THE ROLE OF AQUATIC THERAPY IN THE REHABILITATION OF AN ATHLETE WITH A LOWER EXTREMITY INJURY

by

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A SENIOR THESIS

in

GENERAL STUDIES

Submitted to the General Studies Council in the College of Arts and Sciences at Texas Tech University in Partial fulfillment of the Requirements for the Degree of

BACHELOR OF GENERAL STUDIES

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ACKNOWLEDGMENTS

I would like to express my thanks to all the people who have helped throughout the development of my thesis. First of all I would like to thank the people who graciously volunteered their time to serve on my committee: Dr. Karen Meaney, Leslie Glenn PT, and Dennis Pruss. A special thank you also goes to my family, who has supported me in every step that I have taken. I would also like to thank Dr. Mike Schoenecke and Ms. Linda Gregston for their guidance and council of my thesis.
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CHAPTER I

INTRODUCTION

As a Pre-Physical Therapy major, I wanted to choose a topic that related to this profession. After speaking with several physical therapists, I decided to explore aquatic physical therapy. As I began my research, I quickly realized that I would have to narrow my topic. Therefore, I decided to focus on the interaction of athletes and aquatic physical therapy. However, this still left a wide variety of information to cover. Therefore, I decided to limit my paper to lower extremity injuries in athletes.

As a former high school athlete myself, I have experienced first hand how hard it is to overcome an injury. During the protective phase of rehabilitation, an athlete falls behind in their skills and conditioning. However, incorporating aquatic physical therapy into the rehab program allows the athlete to continue activity, while still obeying the restrictions set by the physician.
CHAPTER II
WHAT IS AQUATIC THERAPY?

Definition of Aquatic Therapy

The aquatic section of the American Physical Therapy Association (APTA) provides the following definition of Aquatic Physical Therapy:

Aquatic Physical Therapy includes, but is not limited to, the rehabilitation, prevention, and overall wellness of a wide patient population. These patients, ranging from infants to the elderly, can benefit from safe and effective physical therapy intervention in the aquatic environment, addressing neurologic, orthopedic, and other conditions. Aquatic Physical Therapy must be supervised and/or performed by a licensed physical therapist. Although various kinds of aquatic environments are utilized to perform these specific treatment techniques, Aquatic Physical Therapy is not a modality, but a Protocol requiring specific skill and training to implement the aquatic techniques correctly. (Cirullo, 1994)

Aquatic Therapy has become more popular among rehabilitation programs with patients of a variety of ages. However, aquatic therapy is used by more than just physical therapists. Occupational therapists, chiropractors, therapeutic recreational specialists and athletic trainers have also incorporated aquatic therapy into their profession. With the wide use of aquatic therapy, several other names are being used rather than aquatic therapy. These names include aquatic exercise therapy, aquatic rehabilitation, pool therapy, and hydrotherapy. However,
each is dealing with water submersion and therapeutic instructions for the prevention and rehabilitation of injuries to people of all ages.

**History of Aquatic Therapy**

For many centuries, people have used water as a source of healing. Although we do not know exactly when people began using water for therapeutic purposes, records indicate that it could be as far back as 2400 BC with the Proto-Indian culture (Ruoti, Morris, & Cole, 1997). Throughout history, there is evidence that many cultures, such as the Egyptians, Assyrians, Chinese, and Japanese, used water for healing a variety of illnesses. Initially, the Greeks developed bathing centers near natural springs and rivers. These bathing centers were originally used for hygiene and prevention rather than for treatment of injuries. However by 330 AD, the Romans continued to use bathing centers for healing and treatment of various illnesses and injuries (Ruoti, Morris, & Cole, 1997). Romans utilized bathing centers until around 500 AD (Becker & Cole, 1997). The popularity of bathing centers continued to decline until the 15th century. Although these centers were no longer used for hygienic purposes, they were being used for therapeutic purposes. Many physicians were now using water to aid in the treatment of various medical problems.
During the 18th century, Americans began to experiment with water for more than basic survival needs. They realized that water could be used to decrease muscle soreness and to lower high fevers. In 1720, Americans began to visit the natural springs of Virginia and West Virginia (Ruoti, Morris & Cole, 1997). Many people suffering from rheumatism, found relief in the warm, spring water. As a result, spas emerged around the natural springs. A majority of these spas were owned by physicians. However, the spas were used more for relaxation than therapy. In the following years, the popularity of the spas began to wear off and interest began to decline.

