

Aquatic Therapy

Water; It is part of everyday life — we drink it, we cook with it, we wash in it and we play with it. It covers 70 percent of the earth. It is magical, mystical, and versatile. It comes in hot and cold, ice, liquid or gas. We need it for life. Water has played a medicinal role in life since the early ages. Soldiers in Rome used water to ease sore muscles, and Roman baths became places to exercise, socialize and were used as aids in medical treatments.

In the 19th century, a German priest named Sebastian Kniepp demonstrated therapeutic application of hot and cold showers as a method to boost immunity and stimulate the circulatory and nervous systems. These concepts are still used in European spas today.

In the modern era, we have used water medicinally to clean wounds, ice injuries and soak in whirlpools for easing discomforts. However, only recently has it been more widely used with therapy for targeted medical interventions.

Aquatic Therapy

Aquatic therapy is useful for a variety of medical and physical conditions. This therapy utilizes the physical properties of water including buoyancy, fluid resistance, hydrostatic pressure and temperature to achieve physical rehabilitation goals and objectives. Aquatic therapy has many benefits. It can help individuals increase joint mobility, range of motion, muscle



strength and endurance and can help an individual bear weight. It can decrease pain and muscle spasms while promoting relaxation. Water also helps with balance and removes the fear of falling, which makes the pool an excellent environment for those in rehabilitation.

The four key properties of water ...

1 – Buoyancy

A relative “weightlessness” occurs when a body is immersed in water. The natural buoyancy of water decreases the effects of gravity, allowing for easier, safer and more comfortable movements during therapy.

What is buoyancy? Rather than the downward force resulting from gravity and body weight, buoyancy is the upward force that keeps the body afloat, making the water a perfect place to work on rehabilitating painful joints and weak or uncoordinated muscles.



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Buoyancy can be classified as assistive, resistive or supportive. If one is working against the tendency of a limb to float, then the movement is referred to as resistive (see figure 2.) Conversely, when one is working with the tendency of a limb to float, it is assistive (see figure 1.) When working in the same plane (i.e., not against buoyancy) it is supportive (see figure 3.) Moving one's arms back and forth over the surface of the water while in a floating position is one example of this. Adding floats or weights can also have an effect on buoyancy. Including floats and moving downward in the water requires additional work, making the activity more challenging. Conversely, the opposite movement becomes easier. Adding weights may assist an exercise that moves toward the bottom of the pool or make it more challenging to move toward the surface.

How people are positioned in the water, whether they are standing or floating, will affect what muscles are in the buoyancy assisted, resisted or supported position. For example, if a person is in the standing position and completing the movement of shoulder abduction (see figure 4), this is considered a buoyancy-assisted movement. But, the opposite movement of shoulder abduction back down to the sides would be a buoyancy resisted movement. The addition of weights or floats will either assist or resist the movement more. Therapists trained and experienced in aquatic therapy will evaluate patient weaknesses so they are optimally positioned and will carefully choose equipment in order to maximize therapy benefits.

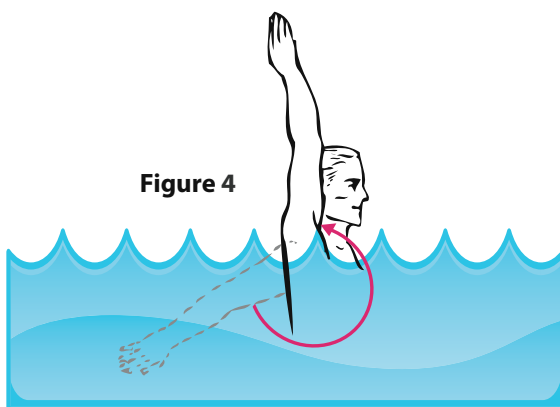


Figure 4

BUOYANCY

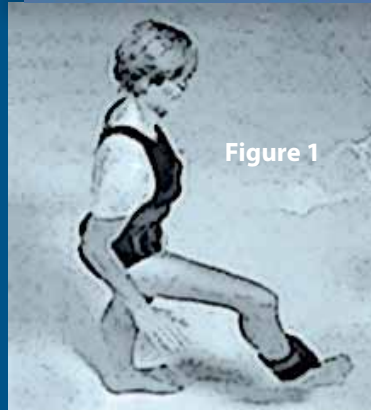


Figure 1

Buoyancy-assisted knee extension

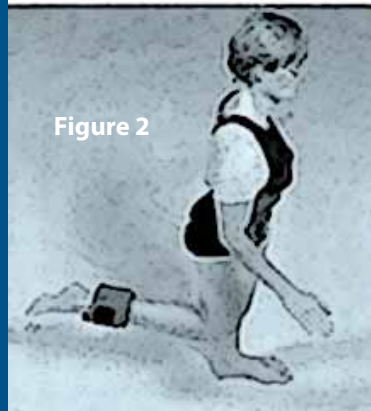


Figure 2

Buoyancy-resistive knee extension

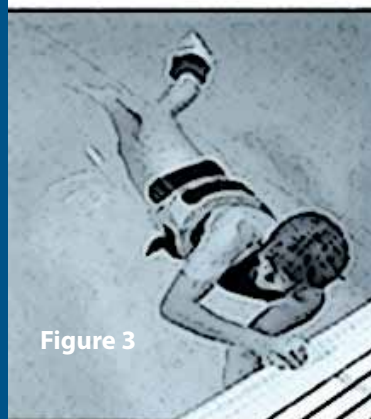


Figure 3

Buoyancy-supported knee extension

Buoyancy is defined as the upward thrust of water that is equal to the weight of fluid displaced by that object. The denser the object the more likely it is to sink, and vice versa. When the relative density is less than one, the object will float. When it is greater than one it will sink. Buoyancy is the property of water that reduces the effect of gravity in the water. In effect it supports the body and takes the weight off of the joints. This is why a person feels weightless (or nearly weightless) when placed in water. When your body is submerged in water, joint stress is reduced compared to being on land where gravity can affect the joints.

