes a scientific therapy, medical rationale, and a set of clinical procedures using water immersion for the restoration of physical mobility and physiologic activity, and, at times, for effecting psychological transformation.¹

The long history of water therapy began as hot and cold baths that were used to treat disease as far back as 460 B.C. in Greece. Three hundred years ago, hot water was used with patients who were spastic or had muscles spasms, and cold water was used to reduce fevers.²

During the late 1700s, cold water was used for the treatment and comfort of smallpox victims.² In 1830, a Silesian peasant, Vincent Priessntiz, combined cold water with a vigorous exercise program to strengthen patients who were ill.² Priessntiz’s program created a stir in Europe which led to seminal research looking at water temperatures and their reaction times to various diseases.

Dr. Winterwitz of Vienna, Austria took part in researching the effects of water at different temperatures on sick patients, which eventually established an accepted physiological basis for hydrotherapy that still stands to this day.² In the United States, hydrotherapy was developed as a treatment modality for neurologic rehabilitation, initially in response to the polio epidemic and then for the treatment of amputees following World War I.²

As years and centuries have gone by, using water for therapy spread throughout the world. Over time, new names to describe water therapy were created, new methods of treatment were discovered, and novel equipment was fashioned, but overall, aquatic principles have largely remained the same. Today, aquatic therapy is used to help individuals improve balance, coordination, weight bearing, muscular endurance, muscular strength, cardiovascular and pulmonary endurance, pain management, motor skills, motor control, range of motion, and circulatory function.³
Aquatic Therapy

AQUATIC PRINCIPLES AND THERAPEUTIC BENEFITS

Buoyancy

Archimedes’ Principle states that when a body is completely or partially immersed in a fluid at rest, it experiences an upward thrust equal to the weight of the fluid displaced.4,5,6 In modern vernacular, this is termed “Buoyancy.” In essence, buoyancy decreases the effects of gravity on the individual’s body by allowing someone who cannot weight bear on land to be able to place weight on their limbs while in the water. The amount of weight bearing the individual may tolerate is dependent on the depth of water in which they are immersed.2 An individual waist deep in water may experience only 50 percent of their weight. A person chest deep in water experiences only 25 to 30 percent of their body weight, and neck deep submersion equates to one experiencing only about 10 percent of their weight.2

Another buoyancy concept relates to body weight in relation to water displacement. If the body or body part is more than the weight of the water displaced, the person or body part will sink. If the weight of body or body part is less than the weight of the water displaced, the person or body part will float.4

The benefits of buoyancy for patients are numerous, including decreased joint compression forces, weight bearing, stress on connective tissues, fear of falling, and blood pooling. Buoyancy also supports weak muscles, enhances flexibility and range of motion, changes biomechanical stress, and strengthens muscles working in opposition to buoyancy. For therapists, it increases ease of handling. Immersion also increases oxygen delivery,3 providing numerous other health benefits.

Hydrostatic Pressure

Hydrostatic pressure is force exerted on an immersed body by fluid molecules.3 As described above, the pressure is proportional to the depth of the immersed body and is equal in all directions.5 This pressure has different effects on a patient’s cardiovascular system, renal system, respiratory system, and nervous system.

From a cardiovascular perspective, when a person is immersed in water, hydrostatic pressure forces blood from the legs into the chest. This results in the heart pumping excess blood and the heart muscles stretching. When the heart muscles are stretched, it produces an increased muscle contraction, causing it to empty more completely. This is called Starling’s Law, which results in fewer heartbeats per minute to pump the same volume of blood thereby decreasing a patient’s heart rate while in water.2 Routine water exercise and the resulting hydrostatic pressure can increase breathing capacity outside of the water and allow the heart to function with greater efficiency.

Hydrostatic pressure can improve kidney function by increasing blood flow to the kidneys. Like the cardiovascular system, the renal system is more efficient due to hydrostatic pressure.

The respiratory system is affected due to blood being forced to the lungs. This makes it harder to
breathe, and the weight of the water on the outside of the chest puts pressure on the diaphragm. The weight of the water on the chest causes resistance to the diaphragm and forces air out of the lungs, improving the inhalation muscles and assisting with exhalation.

The nervous system interprets information about the body’s position in space, temperature, pressure, and sensation. When immersed in water, the body receives sensory information about water pressure and temperature which decreases pain due to over-sensory stimulation and increased circulation to muscles.