The decline in interest of spas continued until the 1930s when physicians from Europe brought the current teaching of aquatic therapy to America (Ruoti, Morris, & Cole, 1997). Physicians were now able to learn the proper techniques and procedures of aquatic therapy. With this new knowledge, more physicians began to incorporate this type of therapy into their treatment programs. The interest in aquatic therapy continued to grow following both World Wars. Many disabled veterans were finding the water very beneficial in their rehabilitation.

Another major step in the development of aquatic therapy came in the 1970's, when Basmajian devoted an entire chapter to aquatic therapy in his book *Therapeutic Exercise* (Ruoti, Morris, & Cole, 1997). After the release of this
book, aquatic therapy was more frequently incorporated into a patient’s rehabilitation program. By the 1990s, aquatic therapy was being used for a variety of injuries. In 1992, two physical therapists founded a section of the American Physical Therapy Association known as Aquatic Physical Therapy (Ruoti, Morris, & Cole, 1997). Aquatic therapy was no longer considered a trend or fad, but a legitimate form of therapy.

**Properties of Water**

Incorporating water into a rehabilitation program can be very beneficial, as long as the therapist understands the principles and properties of water. Although water and air are both defined as fluids, they possess properties that make them unique. These properties include buoyancy, viscosity, hydrostatic pressure, and temperature. Through these properties, a therapist is able to provide an entirely different aspect of therapy that cannot be achieved on land.

**Buoyancy**

Buoyancy is best defined through Archimedes’ Principle that states “when a body is fully or partially submerged in a fluid at rest, it experiences an upward thrust equal to the weight of the fluid displaced” (Bates & Hanson, 1996). The point through which the buoyant force acts is the center of buoyancy. This upward force acts in the direction
opposite to that of the force of gravity. Therefore, an object in water is acted upon by two opposing forces: (1) gravity, acting through the center of gravity, and (2) buoyancy acting through the center of buoyancy. When the weight of the object equals the weight of the fluid displaced, then the center of gravity and center of buoyancy are vertically aligned. However, if the two weights are not equal, then a rotational force or torque is present. Torque can enable people to maintain an upright position with their heads out of water, or it can cause them to rotate to the supine or face up floating position (Bates & Hanson, 1996). A therapist must take this into consideration when adding flotation devices to a patient’s workout program.

Buoyancy can be considered assistive, resistive, or supportive. To be considered assistive, buoyancy is helping or assisting a movement to the surface of the water. Buoyancy is considered a resistive force when it resists a movement away from the surface of the water. When buoyancy equals the force of gravity, then it becomes a supportive force with any horizontal movement. To enhance these attributes, a therapist can add floatation devices. For example, during shoulder abduction (vertical movement of the arms from the side of the body, up, and away from the midline of the body) with a hand held floatation device, buoyancy is an assistive force as the arms move towards the
surface of the body. However, during shoulder adduction (vertical movement of the arms toward the midline of the body) with a handheld floatation device, buoyancy becomes a resistive force as the arms move. When that flotation device is used during horizontal adduction (horizontal movement of the arms toward the midline of the body), then buoyancy is considered a supportive force. These three types of buoyant forces can be increased or decreased according to the patient’s needs.