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2 – Temperature

Water temperature affects a person considerably. Water is an excellent heat conductor — we lose or gain heat from water rather quickly. The human body feels warm or cool based on how much heat is moved in or out. If both water and air are 86 degrees (both lower than the 98.6 degree body temperature), the human body will give up more heat to change the temperature of the water than it gives up to the air. Therefore, water at 86 degrees will feel colder than 86 degree air. Simply stated, water takes more heat from your body and makes you feel cooler.

Pool temperature makes a difference in how clients feel and what type of therapeutic exercise therapists will use. When creating an aquatics program, water temperature must be considered. Water above 86 degrees is not as conducive to vigorous exercise because vigorous exercise increases body temperature — if the water is too warm the body cannot dissipate this heat. Water below 86 degrees is not as effective for relaxing muscles, decreasing muscle spasms, relieving pain or increasing range of motion.

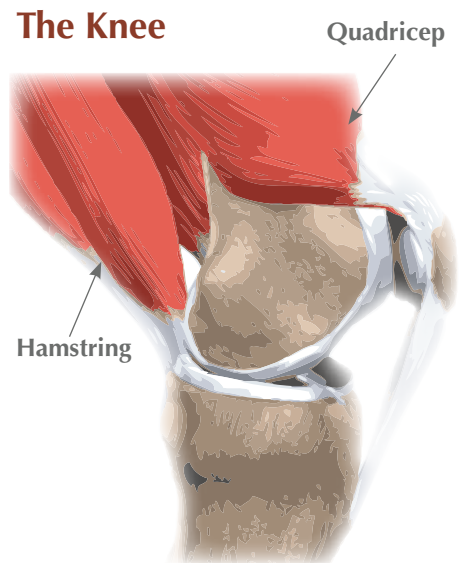
Some can easily become chilled and experience an exacerbation of tone, pain or joint issues. Their programs should be more active in moderate or cool water.

3 – Fluid Resistance (*moving through the water*)

Another property of water that must be considered when designing an aquatics program is fluid resistance. It is the resistive force the body encounters when moving through water. Fluid resistance occurs because of the cohesion or attraction of the water molecules together; this is described as viscosity. When the water is warmer, viscosity decreases, and when water is colder, viscosity increases. Therefore water temperature affects not only the body's physiology but also the water's physical properties, making movements harder or easier depending on the temperature. Force is required to move the molecules apart. This force is described as the resistance of the water to flow. Moving faster in the water can increase resistance.

There are other factors that affect movement through the water. These include how streamlined the object is. A less-streamlined object creates turbulence behind the object that holds it back, which can be used therapeutically. By increasing the surface area of the body part moving through the water, the activity can be made more difficult. This may be achieved by adding equipment like paddles, but also can be done by simply changing the position of the body — for example, moving one's hand so that

Figure 5



water moves against the palm rather than to the side of the hand.

Water also uniquely works opposing muscle groups, as movements are resisted in both directions of movement, which is desirable. From a physical point of view it is appropriate to work both sets of opposing muscles or muscle groups so that imbalances do not occur. For example, if hamstrings are strengthened, quadriceps should be strengthened (see figure 5.) Back muscles should be worked when chest muscles are worked, etc.

4 – Hydrostatic Pressure

Hydrostatic pressure is the fluid pressure that the water exerts equally on all submerged areas of the body at any given depth. This pressure can work against a person who has COPD (chronic obstructive pulmonary disease), as it can make chest expansion more difficult. However, this pressure can also increase awareness of where body parts are as they move. Hydrostatic pressure can also reduce the tendency of the blood to pool, which helps in reducing swelling. It can also help to stabilize joints, which is beneficial to those who have weakness around a particular joint area.

Due to all of water's unique qualities, clients in aquatic therapy have a unique environment in which to work. They are working minimally against gravity in order to move. This makes skills like walking much easier. Water resistance slows movement. The

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hydrostatic pressure it exerts on the body allows people to better feel where their body or limb is in space. The order of contraction of muscles is identical to doing the same movement on land but slowed down. This allows them to slowly relearn what physical reactions they must make in order to make a particular movement such as regaining balance. In addition, clients are also safer as the risks associated with landing on water are much less than landing on a hard surface.

Aquatic therapy in TBI & SCI treatment

All the water properties covered in this article — buoyancy, temperature, fluid resistance and hydrostatic pressure — make a therapeutic pool a marvelous tool for traumatic brain injury and spinal cord injury rehabilitation. In therapy, clients use the water to get a cardiovascular workout, to increase their strength, to improve balance and walking skills, and to work on increasing their physical range of motion or coordination. The fear of falling is virtually eliminated and the therapeutic advantages of warm water in reducing pain and muscle spasms while promoting relaxation makes it an excellent treatment intervention. ❖

About the Author...

*Jenny Auty, BS, MS, CPO, Kinesiologist / Certified Pool Operator
Jenny Auty has more than 20 years of experience in kinesiology and traumatic brain injury rehabilitation. Other experience includes cardiac rehabilitation, park and recreational experience, stress management and an extensive aquatics background. She is certified from the Copper Institute for Aerobics Research in the Biomechanics of Strength Training. Interests include applying principles of kinesiology to those with various disabilities in the aquatic and fitness setting and nutritional awareness.*

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