

HVC Fit Tip-March 2010 by Michelle Miller

Plyometrics in Volleyball

In order for plyometric training to be at its most effective it should follow a phase of maximal strength training. The purpose of plyometrics is to improve the athlete's capacity to apply more force more rapidly. Logically then, the greater the athlete's ability to generate maximal force or strength to begin with, the more of it can be converted into sport-specific power.

There are many plyometric exercises for both the upper and lower body. As with other forms of sports training, exercise selection should mimic the movement patterns of the sport as closely as possible.

Plyometrics refers to exercise that enables a muscle to reach maximum force in the shortest possible time (3). The muscle is loaded with an eccentric (lengthening) action, followed immediately by a concentric (shortening) action.

This article outlines the physiology behind how and why plyometrics works. It also examines the research that demonstrates why plyometric training is very effective.

How Plyometric Exercises Work

A muscle that is stretched before a concentric contraction, will contract more forcefully and more rapidly. A classic example is a "dip" just prior to a vertical jump. By lowering the center of gravity quickly, the muscles involved in the jump are momentarily stretched producing a more powerful movement. But why does this occur? Two models have been proposed to explain this phenomenon.

Mechanical Model

In this model, elastic energy is created in the muscles and tendons and stored as a result of a rapid stretch. This stored energy is then released when the stretch is followed immediately by a concentric muscle action. It is the same effect like that of stretching a spring, which wants to return to its natural length. The spring in this case is a component of the muscles and tendons called the series elastic component.

Neurophysical Model

When a quick stretch is detected in the muscles, an involuntary, protective response occurs to prevent overstretching and injury. This response is known as the **stretch reflex**. The stretch reflex increases the activity in the muscles undergoing the stretch or eccentric muscle action, allowing it to act much more forcefully. The result is a powerful braking effect and the potential for a powerful concentric muscle action.

If the concentric muscle action does not occur immediately after the pre-stretch, the potential energy produced by the stretch reflex response is lost. (i.e. if there is a delay between dipping down and then jumping up, the effect of the counter-dip is lost).



The Stretch-Shortening Cycle

All plyometric movements involve **three** phases. The first phase is the pre-stretch or eccentric muscle action (lengthening of the muscles). Here, elastic energy is generated and stored—very important part of why this works.

The second phase is the time between the end of the pre-stretch and the start of the concentric muscle action (shortening of the muscle—the power producer). The shorter this phase is, the more powerful the subsequent muscle contraction will be.

The third and final phase is the actual muscle contraction. In practice, this is the movement the athlete desires such as a jump and arm swing to get as high as possible to hit as hard as possible.

So, what can we do about it?

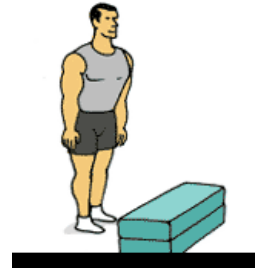
Lower Body Plyometric Exercises (Low Intensity)

Squat Jumps

1. Stand with feet shoulder-width apart, trunk flexed forward slightly with back straight in a neutral position.
 2. Arms should be in the ready" position with elbows flexed at approximately 90.
 3. Lower body where thighs are parallel to ground and immediately explode upwards vertically and drive arms up. Do not hold a squat position before jumping up keep the time between dipping down and jumping up to a minimum.
 4. Land on both feet. Rest for 1-2 seconds and repeat
- Prior to takeoff extend the ankles to their maximum range (full plantar flexion) to ensure proper mechanics.

Jump to Box

1. Stand facing box with feet slightly wider than hip-width apart.
2. Lower body into a semi-squat position and immediately jump up onto box. Do not hold a squat position before jumping up keep the time between dipping down and jumping up to a minimum.
3. Feet should land softly on box. Step back down (not jump back down) and repeat.



Lateral Jump to Box

1. Stand side on to box with feet slightly wider than hip-width apart.
2. Lower body into a semi-squat position and jump up onto box. Do not hold a squat position before jumping up keep the time between dipping down and jumping up to a minimum.
3. Feet should land softly on box. Step back down (not jump back down) and repeat.