A therapist must also take into consideration factors that can affect the ability of a person to float. One of these factors is extreme fear of the water. If patients have a significant fear of water, they may tend to sink due to the increased density caused by tension in their muscle mass. Patients with spastic cerebral palsy, or other disorders may also experience problems with floating. The spasticity in the patient or limb can cause them (or the body part) to float just under the surface of the water (YMCA, 1987). Athletes are also prone to sinking, if they have a large muscle mass compared to their fat content. However, people with a large amount of body fat are more likely to float on top of the water regardless of their size. Special considerations must also be taken into account for amputees. The side of the body with the amputation will float better compared to the uninvolved side. By adding a floatation device to the opposite side of
the amputation, a therapist should be able to help the patient achieve a horizontal level of floatation.

Viscosity

Another property of water is termed viscosity. Viscosity is the resistance to movement through a fluid that is caused by friction between the molecules of the fluid (Bates & Hanson, 1996). Three forces, cohesion, adhesion, and surface tension, play a part in the resistance present with movement in water. Cohesion is a force that is present between neighboring molecules of the same type of matter. Adhesion is the force of attraction between neighboring molecules of different types of matter. The third force, surface tension, only comes into play when a limb breaks the surface of the water. Surface tension is the force of attraction between the surface molecules of a fluid. Together, cohesion, adhesion and surface tension help determine the amount of viscosity present in a fluid.

Viscosity is present in all fluids; however, some fluids have a greater viscosity compared to other fluids. For example, patients exercising outside of the pool do not have to worry about the viscosity of air. However, if the patients were to perform the same movement in water, they would find the movement more difficult. The increase in difficulty is due to the fact that "the viscosity of water
is approximately forty to sixty times more dense than air" (Thein & Brody, 1998). The increase in viscosity will also cause the patients to fatigue earlier than on land. Therapists must take this into consideration when designing a rehabilitation program for their patients.

Hydrostatic Pressure

Hydrostatic pressure is another property that aids in the rehabilitation of patients. Hydrostatic pressure is defined by Pascal's law which states that "fluid pressure is exerted equally on all surfaces of an immersed body at a given depth, and is directly proportional to both the depth and density of the fluid" (Becker & Cole, 1997). This pressure is beneficial in that it opposes the tendency of the blood to pool in the lower extremities. By doing so, hydrostatic pressure aids in the reduction of unnecessary swelling. Hydrostatic pressure also helps with the stabilization of unstable joints.

However, hydrostatic pressure can also cause problems. Due to the fact that the pressure increases with the depth of the water, some patients may not be able to exercise with their bodies eighty-five percent submerged. An example would be a patient with chronic obstructive pulmonary disease or someone who has a vital lung capacity below 1500mL (Becker & Cole, 1997). These patients might experience breathing difficulties due to the added pressure
resisting the expansion of the chest wall. However, this does not mean that aquatic therapy could not be used in their rehabilitation. By using a progressive exercise program, the patient will be able to build their breathing muscles allowing them to gradually increase the depth of the water in which they workout.

Temperature

Temperature of the water plays an important role in aquatic exercise. The temperature of the water should be maintained between 92-96 degrees Fahrenheit. Water that is kept at a higher temperature can cause the body’s core temperature to rise. Results of various research have found that 95 degrees Fahrenheit was determined to be thermoneutral, or having no effect on the body’s core temperature (Bates & Hanson, 1996). However, it does cause a warming of the surface temperature. This warming benefits the patients in a variety of ways that will be discussed in further detail in another section.
CHAPTER III

CONSIDERATIONS FOR AQUATIC THERAPY

Aquatic therapy is currently being used in rehabilitation programs for a wide variety of injuries. In addition, patients of all ages are able to participate in an aquatic therapy program. However, there are limitations and guidelines that must be followed in order to provide the best rehabilitation environment for the patient and therapist. In the following paragraphs, the indications and contraindications will be discussed.

**Indications**

In the water, patients are able to move about more freely and with less effort. With this added freedom, patients are able to accomplish movements that they would be unable to achieve on land. Therefore, patients with disabilities and a wide range of other injuries can benefit from aquatic therapy. In fact, other areas of therapy such as sports medicine, work conditioning, joint replacement, and back rehabilitation are incorporating aquatic therapy into their programs to restore function.

