

# Benefits and Techniques of Aquatic Therapy

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Almost any person regardless of age or physical condition can benefit from exercise and improve their fitness level. Fitness is defined as adapting to the environment so as to be capable of surviving. A state of physical fitness offers enough energy to perform daily duties with energy left at the end of the day to enjoy leisure time. Fitness exercises are designed to improve endurance. This increased stamina is achieved by making the heart and lungs stronger and more efficient. Additionally, exercise can help decrease blood glucose levels, decrease the risk of cardiovascular disease, control weight, improve quality of sleep and develop a sense of well being.

**Challenges of Exercise:** Exercise can be a challenge for individuals with a history of polio. The appropriate balance between overuse and disuse must be achieved. It is essential to have an exercise program that is tailored to the individual's specific muscle test in order to be safe and effective. Extremities used in strengthening exercise must be able to move through complete range of motion against gravity. It is important to adhere to the following general exercise guidelines for polio survivors and avoid excessive fatigue.

## **General Exercise Guidelines for Polio Survivors:**

- Check with your doctor before beginning any exercise program.
- Do not use muscles with strength of 3/5 or less for conditioning or strengthening exercise. These muscles must work all day to fight gravity in basic activities of daily living. Attempting to strengthen these muscles may cause overuse and increased weakness.

- Start a conditioning program slowly. Often 3-5 minutes of conditioning is all that can be initially tolerated. If needed, start with one-minute intervals with rest periods and SLOWLY build up endurance. Watch for signs of overuse.
- Strengthening exercise can be done with muscles of strength greater than 3/5. In other words, that muscle must be able to move the joint through full range of motion against gravity. However, remember to start with minimal number of repetitions (5-7) within tolerance. Increase resistance and number of repetitions cautiously. Watch for signs of overuse. As a general rule, muscles that have a grade of 3/5 or less should be protected and not exercised. Grade 3+/5 muscles can be exercised with caution; grade 4 –4+/5 can be exercised moderately; and grade 5/5 muscles can be exercised more vigorously.

Aquatic exercise is very beneficial, as the buoyancy of the water will help to support weak muscles and decrease joint stress while it can also provide resistance to strong muscles. Remember to start slowly (15-20 minutes) and avoid the tendency to overdo in the pool, because it is easier to move in the water.

**Signs of Overuse:** Although you may feel mild fatigue after exercise, you should not experience the signs of overuse. These signs of overuse can occur within 24-48 hours after too strenuous exercise or a very active day. Pacing activities and modification of the exercise routine is necessary if these occur.

- Muscle cramps or spasm
- Muscle twitching
- Muscle pain
- Extreme fatigue

Aquatic therapy was often utilized during the recovery phase from the original polio. Water is the great equalizer. It allows people to move in ways that they cannot move on land. The buoyancy of water greatly enhances the ability to move and provides resistance based on speed of movement in the water. Further, water exercise offers the ability to improve flexibility, strength, muscle tone and aerobic condition. Water can facilitate a workout that can be tailored to each person's strength.

### **Physical Properties of Aquatic Therapy:**

There are physical properties of water that make exercise less difficult and painful, while increasing its effectiveness. These properties are buoyancy, hydrostatic pressure, relative density, fluid resistance and turbulence.

***Buoyancy*** is the upward pressure exerted by a fluid in which a body is immersed. Archimedes' Principle states that when a body at rest is fully or partially immersed in a fluid, it experiences an upward thrust equal to the weight of the fluid displaced. Buoyancy and gravity constantly oppose each other and reach equilibrium when you float partially immersed. The vertical body is typically at equilibrium when immersed to neck level. Buoyancy can provide support or resistance. As an assist, buoyancy is used to decrease gravitational forces placed on weak limbs that are less able to bear weight. There is less strain on the muscles and joints, requiring less effort to move underwater. Buoyancy adds a challenge to stronger muscles and offers resistance when a floatation device is pushed or held submerged underwater.

Pascal's Law defines ***hydrostatic pressure*** as fluid pressure exerted equally on all surface areas of an immersed body at rest at a given depth. Hydrostatic pressure helps return the blood to the heart, causing it to work more efficiently under less pressure. The water surrounding the body helps circulate blood from the legs to the heart, often reducing any swelling in the ankles and feet. Once swelling is reduced, joint tenderness may decrease and range of motion can improve. Additionally, hydrostatic pressure offers mild resistance around the ribcage. Breathing with the trunk immersed in the water is a form of exercise. Although this can help strengthen people with respiratory involvement, it should be approached with caution. Simply being immersed in water has a positive therapeutic effect on our bodies.

