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Water Power

Aquatic plyometrics give athletes the opportunity for an explosive workout with little impact. That means they can work harder for longer, with less risk for injury than on dry land.

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When you think about plyometric exercises, you likely picture athletes bounding across a field, hopping over cones and hurdles, or jumping on and off plyo boxes. You probably don't visualize any of the exercises being performed in a pool, but that may soon change as aquatic plyometrics continues to grow in popularity among athletes.

Because the work has decidedly less impact in the water than on dry land, athletes don't need as many restrictions on the number of foot touches they can perform in a given week. Aquatic plyos also decrease concerns about acute injury, and pool work provides a nice change of pace by adding more variety to workouts.

During our careers, we have both used aquatic plyos with private clients and athletes of all ages, and have taught the method to students and colleagues for many years. We've seen increases in agility and overall total body strength with minimal muscle soreness for the athletes. We have also found that our athletes and clients really look forward to these pool workouts and quickly master the exercises so they can do them on their own.

WHY WATER?
When an athlete's performance goal is to develop explosiveness, plyometrics in general are a great tool to help them achieve it. Dry-land plyos have been shown to increase acceleration, power, vertical jump height, and leg strength, all while increasing athletes' joint awareness and overall proprioception. The same has now been proven with the use of aquatic plyos.

Any power-based movement consists of an eccentric muscle action, an amortization phase, and a concentric contraction. The elastic energy stored during the eccentric action provides the force needed for the concentric portion of the movement. The goal of training with plyometrics is to shorten the amortization phase--to train muscles to more rapidly load and contract. This allows the movement to be completed in a shorter amount of time, thus leading to increased power and explosiveness.

One drawback to performing plyometric exercises on dry land lies in the intensity of the movements. Impact forces are relatively high, so too many foot touches can result in muscle soreness and increased risk for injury. When plyos are performed in water, however, the impact forces are greatly reduced. And strength gain opportunities are not negatively affected because viscosity and drag provide resistance, forcing athletes to work hard through the movements.

The decreases in impact forces are largely due to the fluid density and buoyancy of the water. Buoyancy acts as a counterforce to gravity, so in waist- deep water, body weight is supported during the eccentric portion of a lower-body plyometric movement, significantly reducing impact. One study found as much as 54 percent of a person's body weight is supported by water when submerged to the waist.

Because water reduces impact, athletes with joint, muscle, or tendon pathologies who cannot withstand forces on land can participate in aquatic plyometrics without precipitating more harm. For the same reason, aquatic plyometrics can be particularly beneficial for heavier athletes in sports like football.

For athletes without joint problems who can effectively perform dry-land plyos without issue, switching to aquatic plyos can help prevent the onset of pain and reduce recovery time. These athletes can see even greater strength gains because the number of foot touches, as well as drop height, don't need to be as severely restricted as in dry-land plyos training.

Adding water to a plyo program also enhances joint awareness and proprioception by providing a sensory awareness that cannot be matched on land. The sensation of water against the skin allows athletes to be more mentally and physically aware of where their body parts are and how they are moving. This is especially true as they are moving through the water since athletes can feel their limbs and body placement during activity.

With aquatic plyometric training, results may be seen in as little as three to four weeks for untrained athletes and about six to eight weeks in highly trained athletes. Of course, the rate of improvement will be based upon the intensity and frequency of the workout program.

DEVELOPING A PROGRAM

All you need to start aquatic plyometrics is a pool and a block of time two to three days per week over a six- to 12-week period. Most collegiate and high school athletic programs have relatively easy access to a lap or therapeutic pool or a nearby community facility that does.

When developing any plyometric program, gradual increases throughout the training period is generally recommended. One of the great advantages to aquatic plyos is that athletes can generally progress more quickly to higher volume and training intensity. We've also found that aquatic plyometrics produce minimal post-workout soreness when compared to dry-land plyometrics.

For example, in a 2010 study, researchers compared subjects who performed plyometrics programs either on dry land or in a pool. Even when the volume of plyos was doubled, participants in the aquatic plyos program reported minimal muscle soreness when compared to their dry-land training counterparts.

It's important to note that athletes' heart rates should be monitored during these sessions to help gauge intensity. When athletes are submerged in water, even waist deep, their cardiac output increases due to the hydrostatic pressure effects on the baroreceptors and atrial stretch receptors. In turn, this increases stroke volume.

It has been suggested in previous studies that athletes perform aquatic plyo work at an intensity that is roughly 16 to 17 beats per minute lower than their standard heart rate during other high-intensity activities. Because of the added element of higher cardiac output in water, we usually have our athletes measure their own heart rate several times during the workout to gauge intensity and make sure we're not pushing them too hard.

