

# Plyometric Fundamentals

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**P**lyometrics are a type of exercise that crop up in the mainstream media and health clubs fairly often as a means to enhance athletic performance. In general, the term plyometrics refers to types of jumping or throwing drills that are designed to help increase an individual's explosiveness.

While a fun and practical way to increase athletic performance, many individuals do not realize that plyometrics can be dangerous. Injuries may occur if safety precautions are not taken and if proper technique and exercise progression is not observed. Overtraining is also easy to achieve with plyometrics.

With that in mind, the rest of this article will discuss safety and injury prevention, different types of plyometric exercises, and present some sample workout programs.

## Safety and Injury Prevention

Plyometrics can be an effective way to improve explosiveness. However, if precautions are not taken they can also cause injury. The following are precautions that should be taken to prevent injuries with plyometrics.

First, learn how to land. Understanding how to land can make the difference between the exercise being effective and causing an injury. It's important to land in such a way that it allows for the muscles of the leg to be loaded as opposed to the ligaments in the knee. When landing, land in a quarter-squat. This is best achieved by pushing the hips back and flexing the knees. The knees should not be allowed to move in towards each other or out away from each other.

Second, observe proper progression. While many of the advanced exercises are fun and challenging, one should master these exercises in the proper sequence. A progression is provided so that you may learn the techniques in a slower, less complicated drill before being expected to apply them in a faster, more stressful

drill. Learning the exercises in the proper sequence ensures that you have the technique and fitness-base necessary for the more advanced exercises.

Third, perform jumps on a non-slip surface. Performing a maximal jump up to a height, down from a height, or over an obstacle and then slipping while landing (or taking off) can result in an injury. Also make sure that if drills are done onto, or off of, boxes that the boxes will not move.

Fourth, make sure the jumping area is free of clutter. This will keep you from tripping on anything and getting hurt.

Finally, realize that more is not better with plyometrics. In general they should only be performed every 48 – 72 hours. This is because they can be very taxing to the central nervous system and a great deal of recovery between workouts is necessary. Also realize that plyometrics lose their effectiveness after too many repetitions. When excessive fatigue sets in, plyometrics tend to be performed slowly and with bad technique. In general, collegiate beginners should only be performing about 100 – 150 foot contacts per workout; younger individuals should adjust that number down. More advanced individuals may perform considerably more per workout, but need to work up to that number over time.

Now that we've covered some of the major safety and injury prevention pointers, the next part of this article will cover several fundamental exercises for a good plyometric workout program.

## Types of Exercises

Following are several categories of plyometric exercises. The techniques behind jumps-in-place and standing jumps should be mastered before moving on to multiple hops and jumps.

### Jumps-in-Place

Jumps-in-place are single-effort jumps that have individuals landing in the same place they started from. These jumps should be maximum effort and should emphasize correct jumping technique and speed of movement. They are valuable for training

because they teach optimal jumping and landing technique, and they also teach how to move the body explosively. The following are a number of sample jumps-in-place, these are presented in the order in which they should be mastered:

- **Counter-Movement Jump**—Stand tall, feet should be hip-width apart with the hands at the sides (see Figure 1). Keeping the weight on the heels, quickly push the hips back while flexing the knees. As this happens the arms should be swung backwards from the shoulders. Squat down to a quarter-squat. Without pausing at the bottom of the squat, reverse direction explosively and throw the body straight up into the air. When landing, make sure to absorb the impact by pushing the hips back and flexing the knees.

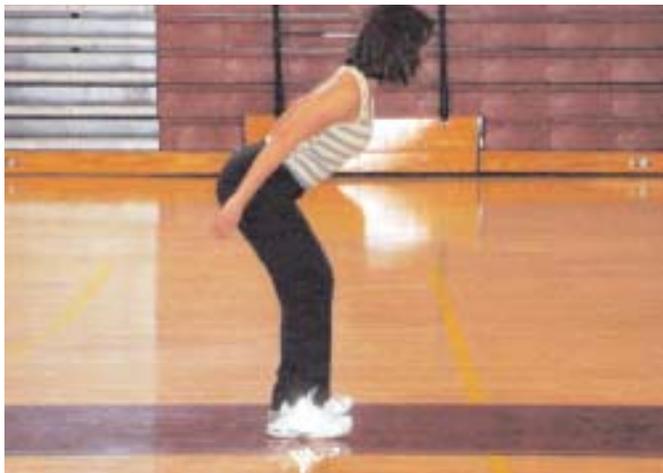


Figure 1: Counter-movement jump, starting position

- **Squat Jump**—Stand tall, feet should be hip-width apart with the hands clasped behind the back or behind the head (see Figure 2). Keeping the weight on the heels, squat down until the thighs are parallel to the floor. Pause in the squat. Without a counter-movement and without use of the arms, jump as high as possible. When landing make sure to absorb the impact by pushing the hips back and flexing the knees.