Benefits of hydrostatic pressure are decreased pain and edema, which will assist in increasing range of motion, and increased venous return and circulation, which decreases heart rate, evens tactile inputs, turns down reticular systems, strengthens muscles for inspiration and assists with exhalation.

Things to consider are patients with respiratory issues and patients with unstable blood pressure. It is suggested for these patients to enter and exit water slowly, especially during the first session, because of the increased sensation. Hydrostatic pressure will assist patients, especially those with cardiopulmonary disease, diabetes, development delay, or intellectual disability.

Resistance/Viscosity

Viscosity is a measure of the frictional resistance caused by cohesive or attractive forces between molecules of liquid. Viscosity provides equal amounts of resistance throughout a movement in water. This makes water a useful strength training medium because it resists more as more force is exerted against it, and strengthens without the need for weights. However, the resistance stops instantly when the forces of movement stops. Because of the resistance provided by viscosity, all muscle groups are worked equally, unlike resistance training on land.

The benefits of resistance to movement include improved muscle strength and tone, better muscle balance, decreased edema, and improved cardiac and pulmonary output. Resistance of water will especially assist patients with Parkinson’s disease and cerebral palsy due to dampening of involuntary movements. Contraindications include patients that have difficulty moving, tactile defensiveness or vestibular issues who may be overstimulated by the water.

**AQUATIC THERAPY TECHNIQUES**

**Bad Ragaz Ring Method (BRRM)**

**History**

This technique originated in Germany in 1957 and was introduced by Dr. Knupfer to the therapeutic thermal pools of Bad Ragaz in Switzerland. Dr. Knupfer utilized three floatation rings to help keep a client in a supportive horizontal supine position (or even prone) with floatation devices at the neck, pelvis, and knees and or ankles. Since then, the technique has become more clearly defined as the Bad Ragaz Ring Method.

**Concept/Description**

BRRM is a method used for muscle re-education utilizing specific patterns of resistance, endurance, elongation of the spine, relaxation, range of motion, and tone reduction.

Requirements of the pool environment are a warm water temperature of 92 degrees Fahrenheit, at least an 8 feet by 8 feet pool area 3 to 4 feet in depth, and the ideal position for the therapist is between thoracic vertebra 8 to thoracic.

![Figure 1. Therapist is positioned at patient’s head.](image1)

![Figure 2. Therapist is positioned at patient’s legs.](image2)
vertebra 11 of their thoracic spine.³ Floatation devices such as neck collars to support neck, floatation belt for pelvis, and floatation cuffs for ankles or knees and arm or wrist are utilized. The therapist can be located at the patient's head, sides or feet to perform swaying, rocking, rolling or other movement. See Figure 1, Figure 2, and Figure 3 to see therapist with floatation devices and variations of the therapist's locations.

While the patient is in this position, the therapist will use aquatic principles to interact with the patient, creating progressive exercises that are passive to active, isometric, isokinetic, and isotonic and incorporate fundamentals of Proprioceptive Neuromuscular Facilitation (PNF) to induce characteristics of normal motor patterns.³

Passive BRRM is when the patient is slowly moved through the water for passive trunk elongation, relaxation, and tone inhibition.³

Isometric means *same length* when performing a muscle contraction. Isometric BRRM is when a patient is holding a fixed position while being moved through the water, and the hold against resistance creates muscle contraction for trunk stabilization.³

Isotonic refers to *same tension* when performing a muscle contraction. Isotonic BRRM is when graded resistance is controlled by the therapist where the therapist acts as the stabilizing factor but also moves through the water with the patient, and the patient is either pushed or pulled in the direction of the movement.³

Isokinetic refers to *same speed* when performing a muscle contraction. Isokinetic BRRM is when graded resistance is controlled by the patient and the therapist acts as the fixator by stabilizing the body part while the patient moves though the water either toward, away, or around the therapist, which allows the patient to determine the resistance by the speed of the movement.³

Outcomes and Contraindications
The benefits of BRRM are tone reduction, trunk alignment and stability, pre-weight bearing activation, and improved range of motion. Patients that would benefit from BRRM include those with pain with movement, decreased range of motion, spasticity, decreased coordination, proprioceptive or sensory deficits, weakness or low tone, and restricted weight bearing.³

Precautions and contraindications of using BRRM would be patients with ear problems and frequent ear infections. Make sure to monitor the patient's breathing to make sure that they are breathing and not holding their breath.³

Watsu®

History
Watsu has been referred to as a mixture of Bad Ragaz Ring Method and shiatsu massage. Watsu was created in 1980 by Harold Dull of Harbin Hot Springs in Northern California and based on his experiences with Zen Shiatsu.³⁵ Dull gained his knowledge of Zen Shiatsu in Japan from Shizuto Masunaga and the two foremost teachers in America, Reuho Yamada and Wataru Ohashi.³⁵ Dull combined his creativity as a poet, his understanding of energy, and his knowledge of shiatsu to create gentle rhythmic moves in the water (Brody & Geigle, 2009).