While water can help decrease impact forces, the resistive forces and density make initial movements more difficult to perform correctly, so during initial plyometric training, more emphasis on the instruction of movements is required. After athletes adapt to moving in the water and controlling their body position, less supervision is needed.

However, the more athletes you have in the water at one time, the more difficulty there will be in properly supervising them. While there are no specific guidelines for aquatic plyometrics, our experience says that a group of 15 athletes is the limit for one supervisor.

To prevent slipping on the bottom of the pool surface and to minimize extraneous drag on the body, athletes may find that shoes made for the aquatic environment and form fitting swim trunks work best. While there is no required equipment for a plyos program, aquatic boxes and cones are often used. Aquatic boxes are specialized submersible boxes that not only stay on the pool bottom but can be incrementally heightened, and have surfaces that help stop slippage.

Traditional plastic cones can be used as barriers to jump toward or over, but must be weighted to remain on the pool bottom. We recommend using cones with plastic weights (one- to two-pound dumbbells will suffice) affixed by thin ropes or other non-metal fasteners. The weights can be inserted inside the cones to the tip and will not affect their overall stability.

The cones should also have holes to allow water through and diminish the buoyancy effect. Since they are relatively light, bumping one will not cause physical harm to the athlete.

Training sessions can last anywhere from 20 to 45 minutes, not including warmup. Our typical five- to 10-minute warmup includes walking in neck-deep water the circumference of the pool (or just the shallow areas) along with lunges, high-knee lifts, high-heel lifts, and cross country ski movements in shallower water.

WATER FACTORS

Although aquatic plyos use the same general movements and exercises as dry-land plyos, you cannot simply take your existing dry-land plyos program and add water. For one thing, because more work will be required by the athlete to overcome the initial inertia and resistance of the water, the distance or height of jumps or barriers may need to be shorter or lower. For example, jumps that are spaced three to four feet apart on land may need to be two feet apart (or less) in the water.

Second, variations in water level need to be factored in, since they will contribute to alteration of movement and overall intensity of the exercises. Based on personal experiences, we suggest most bounding or hopping activities be performed with the arms and hands fully above the water. If the arms swing into and through the water, the drag and resistance force obstructs the normal rhythm of the movement.

In addition, doing plyos in chest- or neck-deep water can be very difficult for people being introduced to aquatic plyos for the first time, and an athlete's focus may tend to move toward performing the movements correctly, taking away from the main goal: decreasing the amortization phase of explosive movement. While a bit uncomfortable at first, athletes quickly adapt to moving with their arms out of the water.

The height and weight of athletes should also be considered. For example, in a 42-inch deep pool, a tall athlete may have water up to the waist while a shorter athlete may be in chest-deep. In addition to height, a lighter athlete--one who weighs 100 pounds, for instance--will tend to "float" more during movements when compared to a heavier athlete, making the movement easier for them. To compensate, the distance or height of the jumps can be altered or you can station different height or weight groups in shallower or deeper areas of the pool.

Another aquatic-specific factor when bounding or hopping across the length of the pool is water drag. For example, in a line of seven athletes following one another single-file across the pool, the first athlete is

forced to overcome more water resistance than the last person, who will most likely just get pulled along by the current. In these instances, alternating direction of movement will limit the amount of current and ensure that nobody gets a free ride.

Some of the lower-body exercises we've found to be effective include two-footed hops over a cone, lateral jumps over a barrier or cone, and standing long jumps in which the athlete jumps as high and as far forward as possible. When a barrier or cone is involved in the exercise, make sure the athlete is actually going over it and not inadvertently around it. We start with 18-inche barriers, and as athletes progress, incrementally increase the height up to 25 inches.

While most aquatic plyometric programs focus on lower extremity exercises, upper-body plyometric movements can be conducted in the pool, too. For example, angled push-ups with hands on the wall utilize the drag property of water. And for core strengthening, when athletes float on their back or chest on the surface, water helps them stay afloat but also encourages them to use their core muscles to remain in the correct posture during the movement.

As your athletes are ready for more advanced work, you can add upper-body resistance to any of the lower-body exercises you are already performing by having them work in chest- or neck-deep water with their hands underwater. To make these movements more difficult for athletes, have them wear aqua gloves or fins over their hands to create more surface area and impede movement. (When starting out, however, we advise sticking with hands above the water.)

Water offers a new and different training environment that works as a motivational stimulus for athletes and increases the potential to improve performance quickly. Athletes can become bored with their routines sin the weightroom or even outdoors, so why not have them jump in for not only a great workout but some fun, too?

You can download a six-week aquatic plyometrics sample program from the authors here.

To view full references for this article, go to: www.Training-Conditioning.com/References.

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