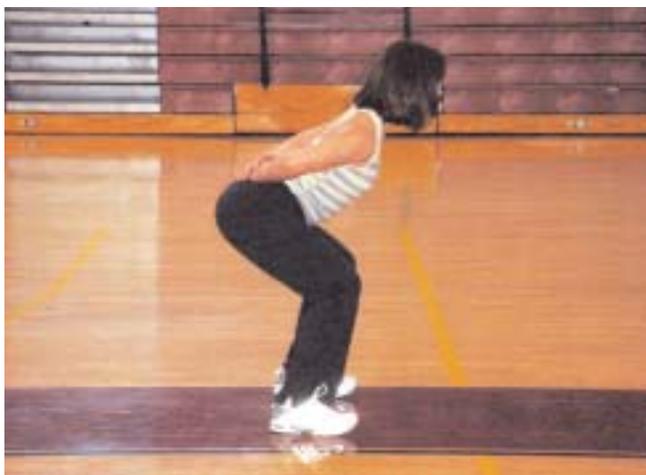


Figure 2: Squat jump, starting position

- **Split Jump with Cycle**—Begin in a lunge position, with the right leg forward (see Figure 3). The right leg should be flexed at the knee and hip, with the right foot flat. The left leg should have a slight bend in the knee; the ball of the left foot should be on the ground. Using primarily the right leg, jump straight up into the air. While in the air cycle the legs so that upon landing the left leg is in front. Repeat with the left leg.



Figure 3: Split jump, starting position

- **Tuck Jumps**—Stand tall, feet should be hip-width apart with the hands at the sides. Keeping the weight on the heels, quickly push the hips back while flexing the knees. As this happens the arms should be swung backwards at the shoulders. Squat down to a quarter-squat. Without pausing at the bottom of the squat, reverse direction explosively and throw the body straight up into the air. While jumping into the air, try to bring the knees up towards the chest. Clasp the knees if possible.
- **Split Jump without Cycle**—Begin in a lunge position, with the right leg forward. The right leg should be flexed at the knee and hip, with the right foot flat. The left leg should have a slight bend in the knee, with the ball of the left foot on the ground. Using primarily the right leg, jump straight up into the air. Instead of cycling the legs, land with the right leg in front. After the desired number of reps have been performed switch legs.
- **One-Legged Counter-Movement Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides (see Figure 4). Lift the left foot so that it is not in contact with the ground. Keeping the weight on the right heel, quickly push the hips back while flexing the right knee. As this happens, the arms should be swung backwards from the shoulders. Squat down into a quarter-squat. Without pausing at the bottom of the squat, reverse directions explosively and throw the body straight up into the air. Beginners should land on both feet. Advanced individuals can land on the right foot. Switch legs after the desired number of repetitions have been performed.



Figure 4: One-legged counter-movement jump, starting position

- **One-Legged Squat Jumps**—Begin standing tall, with the feet hip-width apart and the hands either behind the back or behind the head. Lift the left foot so that it is not in contact with the ground. Pushing the hips back and flexing the right knee, squat down into a quarter-squat. Pause in that position. Without a counter-movement and without use of the arms jump as high as possible. Beginners should land on both feet, though advanced participants may land on just the right foot. Switch legs after the desired number of repetitions have been performed.
- **Combining jumps with other movement skills**—Jumps-in-place can be combined with other movement skills to add variety, sport-specificity, and increase difficulty. For example, perform a counter-movement jump. Immediately upon landing sprint 10 yards.

## Standing Jumps

Standing jumps refer to single-effort jumps that result in moving forwards, backwards, laterally, or diagonally. As with jumps-in-place, they should involve maximum effort and should emphasize correct technique and speed of movement. In addition to teaching how to move explosively, they are also great exercises to help develop and utilize lower body strength. The following are several sample standing jump exercises:

- **Standing Broad Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides. Face the direction of the jump. Begin the exercise by quickly pushing the hips back and flexing the knees. As this occurs swing the arms back from the shoulders. Move into a quarter squat. Without pausing in the squat, jump forward. Remember to swing the arms forward as you jump. A useful cue with this exercise is to “throw yourself forward.”
- **Standing Lateral or Diagonal Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides. Face forward. Perform a maximal effort jump either to the side or (depending upon the exercise) in a diagonal direction.

- **Jump over Cones/Hurdles**—Jumps may be performed forwards, backwards, laterally, or diagonally over cones or hurdles to make the exercises more difficult.
- **Single Leg Jumps**—Advanced individuals may perform any of the standing jumps using only one leg.