Concept/Description
These moves affect the patient from the viscera to the limbic system, the nervous system, the musculoskeletal system, and their psyche.³⁵ Requirements of the pool

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Figure 3. Therapist is positioned at patient's side.

Figure 4. Therapist is cradling patient.
Figure 6. Shows Ai Chi movement of contemplating, floating, uplifting, enclosing, folding, soothing, gathering, and freeing.

Watsu, unlike Bad Ragaz Ring Method, does not use any floatation devices to support the patient. It depends on the therapist to cradle the patient in their arms in a supine position. One arm is called the father arm (right arm first and then left arm after patient is reversed) and the other arm is called the mother arm (left arm first and then right arm after patient is reversed). The mother arm supports life and is positioned with the elbow flexed under the patient’s neck to allow the patient to breathe. The father arm supports the rest of the patient and is positioned with the elbow flexed under the patient’s knees.

The therapist rhythmically moves the patient through the water, left to right, stretching body parts and coordinating breathing in (as the patient moves right of the therapist) and breathing out (as the patient moves to the left of the therapist).

To stretch the other side of the patient, the therapist’s arms will be reversed, as will the patient’s.

Movements can range from the father arm of the therapist under the patient’s hip for trunk extension. Another movement is the father arm of the therapist under the patient’s one leg closest to therapist, letting the other leg drag, or the father arm of therapist under the patient’s leg farthest away from the therapist letting other leg drag to work on breathing and stretching of internal/external range of motion of hips. See Figure 5 to see the different movements of Watsu.

Outcomes and Contraindications

Benefits of Watsu are decreased muscle guarding, decreased muscle pain, increased range of motion, increased energy level, improved breathing patterns, improved sleeping, and improved body awareness.3

Specific patients that could benefit from Watsu include those that have pain with movement, traumatic brain injury, neuromuscular disorder, soft tissue dysfunction, chronic fatigue, hyperactivity, depression, stress, and anxiety. Precautions and contraindications of using Watsu include patients with ear problems, frequent ear infections, vestibular disorders, and a range of motion precautions.3

Figure 5. Therapist performs Watsu with one leg dragging and the other leg being supported.
Ai Chi

History
Ai Chi was created in 1990 by Jun Konno. Konno has a long history of connection to water, working as one of Japan’s youngest Olympic swim coaches at the time, during the 1980s (Brody & Giegle, 2009).

Through observation of Watsu, Konno embraced the principles of fluid movement and the emphasis on long axis of the body, but believed the concept of working in pairs would be uncomfortable for some people. Out of this, he developed Ai Chi which people can perform alone and achieve some of the benefits of Watsu. Along with the concepts of Watsu, Ai Chi utilizes the concepts from Tai Chi and Qigong.

Concept/Description
Ai Chi emphasizes posture and works through the long axis of the body to keep the mind and body in balance. It encourages people to become aware of muscle activity and movement patterns, attention to posture and breathing combined with visualization and imagery.

Requirements of the pool environment are warm water temperature of 86 to 95 degrees Fahrenheit and water depth at shoulder level. Ai Chi is performed in shoulder depth water with feet shoulder-width apart, toes out and knees slightly bent using a combination of deep breathing, coordinating inhalation and exhalation, with slow broad movements of the arms, legs, weight shifting, and core.

Figure 6 illustrates a few Ai Chi movements. Similar with Tai Chi and Yoga, Ai Chi focuses on deep breathing, body awareness, and mindful movements.

Outcomes and Contraindications
Benefits of Ai Chi are increased flexibility, range of motion, general mobility, increased metabolism, and increased blood circulation. It improves the circulation of energy along important meridians, massages vital organs, improves liver efficiency, decreases stress, insomnia, depression, anger, fatigue, and anxiety. It also increases mental alertness and improves body awareness and balance.