**Relative density** is the relation of the mass of an object to the mass of an equal volume of liquid at standard temperature and pressure. It determines whether or not an object sinks in the water. Simply stated, if an object is denser than water, it will sink. Muscle tissue is denser than fat. People who are lean and muscular will tend to sink; those with more adipose tissue tend to float. Swollen extremities retain fluid and that fluid is lighter than muscle tissue; giving those body parts a lower relative density and tendency to float. Therefore, it takes less effort to raise weak or swollen extremities than it does to lower them in the water. Muscles that are paralyzed or have atrophied due to polio will have lower relative density and will tend to float.

**Fluid resistance** is the force that opposes the motion of an object through a fluid. Basically you have to push your way through the water and it slows you down. Fluid resistance is beneficial in aquatic therapy as it supports and helps to hold you in position while also offering resistance to movement. The fluid resistance of water makes it a perfect environment to perform balance exercise. On land, resistance is felt in only one direction, which leads to an over development of some muscles and under utilization of others. Fluid resistance also increases sensory awareness and allows time to react and learn how to maintain proper balance in a gentle environment.

**Turbulence** is the random motion of the water as it responds to a disturbance. A person or limb moving through the water creates changing pressures and turbulence. This swirling effect in the water can provide therapeutic benefits of massage and resistance. The gentle massage can increase circulation and reduce pain. The sensation of water on the skin overloads the peripheral nerves. This causes the brain to ignore other signals, such as pain, that your body is sending. Changing the speed and direction of motion can alter turbulent forces. The use of equipment, such as aquatic gloves or paddles, is another way to increase turbulence.

### **Benefits of Aquatic Therapy:**

In addition to the benefits of general exercise, aquatic exercise offers unique physical and physiological benefits. The buoyancy of water decreases the weight and stress on the joints, encouraging freedom of movement. Movement and functional activity are more comfortable in water because the pull of gravity on the body is not as strong as on land. Water supports the body, reduces joint stress, and provides resistance and assistance to movement, allowing improved mobility, strength, and function.

Water provides a number of unique properties making it an excellent environment for rehabilitation.

### ***Benefits:***

- Increased cardiovascular function - resistance of the water aids in controlled conditioning.
- Reduced stress on joints - buoyancy reduces the stressful effects of gravity on the body.
- Improved muscle strength and tone - resistance of the water aids in gentle muscle strengthening.
- Increased range of motion and flexibility - the support of the water allows effective stretching.
- Increased balance and coordination - balance can be challenged in a safe environment.
- Pain modulation - turbulence and the support of the water decrease pain.
- Decreased edema - the hydrostatic pressure of water decreases swelling.
- Improved posture and trunk stability.
- Promotes relaxation.
- Improved metabolism and calorie burn for weight control.
- Increased circulation - hydrostatic pressure increases venous blood return to the heart.
- Respiratory benefit - hydrostatic pressure offers resistance around ribcage during respiration.
- Improved kidney function - increases blood flow to kidneys, renal clearance and diuretic effect.

***Precautions:***

- Medical clearance is required prior to initiating any exercise program.
- Cardiac precautions should be taken into account.
- Pool temperature can affect exercise tolerance. The temperature of the water is a personal preference. Recommended temperatures range from 85-94 degrees. Cool water is often not well tolerated and will tap your energy quickly. Warm water temperature helps relax the muscles, however be cautious with excessively warm pools to avoid becoming overheated.
- The exercise guidelines specific to post polio hold true for aquatic exercise.
- Medications that cause drowsiness should be avoided.
- Aquatic exercise is contraindicated with skin infections, rashes, open wounds, sores, stitches or contagious diseases.
- Allergies or reactions to pool chemicals should be considered.
- Avoid aquatic exercise during illness. (fever or cold).
- Urinary tract infection or incontinence (lack of bowel or bladder control) prohibits aquatics.
- Get out of pool immediately with any signs of distress, shortness of breath, or dizziness.
- Supervision during aquatic exercise is a must. Never go in alone. Keep a cell phone nearby.
- Safe access to the pool (parking, lifts, rails, ramps, wheelchair accessibility).
- Surfaces around pools tend to be slippery and dangerous for anyone with a tendency to fall.
- Sun exposure, climate changes and lightning are considerations (indoor vs. outdoor pool).
- Don't overdo, aquatic exercise can be deceptive. Fifteen minutes is enough initially.

It may take some time for you to determine the correct amount of exercise for your individual needs. Schedule a specific time to exercise. Try different times to see what works best. Do not exercise when tired. Pace your activities on busy days. Don't exercise right before bed; it can stimulate and interfere with sleep. Breathe normally during exercise: count out loud; exhale with effort. Complete the exercise with correct form and proper posture to prevent injury. Better to do fewer repetitions with good technique and control, than to exercise with sloppy form. It is important to replenish fluids.