Aquatic therapy is also beneficial in patients that are limited in their movements. These limitations can stem from a recent surgery, pregnancy, acute orthopedic or neuromuscular injury, rheumatological disease, or
neurological impairment (Walsh, 1995). In addition, patients who fall into the following situations can also benefit from aquatic therapy. This list is not all-inclusive, but it highlights the variety of patients who benefit from aquatic therapy.

- Multiple injuries
- Inability to fully weight bear
- Inability to tolerate impact stresses
- Arthritis
- Lower extremity swelling
- Range of motion loss
- Poor muscular strength
- Muscle spasms
- Athletes
- Chronic pain patients

Although there are many indications that aquatic therapy should be included in patients' rehabilitation, the main indication is that they are able to accomplish a movement or skill that they are unable to on land. In the water, many physical barriers, such as weight, inflammation, and pain, are removed, which helps to promote accelerated rehabilitation. However, we must remember that we can not live in water, and the exercises that patients are performing should be helping them make the transition to function on land.

**Contraindications**

Even though aquatic therapy is beneficial for many people, there are patients that should be restricted from
participating in an aquatic therapy program. These restrictions are based on the safety of both patients and therapists. The following is a list of absolute contraindications for patients that have been referred for aquatic therapy (Bates & Hanson, 1996).

- Waterborne diseases such as typhoid, cholera, and dysentery
- Fever higher than 100 degrees Fahrenheit
- Cardiac failure
- Kidney diseases (where there is an inability to adjust to fluid loss)
- Gastrointestinal disorders
- Infectious diseases
- Open wounds
- Contagious skin rashes
- Perforated eardrums
- Incontinence of feces or urine
- Menstruation without internal protection
- Epilepsy
- Abnormal blood pressure (hypertension or hypotension)
- Current or recent radiation treatment (during the last three months)
- Low vital lung capacity (900-1500 mL)

A therapist must also consider factors in addition to the before mentioned contraindications. Many people have a fear of water. If this is the case with a patient, then the therapist may need to consider another modality for therapy. Therapists also need to take into consideration whether the patient is hypersensitive to the sanitizing agents or chemical that are used in the pool. In addition, therapists need to be aware of any medications that a patient is on that could cause them to fatigue easier. The most important thing for a therapist to remember before a patient begins an
aquatic rehab program is to ensure that the patient is safe no matter what conditions that particular patient might have.
CHAPTER IV
AQUATIC THERAPY AND THE ATHLETE

Benefits

The focus of this paper is on the benefits that aquatic therapy offers athletes. Please keep in mind that these benefits are applicable for almost all patients, but I am concentrating on those that affect the athlete. The benefits can be classified into two categories, the physiologic and therapeutic effects.

Physiologic Effects

The physiological effects of pool therapy combine those brought about by the warm water of the pool with those of exercise. However, the extent of the effects vary with the temperature of the water, the length of the treatment, and the type and severity of the injury. During the period of immersion, the physiological effects are similar to those brought about by any other form of heat but are less localized. Therefore, the body as a whole is affected.

A general rise in body temperature occurs due to several factors. The temperature of the water is kept just slightly above the temperature of the skin. Therefore, the body is gaining heat through the area of the body which is submerged. The body can only lose the gained heat through cutaneous vessels and sweat glands of areas that are not in
the water, such as the face and neck (Davis & Harrison, 1998). Another factor that adds to an increase in temperature is the contraction of the muscles during the exercises. The rise in temperature is inevitable, but it does vary from athlete to athlete.

As the skin warms, the superficial blood vessels dilate and the peripheral blood supply is increased (Davis & Harrison, 1998). Therefore, more blood is being supplied to the active muscles. As a result, the heart rate increases. This increase also depends upon the temperature of the water and the severity of the exercise.

A person's blood pressure is also affected by the immersion in warm water. As athletes enter the pool, their blood pressure initially rises. This is caused by the momentary constriction of the blood vessels. However, after the body is immersed, blood vessels dilate causing the blood pressure to fall. It is very important that the therapist monitor the blood pressure of the athletes especially if they have prior history of blood pressure problems.

