

PLYOMETRIC WORKSHOP

Plyometric exercises are powerful aerobic exercises used to increase your speed, endurance, and strength. They require you to exert your muscles to their maximum potential in short periods of time. Plyometrics, also known as jump training or plyos, are exercises in which muscles exert maximum force in short intervals of time, with the goal of increasing power (speed strength). Plyometric exercises are usually geared toward highly trained athletes or people in peak physical condition.

However, they can also be used by people wishing to improve their fitness. Plyometric exercises can cause stress to the tendons, ligaments, and lower-extremity joints, especially the knees and ankles. It's important that you have the strength and fitness level necessary to do these exercises safely and effectively. Plyometrics include explosive exercises to activate the quick response and elastic properties of the major muscles. It was initially adopted by Soviet Olympians in the 1950s, and then by sportspeople worldwide. Plyometric exercises include vertical and broad jumps, where you jump as high and/or as far as possible. Skipping rope, jumping squats, single leg hopping and clapping push-ups are also great examples of plyometric exercises. If you go to the gym, you probably noticed a few wooden boxes or metal platforms stacked beside other sports equipment. Plyometric exercises often use these types of props to jump on and down from to promote a greater extension of muscle fibers. If you go to the gym, you probably noticed a few wooden boxes or metal platforms stacked beside other sports equipment.

Plyometric exercises often use these types of props to jump on and down from to promote a greater extension of muscle fibers. It's a fun alternative to an everyday strength training workout that boosts your muscle power, strength, balance, and agility. You can either do a workout based on plyometrics, or add some plyo moves to your usual routine without giving it an entire session. Power is the ability to produce large amounts of force quickly. Are there any athletes that would not want to improve their ability to generate power? Or who want to increase their explosive strength? What about clients seeking to improve general fitness? Power is essential for all three groups. By incorporating plyometric exercises into training programs, you can harness the speed and force of movement for improved performance and daily activities.

What is Plyometrics?

We define plyometric training as a quick, powerful movement involving a system of reactive exercises and an eccentric contraction, followed immediately by an explosive concentric contraction. You accomplish this through any movement utilizing the Stretch-Shortening Cycle (SSC).

Plyometric training is often interchangeable with power training. However, as some traditionally use plyometric training to define a specific movement pattern in which three distinct phases of movement occur rapidly, not all power training is plyometric training (though all plyometric training is considered power training).

By contrast, Power Lifting is a sport and often confused with power/explosive training. To clarify, it is a misnomer as its primary focus is strength enhancement and development and traditionally does the bulk of training with heavy, slow lifts. Plyometrics is built upon various scientific principles (stretch-shortening cycle, optimizing sarcomere length, and stretch reflexes) that can help individuals tremendously boost their power output. Improvement to the Rate of Force Development and the maximum power output of various movement patterns related to sport is crucial to improving sport-related tasks. Still, it is also extremely valuable in return to play, post-rehabilitation, and pre-habilitation (or injury reduction) protocols. Note the following areas of injury reduction:

- Improved control for varus and valgus movements at the knees during landing
 - Enhanced dynamic knee stability during the deceleration phase of landing
 - Enhanced anaerobic power and vertical jump height
 - Improvement in overall power and change of direction speed in all planes of motion
- Plyometric training can add a fun and challenging component to training programs. However, like most training protocols, it must be introduced, coached, and progressed systematically to avoid injuries.

Unilateral and gravity accelerated patterns such as bounding, hops, depth jumps, and combination jumps demand a solid foundation of stability, motor control, coordinated patterning, eccentric strength, joint integrity, flexibility, and technical proficiency to avoid injury

The 3 components of Plyometric Patterns

Plyometric exercises have three distinct components: an eccentric, an amortization, and a concentric phase that releases the explosive force. These three components make up a stretch-shortening cycle.

ECCENTRIC COMPONENT

During the eccentric component, the muscle is pre-stretched, storing potential energy in its elastic elements. The eccentric phase can be referred to as deceleration, absorption, loading, yielding, or the cocking phase. When basketball players bend their knees and lower their arms before a rebound shot or when a baseball player pulls his arm back before a throw to first base are both examples of the eccentric component. **AMORTIZATION COMPONENT** The

amortization component is a time of dynamic stabilization during which the muscle transitions from overcoming the acceleration of gravity and loading the energy to releasing it. If this segment lasts too long, the potential elastic energy can be lost. The shorter the amortization segment, the more powerful the results.

CONCENTRIC COMPONENT Unloading the elastic energy occurs next in the concentric phase, which adds to the tension generated in a concentric muscle contraction. This is where the athlete releases the stored and redirected energy, jumping for the basket or slinging the ball to first base.