**Aquatic Therapy Techniques:**

Techniques of aquatic therapy will be discussed and demonstrated in the actual session. A booklet of aquatic exercise ("Ready, Wet, Go" by K. Wollam, PT and C. Henley, PT) will be given to participants in attendance at the session. Their philosophy of aquatic exercise for polio survivors, which includes the need for a formal assessment and manual muscle test (MMT) to appropriately plan an individualized program, will be emphasized. The volunteer participants have been evaluated by the presenting physical therapists prior to the aquatic therapy demonstration. These therapists use the water to work towards an individual's goals as listed in the benefits of aquatic exercise based on the evaluation.

Additional aquatic therapy techniques may prove beneficial to polio survivors depending on the evaluation, MMT, assessment and goals. These techniques, however, will not be discussed in depth and are beyond the scope of this presentation. Techniques such as Ai Chi (deep breathing with concepts of TaiChi, Shiatsu and Qigong in shoulder depth water), Feldenkrais (gentle movement and directed attention to improve movement and enhance human function), Lyu Ki Dou ("Floating Life Energy Pathways") and Pool Massage focus on the relaxation benefits of aquatic therapy. BackHab (an aquatic walking program), Proprioceptive Neuromuscular Facilitation (therapeutic exercise that includes three components of motion) and Water Pilates (core strength and spinal alignment) emphasize active exercise and resistive properties of water. Other techniques in the literature include Ai Chi Ne, Bad Ragaz, UCT, Watsu, Water Yoga, Wassertanzen and Yagalates. Additionally, the Burdenko Method and Halliwick Concept include methods of swim training for people with disabilities.

## **Types of Exercise:**

**Warm up exercises** gently increase the heart rate and respiratory rate. They also prepare the body for exercise by gently loosening the major muscle groups and joints. An adequate warm up can decrease the risk of injury.

**Stretching and range of motion exercise** help lubricate the joints and prepare the nervous system. Stretching is an important part of any fitness program. Shortened muscles can lead to muscle imbalance. For example, spending a lot of time in a seated position can cause tightness in the legs making it difficult to stand straight. Weak shoulders and tight chest muscles can cause forward flexed posture yielding neck pain or making it difficult to breathe. Aquatic stretching can assist in proper positioning for stretching. Hold stretch position ~15-20 seconds and don't bounce into the stretch.

**Resistance exercise** helps increase muscle strength. Resistance can be achieved during aquatic exercise by increasing the speed that the limb moves through the water or by adding equipment. This causes increased turbulence and greater resistance. Slowly progress the exercise program by gradually increasing speed and repetitions over time.

**Aerobic exercise** challenges the cardiovascular system. Aquatic exercises can be performed in deep water (using a floatation belt or Styrofoam noodle for support) including bicycle or jogging movements to increase heart rate. Upper extremity exercises can be performed in the shallow water to increase heart rate as well. Over time, this type of exercise improves endurance and stamina helping to offset fatigue.

**Cool down** is much like the warm up phase and returns the body to the resting state. The cool down helps prevent post-exercise soreness and reduces the risk of injury.

### ***Progressing Your Program:***

Once an appropriate level of exercise is established, fitness is maintained with a consistent program. To advance the program, it is important to progress cautiously and remember the signs of overuse. Some ideas to progress the program are listed. Choose only one variation at a time to advance the program.

- Add repetitions to the current exercise routine, beginning with 1-2 per week.
- Add new exercises to the routine, no more than 1 new exercise per week.
- Work in more shallow water for balance and gait activities to decrease buoyancy. Shallow water is more challenging to balance and trunk control.
- Increase the speed of exercise under water to increase the resistance. Deeper water provides more support at slow speeds and more resistance at fast speeds.
- Exaggerate arm swing, step height or step length during gait activities.
- Increase the time of conditioning exercise (i.e. pool walking, arm cycling or bicycling) 2-3 minutes per week. When swimming laps, find a comfortable stroke, use your strong extremities and swim the width of the pool. Progress to swim the length of the pool, add laps to tolerance.
- Add equipment to increase the resistance in the water.

## **Equipment:**

Equipment can be utilized to provide flotation or resistance, assist or challenge balance or offer protection from the elements. Aquatic equipment can be purchased online or at pool, sports and toy stores.

- Flotation devices provide flotation while allowing freedom of movement of limbs:
  - noodles, kickboards, water belt, arm rings, flotation vest, flotation ring
- Balance can be assisted or challenged in the water:
  - water walker, noodles
- Resistance can be increased by the addition of simple equipment:
  - aquatic gloves, foam dumbbells, hand paddles, fins, kickboard
- Protect your body from the elements:
  - wetsuit for cold intolerance
  - solar protection clothing, hat/visors and sunscreen in outdoor pools
  - water shoes protect skin from abrasion, particularly important for diabetics

***Enjoy the relaxing and invigorating qualities of aquatic exercise. Keep it fun. Vary the exercises to prevent boredom or exercise with a partner. Approach the exercise program with patience and consistency to reap the benefits of an improved condition with less fatigue, better endurance and functional gains. Avoid excuses and do something special for yourself!!!***

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