Specific patients who could benefit from Ai Chi would be those that have pain with movement, cardiovascular disease, pulmonary disease, type II diabetes, arthritis, fall issues, immunodeficiency disorders, orthopedic problems, anxiety and depressive disorders.

Precautions and contraindications of using Ai Chi would be to have patients work within their pain-free range of motion.

AquaStretch™

History
AquaStretch was developed in 2010 by George Eversaul, A.P.H. in Nevada. AquaStretch was demonstrated to a few aquatic therapists while at an Aquatic Therapy and Rehabilitation Institute conference in Nevada. AquaStretch is a relatively new technique that has been utilized in wellness techniques and as a specific aquatic therapy technique.

Concept/Description
AquaStretch is considered a breakthrough in pain management and preventive medicine.

Requirements of the pool environment are warm water temperature of 82 to 92 degrees Fahrenheit, pool depth of 3 to 5 feet, and the ideal position is to have the patient in the corner of the pool for most of the exercises.

AquaStretch exercising seems to quickly dissolve (“release”) fascial adhesions by controlling "stretch resistance," accomplished by wearing weights (5 to 15 lbs.), by changing buoyancy, and by accenting the body's “intuitive movements” that occurs when joints are subjected to stretch pressure.

In the low environment of water, the body may stretch in positions it cannot while under the influence of normal gravity on land and for much longer periods of time. It is primarily the connective tissue such as the fascia being stretched rather than the muscles.

The technique requires the therapist to progress a patient through a series of starting positions and hand-grips while encouraging movement. By applying the basic procedure to the patient-specific areas of tightness, the therapist works with the patient to restore motion.

The basic AquaStretch procedure consists of four steps:
1. Play
2. Freeze
3. Pressure
4. Move (if you feel the need to move).

First, have the patient “play” with their body's movement to find a position in which they experience pain or restriction. Second, the patient is asked to “freeze” their body in the exact position they feel their pain or restriction. Third, the therapist will ask the patient specifically where the pain is located on their body. Then the therapist will apply “pressure” with their thumb, hand, or fingers where the patient feels the pain or restriction while the patients maintains the “frozen” position. The patient is instructed to communicate to the therapist
about the pain—good or bad pain—they are feeling while “pressure” is applied. Fourth, with the therapist continuing pressure on the area where the patient feels pain or restriction, the therapist will ask the patient to “move, if they feel the need to move.” This request usually results in the patient’s body experiencing “intuitive movement,” with the body moving in highly individual movements that result in the pain or muscle tensions being relieved.³

Outcomes and Contraindications

The benefits of AquaStretch are relief of pain and muscle soreness and to restore flexibility. Patients who have pain or muscle soreness in rehabilitation, wellness, or fitness environments could benefit from AquaStretch.³

Precautions and contraindications of using AquaStretch would be to educate the patient on “good” versus “bad” pain, and if the patient experiences “bad” pain, to immediately stop the activity. If a soft tissue or bone fracture is suspected or known, do not perform AquaStretch until adequate healing has occurred.³

OVERALL BENEFITS OF AQUATIC THERAPY

As discussed in this article, aquatic therapy has a long history and continues to produce different techniques to help patients. Bad Ragaz Ring Method, Watsu, Ai Chi, and AquaStretch are just a few of the aquatic therapy techniques in use today. There are more techniques currently being performed, and new techniques are being developed.

Here is a list of current aquatic therapy techniques that are being used on patients in the aquatic environment: Backhab, Burdenko, Feldenkrais, Halliwick, Lyu Ki Dou, Massage, Proprioceptive Neuromuscular Facilitation (PNF), Pilates, Yoga, Yogalates (combination of Pilates and Yoga), Unpredictable Command Technique (UCT), Wassertanzen, and Jahara (Sova, 2012).

Patients with the following issues would greatly benefit from aquatic therapy: sensory disorders, limited range of motion, weakness, incoordination, pain, spasticity, perceptual and spatial problems, balance deficits, joint replacements, orthopedic injuries or trauma, obesity, prenatal, neurological, osteoporosis, arthritis and fibromyalgia, respiratory problems, circulatory insufficiency, inadequate oral facial control, depression and poor self-esteem, cardiac disease, and motor skills deficiencies.³

Overall benefits of aquatic therapy include improving balance, coordination, weight bearing, muscular endurance, muscular strength, cardiovascular and pulmonary endurance, pain management, motor skills, motor control, psycho-social, range of motion, and circulatory function.³

References