Athletes will also experience an increase in metabolism. This increase is present in the skin, muscles, and general metabolic rate. As the metabolic rate rises, the demand for oxygen increases. Therefore, the production of carbon dioxide increases as well. As a result, the athletes' respiratory rate will proportionally increase.
The increase in respiratory rate is also determined by the rate and intensity that the athletes perform the exercises.

As the athletes exit the pool, their bodies begin to return to baseline. The bodies begin by going through actions to decrease temperature. Heat is lost from the surface vessels and sweat glands as the athlete rests after exercising. In addition, the heart, respiratory, and metabolic rates as well as the distribution of blood will return to normal. However, the blood pressure will remain lower until the people return to their daily activities.

Therapeutic Benefits

The second category of benefits are those that deal with the advantages offered from warm water immersion in a rehabilitative setting. Through aquatic therapy, athletes can experience physical as well as emotional benefits. In addition, athletes can experience a decrease in the amount of pain they are experiencing. These benefits not only make aquatic therapy effective, but enjoyable for the athletes.

Many people take a long hot bath after a tired and stressful day. They do so to relax and unwind. Like a hot bath, the warm pool water helps relax the athletes' muscles. This relaxation helps prevent restricted joint movement. In addition, the warmth of the water can help to reduce abnormal muscular tone and decrease muscle spasms. This is
due to the rise in temperature of the extremities toward the core temperature (Bates & Hanson, 1996).

Another benefit that athletes experience as they enter the warm water is pain reduction. The pain cycle is interrupted as the water helps to alleviate the compressive forces caused by gravity at the joints. The athletes are also able to maintain a comfortable position as the buoyancy factor of water helps support the injured area. Please note that water is not a miracle cure for pain. As the athletes enters the pool, "the warm water 'distracts' the pain by bombarding the nervous system" (Bates & Hanson, 1996). Therefore, the sensory input from the warm water is actually competing with the pain input. In this case the pain is "blocked" out due to the fact that the sensory input from the water travels through fibers that are larger, faster and have a greater conductivity (Bates & Hanson, 1996). The reduction of pain is probably the most important benefit that aquatic therapy has to offer.

Athletes will also experience an increase in joint movement with the use of aquatic therapy. As mentioned earlier, the buoyancy of the water helps decrease the compressive forces present at the joints. The reduction of these forces also decreases the need for muscle splinting or guarding. Therefore, movement becomes easier and less painful for the athlete. In addition, the warm water helps prepare the connective tissue for stretching and increased
movement at the joint. As a result, the elongated tissue is at a lower risk for injury and muscle soreness.

Aquatic therapy also offers an environment where gravity is reduced. This enables athletes who are restricted from full weight bearing to begin gait training and strengthening exercises earlier in their rehabilitation. By beginning strengthening exercises earlier, there is also a reduction in the amount of muscle atrophy that occurs. The water also eases concerns of reinjuring or causing further damage to the affect areas. In addition, the therapist can gradually increase the amount of weight bearing by decreasing the depth of the water in which the athlete is performing their exercises.

An increase in peripheral circulation is also experienced by athletes participating in aquatic therapy. As the body is immersed, the blood is redistributed causing an increase to the periphery. The increase in circulation is due to the hydrostatic pressure that is exerted on the submerged body parts. In addition, the exercise causes the blood supply to the muscles to increase. With the increase in circulation, the body is able “to remove the retained metabolites and help speed up the healing process” (Bates & Hanson, 1996).

Aquatic therapy benefits the body emotionally as well as physically. The water allows athletes, who are restricted in their exercises on land, to be able to
exercise earlier in the water. The exercises are also easier than on land. Many times, the athletes’ confidence level drops during the time that their movements are restricted. However, they are able to do more movements with aquatic therapy, which enable them to rebuild their confidence. With the added confidence, the athletes’ fears of reinjury maybe eased.