Figure 5: Cone hops, starting position

## Multiple Hops/Jumps

Multiple hops and jumps are advanced drills and should only be attempted after an individual has mastered the techniques of jumps-in-place and standing jumps. Hops can be defined as submaximal jumps with a directional component. Multiple hops and jumps string together jumps. They are designed to be performed for a specific distance or a specific period of time. When performing these exercises, one should emphasize explosiveness, getting off the ground quickly, and correct technique. The following are examples of multiple hops and jumps:

- **Ankle Hops**—Ankle hops may be done in place, forwards, backwards, laterally, or diagonally. They are hops that are primarily performed by the ankles. These are useful for conditioning the muscles and tissues of the lower leg and good for shin-splint prevention exercises. When performing ankle hops, keep the knees soft but try to avoid using them. Perform the exercises by plantarflexing the ankles and concentrating on getting off the ground quickly. Advanced individuals may perform these drills on one leg.
- **Multiple Hurdle/Cone Hops**—These drills may be performed forwards, backwards, laterally, or diagonally (see Figure 6). String together a number of hurdles or cones and jump over them. Emphasize correct technique and getting off the ground quickly. To increase the difficulty: make the cones/hurdles further apart, make the cones/hurdles higher, etc. Advanced exercisers may perform these drills on one leg, or may combine the hops with other movement skills (for example, perform hops over 10 yards then change directions and sprint to the right for 10 yards).



Figure 6: Diagonal cone hops, starting position

- **Rim Jumps**—As the name implies, rim jumps can be performed under a basketball rim to help with visualization. Stand under the rim, jump as high as possible while reaching for the rim with the right hand. Upon landing immediately reverse directions and reach for the rim with the left hand. Continue alternating until the set is completed. The object is to spend as little time on the ground as possible while touching the rim.
- **Triple Jump**—Begin standing tall, with the feet hip-width apart and the hands at the sides. Face the direction of the jump. Begin the exercise by executing a standing broad jump. Land on one foot. Immediately push off that foot and jump forward landing on the other foot. Push off that foot, jumping forward. Extend both legs and land on both feet.

The remainder of this article will present some sample workouts using many of the exercises described above.

## Sample programs

I spend much of my time working with younger athletes. Typically they have a shorter attention span and need to work on all of the physical qualities (speed, agility, strength, etc.). As a result, plyometric-only workouts don't work very well. Likewise, having them perform sets of plyometrics (for example, three sets of ten jumps) tends to be ineffective as well. The sample programs that follow are methods I've come up with to introduce plyometrics in a fun, challenging, and effective way. More advanced individuals will probably benefit from a more traditional set and repetitions approach to programming.

### Beginner's Drill

This first drill is a way to make plyometrics fun and applicable while developing basic techniques and explosiveness.

Stand behind the start line. Place a tape measure on the ground and set a goal to jump to (for example, pick the six foot mark on the tape). Perform three standing broad jumps, resting in-between attempts.

After performing three standing broad jumps, line up behind the start line again. Perform another standing broad jump. This time, when landing, immediately perform a counter-movement jump. Try to make the second jump as quickly after landing as possible. Perform this combination three times. Rest in-between attempts.

After three standing broad jumps + counter-movement jumps have been performed, it is time for the third part of the drill. Perform a standing broad jump. As you land on the ground, have your partner throw a basketball or medicine ball high into the air, jump up and try to catch the ball. Perform this combination three times. Rest in-between attempts.

The fourth part of this drill is performed exactly like the third (i.e. standing broad jump + counter-movement jump + catch the ball). However, after the ball has been caught, land and immediately perform another counter-movement jump. This time take a jump shot as you are in the air. Perform this combination three times. Rest in-between attempts.

This drill results in 24-foot contacts, makes plyometrics fun, and participants can instantly see how these drills apply to the real world!

### Intermediate Drill

The intermediate drill is a circuit with ten stations. Exercise at each station for 30 – 60 seconds (depending upon fitness level). Stress explosiveness and technique. Depending upon fitness level you may rest in-between stations.

- Bodyweight Squats
- Counter-movement Jump, stick landing
- Bodyweight Lunges
- Standing Broad Jump
- Jumping Jacks
- Hurdle/Cone Hops for 5 – 10 yards
- Push-ups
- Medicine Ball Chest Passes
- Crunches
- Medicine Ball Overhead Throws

### Advanced Drill

The advanced drill is a circuit with thirteen stations and more advanced exercises. Exercise for 30 – 60 second at each station focusing on explosiveness and technique. Rest may be allowed in-between stations.

- Bodyweight Squats
- Rim Jumps
- Bodyweight Lunges
- Split Jump with Cycle

- Standing Broad Jump
- Jumping Jacks
- Hurdle/Cone Hops for 5 – 10 yards
- Push Ups
- Medicine Ball Chest Pass
- Tuck Jump
- Crunches
- Medicine Ball Overhead Toss
- Squat Jumps

Plyometrics can be a fun, effective way to help increase explosiveness and improve athletic performance. While the advanced drills often look fun and interesting, one should be careful and make sure that they are ready for those drills. Failing to take steps to ensure safety and proper progression could result in injury, or the wasting of valuable time.

## About the Author

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