THE BENEFITS OF PLYOMETRICS

Of the many benefits of plyometric training, some of the more recognized are:

- increased vertical jump height
- increased long jump distance
- Increased strength
- improved running speed, agility, and quickness
- injury reduction
- improved throwing, hitting, striking velocity
- Why does the use of plyometrics and power patterns improve power output and performance? Several reasons have been found as to the realized benefits of utilizing plyometrics:
 - Rapid eccentric movement followed by immediate concentric contraction enhances power output 10-15%
 - Increased explosive strength due to improved rate of force development RFD
 - Increased reactive strength due to greater storage and re-utilization of elastic energy
 - Improved ability to transfer force through the joints and minimize energy leaks
 - Increased active state/force preload (pre-tension developed in anticipation of power
 - Enhanced Stretch Reflex (Muscle Spindle/greater contraction
 - Decreased co-contraction of the antagonist
 - Storage and re-utilization of elastic energy (series elastic component: tendon and aponeurosis)
 - Desensitization of the GTO
 - Enhanced neuromuscular efficiency

It's probably easier to see how plyometric training can improve athletic performance, but perhaps more challenging to see why plyometric exercises would benefit the non-athlete. Plyometrics is interchangeably termed reactive training. From this perspective, it is essentially about how the body interacts with ground surfaces. Quickly responding to an unexpected change in the surface when stepping off a curb or rapidly changing direction when walking a dog on a leash are possible examples clients may encounter. Begin with activities that focus on plyometric stabilization exercises, even using regressions such as step-up/step-down or step-up/step-down to the front on a low box or bench.

Our workshop on training of good Plyometric Techniques

Teaching good technique begins with instructing landing/absorbing/catching mechanics and progressing the program only when form mastery is exhibited. Some simple mantras to remember are that you must "Load before you can explode" and "train slow, move slow, train fast, move fast, but if you can't do it slowly, you can't do it fast." Some coaching tips to improve jump-landing mechanics include:

PHASE 1

Body position and mechanics, as well as landing/absorption, is key in this phase.

- Instructing individuals how to properly hip-hinge and land is critical. From a standing position, using a dowel or light bar and maintaining good spinal orientation as the body hinges and lowers (i.e., 3 points of contact with the bar - sacrum, thoracic spine, and back of the head) can be helpful. This movement, versus a more quad-dominant lowering position, reduces knee and hip shearing forces while also loading (eccentrically) the gluteus maximus to facilitate more powerful unloading (concentric contraction) during the triple extension phase (ankle, knee, and hip).
- Further, athletes must be instructed about ground contact and absorption. Keeping it simple, since the priority is force absorption to reduce impact and joint wear and tear, the cues keep it quiet and keep it soft. The less noise/sound on impact, the better. A standard error is the "heel slap." This is the inability (or lack of awareness/effort) to keep the heel of the foot from striking/impacting the ground hard and causing a loud noise on the landing. This increases impact forces. If this cannot be controlled, the pattern's intensity should be reduced until the athlete can master the ability to quietly land on the fall of the foot and maintain a credit card space underneath the heel.
- Arm swing must be taught and not overlooked. It is key to potentiating power and is often misunderstood by athletes. Arms need to be loaded back in hyperextension early and released into flexion with maximal effort.
- Getting athletes to keep these priority segments aligned in the sagittal plane (allowing for hip- shoulder-width foot placement based on jumps) has been shown to decrease injury and improve force production due to less lost energy or force leaks.
- Emphasize upper extremity alignment and head position (eyes-ups, head aligned with the spine) using cues like nose-over-toes or chest-over-knees at the bottom of the eccentric loading phase.
- Keep the patterns primarily uniplanar and directional in this phase.

PHASE 2-3

Introduce more dynamic movements, which will begin to vary planes and directions and increase gravity acceleration and impact forces.

- Introduce two planes or direction of movement into patterns
- The introduction of barriers to jump over and variable planes and increased movement speeds due to gravity and countermovement patterning will challenge the athlete to gain another level of motor control and absorption and the ability to change direction and release the stored energy to a greater degree.
- When ready, begin coaching your athletes to reduce the amortization phase or transition between the lowering and rising phases to harness elastic energy into motion (minimizing potential energy leaks).
- Maintain all postural and landing considerations from previous phases.

PHASE 4-5

Progress to double contact movements/bounces (small jump preceding large jump) to potentiate the SSC further. This is what most consider "true plyometrics," wherein the emphasis is on switching from a landing (eccentric) to a take-off (concentric) as rapidly as possible.

- Introduction of bounce or double contact.
- Emphasize minimizing ground contact time.
- Maintain all postural and landing considerations from previous phases.
- Introduce alternating limb patterns.
- Introduce 2+ planes and/or directions of movement.
- Introduce external load.

PHASE 6

The focus of this phase is to move the full spectrum of velocities, planes, directions, and sport-related patterns to fully integrate the weight room to the playing field

- Introduce multiple loading variable and skills into sequences (i.e., MB throws to barrier jumps to sprints.)
- Introduce repeating patterns with maximal elasticity demands (depth jumps, high hurdle jumps, etc.)
- Introduce reactive/chaotic scenarios.
- Hybrid variations of takeoffs and landings (1 - 2 leg and 2 - 1 leg.)

In closing, while plyometrics can be fun, take the needed time to prepare the body physiologically. Develop your systematic plan to advance individuals towards higher-intensity drills once they demonstrate technique mastery and adequately tolerate jump-landing forces.