Lower Extremity Rehabilitation Program

In any sport, it is inevitable that an injury will occur. These injuries are not limited to certain parts of the body. However, I have focused on injuries that occur to the lower extremity. Although I will be focusing on the lower extremity as a whole, it is comprised of the hip, knee, and ankle joints. The following material will cover a general program for a lower extremity injury even though each injury will require specific alterations to the athlete’s rehabilitation program.

Upon injury, the therapist must decide which rehabilitation program will help return that athlete to competition in the least amount of time. Many therapists are now turning to aquatic therapy to begin the athletes’ rehabilitation. With aquatic therapy, the athletes may be allowed a more rapid progression to full weight bearing than
in the past. This reduces the amount of latency period which can affect how long athletes are restricted in their activities.

Rehabilitation Stages

Stage I

The main focus during the initial phase of the athletes’ aquatic rehabilitation program are unloading and stabilization (Ruoti, Morris, & Cole, 1997). The goals during this phase are to decrease the overall load placed on the lower extremity while maintaining proprioceptive input. As mentioned before, the patients’ weight bearing status is determined by their physician. Although it differs from doctor to doctor, the extent and type of injury usually determine the amount of weight bearing that the athlete is allowed. In addition, the doctor also governs how long aquatic therapy will remain a part of the athletes’ rehabilitation program.

During stage one, the therapist and athlete are working toward the goals of increasing the range of motion, increasing circulation, and decreasing pain (Ruoti, Morris, & Cole, 1997). They are also looking to maintain the athlete’s strength, endurance, and proprioceptive abilities. This is achieved by a combination of both aquatic and land environments. Although the water offers many benefits, joint mobilization techniques are more effective on land, while gait training is more effective in the water.
In an aquatic medium, the water can be used to facilitate muscle activity. This allows the athlete to immediately begin gait training. In addition, the water helps to eliminate the tendency of athletes to favor the injured area while walking. Many times athletes are unaware of the compensations they are making. Therefore, it is critical for the therapist to provide feedback to athletes during the gait training process.

Athletes will also begin exercises to help with their stabilization during the first stage. The most critical areas of stabilization are the pelvis and the hip (Ruoti, Morris & Cole, 1997). With this in mind, the therapist initiates exercises to help strengthen the muscles that provide stabilization to these areas. Hip flexion, extension, abduction, and adduction are just some of the exercises that are used for stabilization.

In order to help progress athletes through the phases, several methods can be used. As mentioned earlier, weight bearing can be increased by decreasing the depth of the water in which athletes performs their exercises. The therapist can also vary the length of time that the athlete is in the pool, as well as the speed and intensity of the workout. In addition, the therapist can add water weights or other resistive devices to the athletes’ extremities to increases the amount of resistance.
Stage II

As athletes enters stage two, a more dynamic format should be used. Athletes will begin doing functional exercises during this phase. These functional exercises include walking, running, step-ups, and cross-country skiing patterns (Ruoti, Morris, & Cole, 1997). Unlike stage one, athletes will use very little resistance while performing the above mentioned exercises. Please note that the athletes are still continuing with the exercises that work on range of motion, balance, and gait from stage one. In conjunction with the aquatic exercises, athletes will continue with a land program. Joint mobilization should continue until full range of motion returns. In addition, the therapist can begin implementing manually applied techniques and resistive devices. However, the addition of the exercises should depend upon the stability of the structures surrounding the injured area.

Stage III

Once athletes no longer show any signs of compensation in their movement, they can progress to stage three of their rehabilitation. However, it is very important that the therapist not progress athletes into this stage too early. The therapist must keep in mind the
rate at which the injured tissue is healing. Progressing too early could cause further damage or a set back in the athletes' therapy.

During stage three, athletes can begin to include exercises that are specific to the sport in which they participate. In addition, athletes are no longer limited to movements in one direction, or the amount of resistance involved. The therapist is able to vary the workout in order to continue to challenge the athlete. Although the workout will still include cardiovascular and stabilization exercises, the focus of this stage is to begin progression to unrestricted activity.

In the pool, athletes can begin to increase the amount of weight-bearing by performing their exercises in more shallow water. By doing so, the amount of joint force and torque will also increase (Ruoti, Morris & Cole, 1997). Athletes can also include jumping, leaping, and multiple plane trotting into their aquatic workout. The exercises should also include frequent starts and stops in the actions. Although athletes are working on their cardiovascular conditioning, the exercises should begin slow and progress to higher speeds in order to ensure correct form.

On land, the workout will begin to involve movements that are more sport specific to the athlete. However, these movements should not be performed at full speed. Jumping
should not be performed in a position of full weight-bearing. These limitations are due to the condition of the healing tissue, and are a precautionary measure.

**Stage IV**

Once the injured tissues have had the proper amount of time to heal and athletes have progressed through the first three stages, they are ready to enter stage four. This stage is the last stage before athletes are released to unrestricted activity. It is very important that the therapist and athletes work and communicate together during the transition to full weight-bearing, speed and multisurface training (Ruoti, Morris & Cole, 1997). In addition, the therapist should try to incorporate an unlimited variety of sport-specific activities into the program during this stage.

The aquatic and land program coincide during this phase. However, in the pool the therapist is able to add resistance that cannot be achieved on land. For example, the resistance added by the jets while running in the pool cannot be duplicated when athletes run on a treadmill. Once athletes pass a performance test designed for specific injuries, they can be released from therapy, and then from their doctor to return to unrestricted activity.
Sample Aquatic Exercise Program

As I mentioned before, each athlete's therapy will vary according to the injury which they have sustained. However, they all follow the basic stages which I have covered. The therapy also varies with the extent of the injury and the time of progression of the athlete. I have included an outline from *Physical Rehabilitation of the Injured Athlete* that covers the exercises and progression of an athlete through aquatic therapy after anterior cruciate ligament (ACL) reconstruction.

Aquatic Exercise Progression After Anterior Cruciate Ligament Reconstruction

I. Phase I: Maximum Protection Phase
A. Weeks 2–6
   1. Gait training
      a. Forward
      b. Backward
      c. Sideways
   2. Resistive exercises
      a. Minisquats
      b. Hip flexion and extension with knee flexion
      c. Hip abduction and adduction
   3. Deep-well endurance activity
      a. Bicycling
      b. Scissor kick
      c. Hip abduction and adduction
   4. Hamstring and gastrocnemius/soleus stretching
B. Weeks 3–6
   1. Barbell minisquats
   2. Straight leg hip flexion and extension
   3. Addition of resistance exercise equipment

II. Phase II: Controlled Ambulation Phase
A. Weeks 6–9
   1. Continue resistance exercises
   2. Side-lying cycling: forward and backward
   3. Lateral step-ups
   4. Cariocas
5. Jogging: forward and backward
6. Swimming with buoy
7. Back-lying flutter kick

III. Phase III: Moderate Protection Phase
A. Weeks 9-14
   1. Continue resistance exercises
   2. Kickboard lap swimming
   3. Resistance kickboard running

IV. Phase IV: Light Activity Phase
A. Months 3-4
   1. 3 months
      a. Swimming
      b. Vertical jumping
      c. Resistance running with jets
      d. Agility patterns
      e. Diagonal cutting
   2. 3.5 months
      a. Kickboard laps with fins
      b. Deep-well running with fins
      c. Tethered shallow-water running
      (Andrews, Harrelson, & Wilk, 1998)
Aquatic physical therapy is being more widely used in the rehabilitation of athletes. Exercising in water allows athletes to return to functional activities at an accelerated rate. The water provides an alternative environment for patients who are restricted from fully weight-bearing to exercise. In addition, it is an excellent environment to work on range of motion, strengthening, and cardiovascular conditioning. In many cases, incorporating aquatic therapy into the rehabilitation program has allowed the athletes to return to activity at the pre-injury level. The aquatic environment also allows for more sport-specific activities in the earlier stages of the athlete’s rehabilitation. The multiple benefits afforded through aquatic rehabilitation make this approach a valuable component to the athletes’ return to function.


